DOWNLOAD PDF DIGITAL BASICS FOR CABLE TV SYSTEMS

Chapter 1 : An Introduction To Digital TV Technology â€“ TV Without Borders

*Digital Basics for Cable TV Systems [Jeffrey L. Thomas, Francis M. Edgington] on www.nxgvision.com *FREE* shipping on qualifying offers. If you install, upgrade, or maintain digital or mixed digital/analog systems, Digital Basics for Cable Television Systems is your complete guide to this new world.*

Analog television systems[edit] Analog colour television encoding systems by nation All but one analog television system began as black-and-white systems. Each country, faced with local political, technical, and economic issues, adopted a color television system which was grafted onto an existing monochrome system, using gaps in the video spectrum explained below to allow color transmission information to fit in the existing channels allotted. The grafting of the color transmission standards onto existing monochrome systems permitted existing monochrome television receivers predating the changeover to color television to continue to be operated as monochrome television. Because of this compatibility requirement, color standards added a second signal to the basic monochrome signal, which carries the color information. The color information is called chrominance with the symbol C, while the black and white information is called the luminance with the symbol Y. Monochrome television receivers only display the luminance, while color receivers process both signals. Though in theory any monochrome system could be adopted to a color system, in practice some of the original monochrome systems proved impractical to adapt to color and were abandoned when the switch to color broadcasting was made. All countries used one of three color systems: Ignoring color, all television systems work in essentially the same manner. The monochrome image seen by a camera later, the luminance component of a color image is divided into horizontal scan lines, some number of which make up a single image or frame. A monochrome image is theoretically continuous, and thus unlimited in horizontal resolution, but to make television practical, a limit had to be placed on the bandwidth of the television signal, which puts an ultimate limit on the horizontal resolution possible. When color was introduced, this necessity of limit became fixed. All analog television systems are interlaced: Each half of the frame is called a video field , and the rate at which field are transmitted is one of the fundamental parameters of a video system. It is related to the utility frequency at which the electricity distribution system operates, to avoid flicker resulting from the beat between the television screen deflection system and nearby mains generated magnetic fields. All digital, or "fixed pixel," displays have progressive scanning and must deinterlace an interlaced source. Use of inexpensive deinterlacing hardware is a typical difference between lower- vs. All films and other filmed material shot at 24 frames per second must be transferred to video frame rates using a telecine in order to prevent severe motion jitter effects. Viewing technology[edit] Analog television signal standards are designed to be displayed on a cathode ray tube CRT , and so the physics of these devices necessarily controls the format of the video signal. The image on a CRT is painted by a moving beam of electrons which hits a phosphor coating on the front of the tube. This electron beam is steered by a magnetic field generated by powerful electromagnets close to the source of the electron beam. In order to reorient this magnetic steering mechanism, a certain amount of time is required due to the inductance of the magnets; the greater the change, the greater the time it takes for the electron beam to settle in the new spot. For this reason, it is necessary to shut off the electron beam corresponding to a video signal of zero luminance during the time it takes to reorient the beam from the end of one line to the beginning of the next horizontal retrace and from the bottom of the screen to the top vertical retrace or vertical blanking interval. The horizontal retrace is accounted for in the time allotted to each scan line, but the vertical retrace is accounted for as phantom lines which are never displayed but which are included in the number of lines per frame defined for each video system. Since the electron beam must be turned off in any case, the result is gaps in the television signal, which can be used to transmit other information, such as test signals or color identification signals. The temporal gaps translate into a comb-like frequency spectrum for the signal, where the teeth are spaced at line frequency and concentrate most of the energy; the space between the teeth can be used to insert a color subcarrier. Hidden signaling[edit] Broadcasters later developed mechanisms to transmit digital information on the phantom lines, used mostly for teletext and closed captioning: PALplus uses a hidden signaling scheme to indicate if it exists, and if so what operational mode it is in. NTSC has been modified by the Advanced Television Systems Committee to support an anti-ghosting signal that is inserted on a non-visible scan line. Teletext uses hidden signaling to transmit information pages. Widescreen All line systems incorporate pulses on line 23 that flag to the display that a Overscan Television images are unique in that they must incorporate regions of the picture with reasonable-quality content, that will never be seen by some viewers. Interlaced video In a purely analog system, field order is merely a matter of convention. For digitally recorded material it becomes necessary to rearrange the field order when conversion takes place from one standard to another. Image polarity[edit] Another parameter of analog television systems, minor by comparison, is the choice of whether vision modulation is positive or negative. Some of the earliest electronic television systems such as the British line system A used positive modulation. It was also used in the two Belgian systems system C, lines, and System F, lines and the two French systems system E, lines, and system L, lines. In positive modulation systems, as in the earlier white facsimile transmission standard, the maximum luminance value is represented by the maximum carrier power; in negative modulation , the maximum luminance value is represented by zero carrier power. All newer analog video systems use negative modulation with the exception of the French System L. Impulsive noise, especially from older automotive ignition systems, caused white spots to appear on the screens of television receivers using positive modulation but they could use simple synchronization circuits. Impulsive noise in negative modulation systems appears as dark spots that are less visible, but picture synchronization was seriously degraded when using simple synchronization. The synchronization problem was overcome with the invention of phase-locked synchronization circuits. When these first appeared in Britain in the early s one name used to describe them was "flywheel synchronisation. This was usually user-adjustable with a control on the rear of the television labeled "White Spot Limiter" in Britain or "Antiparasite" in France. If adjusted incorrectly it would turn bright white picture content dark. Most of the positive modulation television systems ceased operation by the mids. The French System L continued on up to the transition to digital broadcasting. Positive modulation was one of several unique technical features that originally protected the French electronics and broadcasting industry from foreign competition and rendered French TV sets incapable of receiving broadcasts from neighboring countries. Another advantage of negative modulation is that, since the synchronizing pulses represent maximum carrier power, it is relatively easy to arrange the receiver automatic gain control to only operate during sync pulses and thus get a constant amplitude video signal to drive the rest of the TV set. This was not possible for many years with positive modulation as the peak carrier power varied depending on picture content. Modern digital processing circuits have achieved a similar effect but using the front porch of the video signal. Modulation[edit] Given all of these parameters, the result is a mostly-continuous analog signal which can be modulated onto a radio-frequency carrier and transmitted through an antenna. All analog television systems use vestigial sideband modulation , a form of amplitude modulation in which one sideband is partially removed. This reduces the bandwidth of the transmitted signal, enabling narrower channels to be used. Audio[edit] In analog television, the analog audio portion of a broadcast is invariably modulated separately from the video. Most commonly, the audio and video are combined at the transmitter before being presented to the antenna, but separate aural and visual antennas can be used. In all cases where negative video is used, FM is used for the standard monaural audio; systems with positive video use AM sound and intercarrier receiver technology cannot be incorporated. Stereo, or more generally multi-channel, audio is encoded using a number of schemes which except in the French systems are independent of the video system. In a few countries, most notably the United Kingdom , television broadcasting on VHF has been entirely shut down. Note that the British line system A, unlike all the other systems, suppressed the upper sideband rather than the lowerâ€"befitting its status as the oldest operating television system to survive into the color era although was never officially broadcast with color encoding. It was tested with SECAM in the early stages, but later the decision was made to adopt color in lines. In many parts of the world, analog television broadcasting has been shut down completely, or in process of shutdown; see Digital television transition for a timeline of the analog shutdown. The first ones were mechanically based and of very low resolution, sometimes with no sound. Later TV systems were electronic. ITU standards[edit] On an international conference in Stockholm in , the

International Telecommunication Union designated standards for broadcast television systems. The following table gives the principal characteristics of each standard. Except for lines and frame rates , other units are megahertz MHz.

Chapter 2 : What Is Digital Headend Or Cable TV Headend SYSTEM

Digital Basics for Cable Television Systems is also a great reference, with a convenient glossary of digital terminology, a performance measurement map, a test equipment survey, exercises with answers, and much more.

Traditionally we were using the Analog Headend with limited number of services. Number of channels were increasing day by day but there was no any solution. Then the term came Digital Headend. A Digital Headend system is a new revolution in cable TV industry. Digital Headend changed the whole phenomenon of cable TV industry by increasing the number of services. A large number of services can be run on a digital headend. Also digital headend system reduces the bandwidth and provide us better pitcher quality. But as we all knows channels are growing continuously and to provide all of these channels via Analog Headend is not possible that is why we need to go for compression techniques to provide maximum number of services to our subscribers. Dishes We receive the signal from the satellite via satellite dishes into the IF section of the digital headend. These dishes are generally mounted on the floor of headend. Each dish is tuned for different satellite to cover all the channels of that particular satellite. A RG 11 cable is mostly used for to get the signal from these dishes because of its low resistance. Splitters We need to play multiple channels from one satellite cable which comes through dishes , that is why we need to use splitters. These splitters cab be active splitters and passive splitters. These splitters split the RF signal into many output. These splitters cab be 2 way , 4 way , 6 way , 8 way and 16 way etc. Spliitters have RF input and provides RF output. Each IRD is tuned for particular frequency for a particular satellite. So it decode the channels and provide as IP output. Decoders Decoders are used to decode the channels. This signal goes directly into the encoders as shown in figure. For PAY channels broadcasters provides their own decoder to decode their channels these decoders are known as PAY decoders. Encoders The output of decoders which is composite video signal goes directly into the Encoder as input. This IP output from this encoder goes into the Video Switch. There are different kinds of encoders available in the market some them encodes 4 channels and others encode 8 channels simultaneously. Each channel is encoded in a particular multicast IP. We can control the bitrate of channels and volume of channels too by using these encoders. It gives IP output to the Video Switch as shown in figure above. This is 48 GB port switch. We can also configure this switch to maintain the Data. Each port is having its dedicated LED showing the status of data. It is also capable for hard reset. QAM is also known as heart of the Digital Headend because it plays important role in it. All the transport streams are configured in the QAM and each Transport Streams are tuned for different frequency. Scrambling is performed inside it. QAM modulate the signal and provides RF output. Management Switch Management can be 24 MB port switch. So Management Switch provides a medium to get the access of different devices by the client PC. It is connected with Management Switch as shown in figure. As its name indicates that it manages the subscriber. It can give the commands for On Screen Display on one stb as well on all the stbs. It can generate the Bill for subscribers as well for LCOs. Splitter Again a splitter is used after the QAM which works as combiner. Now the input port of splitter works as output. The output of QAM goes into the combiner or splitter where it combines and get loss of signal level then it goes into the STB. MPEG-2 compression system records only those part of pictures which are changes while it did not records the repeated pictures. Thus by excluding the repeated pictures it reduces the bandwidth space. This is how MPEG -2 system works. One analog channel consumes the 7 Mhz frequency approximately in which by using this MPEG -2 compression system we can use approximately 8 TV channels. So we provides maximum data in limited bandwidth. By using this technique we can provide services to our subscribers in Mhz bandwidth. DOLBY Or Stereo Sound Benefit Traditional analog headend does not support the stereo or dolby sound while digital headend supports the stereo or dolby sound also voice quality is improved in mpeg â€” 4 compression.

DOWNLOAD PDF DIGITAL BASICS FOR CABLE TV SYSTEMS

Chapter 3 : Pearson - Digital Basics for Cable TV Systems - Jeffrey L. Thomas & Francis M. Edgington

Title: Digital Basics For Cable Tv www.nxgvision.com Author: Book PDF Subject: Free Download Digital Basics For Cable Tv Systems Book PDF Keywords: Free DownloadDigital Basics For Cable Tv Systems Book PDF, read, reading book, free, download, book, ebook, books, ebooks, manual.

Distribution[edit] A cable television distribution box left in the basement of a building in Germany, with a splitter right which supplies the signal to separate cables which go to different rooms To receive cable television at a given location, cable distribution lines must be available on the local utility poles or underground utility lines. The standard cable used in the U. Multiple cables to different rooms are split off the incoming cable with a small device called a splitter. There are two standards for cable television; older analog cable , and newer digital cable which can carry data signals used by digital television receivers such as HDTV equipment. All cable companies in the United States have switched to or are in the course of switching to digital cable television since it was first introduced in the late s. Most cable companies require a set-top box to view their cable channels, even on newer televisions with digital cable QAM tuners, because most digital cable channels are now encrypted, or "scrambled", to reduce cable service theft. A cable from the jack in the wall is attached to the input of the box, and an output cable from the box is attached to the television, usually the RF-IN or composite input on older TVs. Since the set-top box only decodes the single channel that is being watched, each television in the house requires a separate box. Some unencrypted channels, usually traditional over-the-air broadcast networks, can be displayed without a receiver box. Older analog television sets are "cable ready" and can receive the old analog cable without a set-top box. To receive digital cable channels on an analog television set, even unencrypted ones, requires a different type of box, a digital television adapter supplied by the cable company. Principle of operation[edit] Diagram of a modern hybrid fiber-coaxial cable television system. At the regional headend , the TV channels are sent multiplexed on a light beam which travels through optical fiber trunklines, which fan out from distribution hubs to optical nodes in local communities. Here the light signal from the fiber is translated to a radio frequency electrical signal, which is distributed through coaxial cable to individual subscriber homes. Many channels can be transmitted through one coaxial cable by a technique called frequency division multiplexing. At the headend, each television channel is translated to a different frequency. By giving each channel a different frequency "slot" on the cable, the separate television signals do not interfere with each other. Due to widespread cable theft in earlier analog systems, the signals are typically encrypted on modern digital cable systems, and the set-top box must be activated by an activation code sent by the cable company before it will function, which is only sent after the subscriber signs up. There are also usually " upstream " channels on the cable to send data from the customer box to the cable headend, for advanced features such as requesting pay-per-view shows or movies, cable internet access , and cable telephone service. Subscribers pay with a monthly fee. Subscribers can choose from several levels of service, with "premium" packages including more channels but costing a higher rate. At the local headend, the feed signals from the individual television channels are received by dish antennas from communication satellites. Additional local channels, such as local broadcast television stations, educational channels from local colleges, and community access channels devoted to local governments PEG channels are usually included on the cable service. Commercial advertisements for local business are also inserted in the programming at the headend the individual channels, which are distributed nationally, also have their own nationally oriented commercials. Hybrid fibre-coaxial Modern cable systems are large, with a single network and headend often serving an entire metropolitan area. Most systems use hybrid fiber-coaxial HFC distribution; this means the trunklines that carry the signal from the headend to local neighborhoods are optical fiber to provide greater bandwidth and also extra capacity for future expansion. At the headend, the radio frequency electrical signal carrying all the channels is modulated on a light beam and sent through the fiber. The fiber trunkline goes to several distribution hubs, from which multiple fibers fan out to carry the signal to boxes called optical nodes in local communities. At the optical node, the light beam from the fiber is translated back to an electrical signal and carried by coaxial cable distribution lines on utility poles, from which cables branch out to a series of signal amplifiers and line extenders. These devices carry the signal to customers via passive RF devices called taps. History in North America[edit] This section does not cite any sources. Please help improve this section by adding citations to reliable sources. Unsourced material may be challenged and removed. March Further information: Cable television in the United States Cable television began in the United States as a commercial business in , although there were small-scale systems by hobbyists in the s. The early systems simply received weak broadcast channels, amplified them, and sent them over unshielded wires to the subscribers, limited to a community or to adjacent communities. The receiving antenna would be higher than any individual subscriber could afford, thus bringing in stronger signals; in hilly or mountainous terrain it would be placed at a high elevation. At the outset, cable systems only served smaller communities without television stations of their own, and which could not easily receive signals from stations in cities because of distance or hilly terrain. In Canada, however, communities with their own signals were fertile cable markets, as viewers wanted to receive American signals. Rarely, as in the college town of Alfred, New York , U. Although early VHF television receivers could receive 12 channels , the maximum number of channels that could be broadcast in one city was 7: There were frequency gaps between 4 and 5, and between 6 and 7, which allowed both to be used in the same city. As equipment improved, all twelve channels could be utilized, except where a local VHF television station broadcast. Local broadcast channels were not usable for signals deemed to be priority, but technology allowed low-priority signals to be placed on such channels by synchronizing their blanking intervals. Similarly, a local VHF station could not be carried on its broadcast channel as the signals would arrive at the TV set slightly separated in time, causing " ghosting ". Once tuners that could receive select mid-band and super-band channels began to be incorporated into standard television sets, broadcasters were forced to either install scrambling circuitry or move these signals further out of the range of reception for early cable-ready TVs and VCRs. However, once all allocated cable channels[which? Unfortunately for pay-TV operators, the descrambling circuitry was often published in electronics hobby magazines such as Popular Science and Popular Electronics allowing anybody with anything more than a rudimentary knowledge of broadcast electronics to be able to build their own and receive the programming without cost. Later, the cable operators began to carry FM radio stations, and encouraged subscribers to connect their FM stereo sets to cable. About this time, operators expanded beyond the channel dial to use the "midband" and "superband" VHF channels adjacent to the "high band" of North American television frequencies. Some operators as in Cornwall, Ontario , used a dual distribution network with Channels on each of the two cables. During the s, United States regulations not unlike public, educational, and government access PEG created the beginning of cable-originated live television programming. As cable penetration increased, numerous cable-only TV stations were launched, many with their own news bureaus that could provide more immediate and more localized content than that provided by the nearest network newscast. Such stations may use similar on-air branding as that used by the nearby broadcast network affiliate, but the fact that these stations do not broadcast over the air and are not regulated by the FCC, their call signs are meaningless. Many live local programs with local interests were subsequently created all over the United States in most major television markets in the early s. Cable specialty channels , starting with channels oriented to show movies and large sporting or performance events, diversified further, and " narrowcasting " became common. By the late s, cable-only signals outnumbered broadcast signals on cable systems, some of which by this time had expanded beyond 35 channels. By the mids in Canada, cable operators were allowed by the regulators to enter into distribution contracts with cable networks on their own. By the s, tiers became common, with customers able to subscribe to different tiers to obtain different selections of additional channels above the basic selection. By subscribing to additional tiers, customers could get specialty channels, movie channels, and foreign channels. Large cable companies used addressable descramblers to limit access to premium channels for customers not subscribing to higher tiers, however the above magazines often published workarounds for that technology as well. During the s, the pressure to accommodate the growing array of offerings resulted in digital transmission that made more efficient use of the VHF signal capacity; fibre optics was common to carry signals into areas near the home, where coax could carry higher frequencies over the short remaining distance. Although for a time in the s and s, television receivers and VCRs were equipped to receive the mid-band and super-band channels. Due to the fact that the descrambling circuitry was for a time present in these tuners, depriving the cable operator of much of their revenue, such cable-ready tuners are rarely used now - requiring a return to the set-top boxes used from the s onward. The conversion to digital broadcasting has put all signals - broadcast and cable - into digital form, rendering analog cable television service mostly obsolete, functional in an ever-dwindling supply of select markets. Analog television sets are still[when? Deployments by continent[edit] Main article: Cable television has had little success in Africa , as it is not cost-effective to lay cables in sparsely populated areas. So-called "wireless cable" or microwave -based systems are used instead. Other cable-based services[edit] Coaxial cables are capable of bi-directional carriage of signals as well as the transmission of large amounts of data. Cable television signals use only a portion of the bandwidth available over coaxial lines. This leaves plenty of space available for other digital services such as cable internet , cable telephony and wireless services, using both unlicensed and licensed spectrum. Broadband internet access is achieved over coaxial cable by using cable modems to convert the network data into a type of digital signal that can be transferred over coaxial cable. One problem with some cable systems is the older amplifiers placed along the cable routes are unidirectional thus in order to allow for uploading of data the customer would need to use an analog telephone modem to provide for the upstream connection. This limited the upstream speed to Many large cable systems have upgraded or are upgrading their equipment to allow for bi-directional signals, thus allowing for greater upload speed and always-on convenience, though these upgrades are expensive. In North America , Australia and Europe , many cable operators have already introduced cable telephone service, which operates just like existing fixed line operators. One of the standards available for digital cable telephony, PacketCable , seems to be the most promising and able to work with the quality of service QOS demands of traditional analog plain old telephone service POTS service. The biggest advantage to digital cable telephone service is similar to the advantage of digital cable, namely that data can be compressed, resulting in much less bandwidth used than a dedicated analog circuit-switched service. Other advantages include better voice quality and integration to a Voice over Internet Protocol VoIP network providing cheap or unlimited nationwide and international calling. In many cases, digital cable telephone service is separate from cable modem service being offered by many cable companies and does not rely on Internet Protocol IP traffic or the Internet. Traditional cable television providers and traditional telecommunication companies increasingly compete in providing voice, video and data services to residences. The combination of television, telephone and Internet access is commonly called " triple play ", regardless of whether CATV or telcos offer it.

Chapter 4 : Cable TV System Design; Cable Headend Design

Table of Contents (NOTE: Chapter begin with What You Will Learn and end with Summary, Questions for Review, and Selected Bibliography sections).. 1. Digital Signal Measurement Guidelines.

Click here for a sample chapter for this book: Digital Signal Measurement Guidelines. Defining analog and digital for communications. Digital and analog, similarities and differences. Performance and measurements preview. Modulation and Frequency Management. Preparing information for distribution. Frequency and phase modulation. Viewing the signal in the frequency domain. What is in a signal? Analog to digital signal processing. Signal sampling and quantizing. Restoring the analog signal from the digital signal. Distributing, Layering, and Multiplexing. Multiplexing in broadband cable and HFC systems. Introduction to Digital Modulation Formats. Modulation and multiplex formats. Comparing analog and digital video signals. Viewing modulation with vector diagrams. Constellation and eye diagrams. Symbols, symbol rate, and bit rate. Filtering a digitally modulated signal. Error Correction, Equalization, and Compression. The keys to signal quality and efficiency. The causes of errors. Bit, packet and frame error rates. Reed-Solomon error correction coding. What FEC statistics can tell. Adaptive equalization removes linear distortion. Limitations to adaptive equalization. How adaptive equalization works. View system response from the equalizer. Digital video depends on compression. Compression forms and formats. Why measure signal quality? What degrades digital signal quality? Measuring bit error rate. Viewing modulation with constellation and eye diagrams. Troubleshooting with constellation diagrams. MER diagnostics for troubleshooting and margin. Jitter is all in the timing. Instruments for signal quality measurements. What is a power measurement? Digital signals are different. Types of power measurements. Relative signal level measurements. Measuring digital signal average power. The influence of peak and burst power on signal quality. The nature of non-continuous power. Peak power and peak-to-average power ratio. Peak and burst measurements. Distortion, Noise, and Interference. Effects on digital signals. A new role for noise measurements. Troubleshooting and measuring noise performance. Test equipment for noise and distortion measurements. Performance and Measurement Map. Answers to Chapter Questions. Preface Preface Digital technology is coming to a cable system near you. How will this new technology affect your day-to-day job? Why is it that you feel a bit lost when you open a cable television or broadcast trade magazine and find unfamiliar concepts, words, phrases, and acronyms? I certainly did when I started research for this book. Fortunately, I just asked my partner in this project, Francis Edgington. He has helped many of you with your digital signal cable measurement questions. We have learned an important lesson. A system that keeps high analog performance standards may not provide the same reliability for digital signals. Worse, your analog proof-of-performance measurements do not help you troubleshoot or fix a digital signal problem. Digital video signals, in and of themselves, do not show you their contents or their quality. They recover from stress automatically, to provide the best picture, sound, or data to your subscriber, but may be close to crashing without your knowing it. Our first goal is to acquaint you with the fundamentals of digital technology, system integration, and quality parameters as they relate to the delivery of digital video over cable and optical fiber systems so you can study what you need, when you need it. Our second goal is to leverage your basic knowledge into making realistic measurements on digital signals in your cable system with the tools at hand. The third goal is to help you recognize the symptoms of trouble caused by digital signals in your analog environment so you can efficiently get it operating again. This book is for cable, telephony, and radio frequency RF and optical fiber system technicians and engineers who install, upgrade, and maintain analog- and digital-signal systems. To get the most out of this book you should be experienced or at least familiar with the signal technologies and testing of NTSC or PAL cable television systems. This includes some fundamental test instrument knowledge, such as the way a television channel looks in the time and frequency domains, but not necessarily the modulation theory behind the video formats. You should also understand the fundamentals of distortion and carrier-to-noise ratio in systems with multiple channels. You can pick up most of this background from the book Cable Television Proof-of-Performance, listed in the bibliography of the first chapter. The chapters have been kept small to allow reading in one or two brief sessions. The beginning of each chapter outlines what you will learn. As a review, each chapter includes a summary and questions for review. The answers to the review questions are in an appendix. Here is the contents by chapter: Chapter 1 introduces the differences and similarities between analog and digital signals. Chapter 2 teaches you how information is sent on carriers using modulation. Chapter 3 introduces the transformation of an analog signal into a digital bit stream. Chapter 4 discusses the distribution of signals, and how digital signals are layered to protect themselves from transmission harm. Chapter 5 shows how digital modulation is created and viewed. Chapter 6 digs deeper into the methods used for making a digital signal compact, resistant to transportation problems, and self-correcting. Chapter 7 summarizes the uses and attributes of several popular digital modulation formats and multiplexing schemes. Chapter 8 describes the measurement of digital signal quality. Chapter 9 helps you make digital signal power measurements. Chapter 10 helps you make burst power measurements. Chapter 11 shows how distortion, noise, and interference affect digital signals. Appendices contain a glossary of terms and acronyms used in the book, a performance and measurement map, a test equipment survey, answers to the chapter questions. Many people helped to inspire and watch over our creation of this book. First is Helen Chen of Hewlett-Packard, who, along with her design team, organized the cable television digital test scenario in articles first published in Her firsthand tutoring of the strengths and weaknesses of digital signals and their transport were fundamental to the creation of this book. Next we wish to acknowledge the people who put long hours in reading and critiquing the manuscript: We hope you enjoy the reading.

DOWNLOAD PDF DIGITAL BASICS FOR CABLE TV SYSTEMS

Chapter 5 : Pearson Education - Digital Basics for Cable TV Systems

A new drama 'Ishq Parast' coming soon on ARY Digital - ARY Digital.

Simple fundamentals of digital signals and transport. How digital signals differ from analog signals. Complete coverage of digital testing and proof-of-performance. Key digital measurement techniques, including the use of a spectrum analyzer. Digital signal composition features, such as adaptive equalization, error correction, and compression. Digital Basics for Cable Television Systems is also a great reference, with a convenient glossary of digital terminology, a performance measurement map, a test equipment survey, exercises with answers, and much more. Digital Signal Measurement Guidelines. Defining analog and digital for communications. Digital and analog, similarities and differences. Performance and measurements preview. Modulation and Frequency Management. Preparing information for distribution. Frequency and phase modulation. Viewing the signal in the frequency domain. What is in a signal? Analog to digital signal processing. Signal sampling and quantizing. Restoring the analog signal from the digital signal. Distributing, Layering, and Multiplexing. Multiplexing in broadband cable and HFC systems. Introduction to Digital Modulation Formats. Modulation and multiplex formats. Comparing analog and digital video signals. Viewing modulation with vector diagrams. Constellation and eye diagrams. Symbols, symbol rate, and bit rate. Filtering a digitally modulated signal. Error Correction, Equalization, and Compression. The keys to signal quality and efficiency. The causes of errors. Bit, packet and frame error rates. Reed-Solomon error correction coding. What FEC statistics can tell. Adaptive equalization removes linear distortion. Limitations to adaptive equalization. How adaptive equalization works. View system response from the equalizer. Digital video depends on compression. Compression forms and formats. Why measure signal quality? What degrades digital signal quality? Measuring bit error rate. Viewing modulation with constellation and eye diagrams. Troubleshooting with constellation diagrams. MER diagnostics for troubleshooting and margin. Jitter is all in the timing. Instruments for signal quality measurements. What is a power measurement? Digital signals are different. Types of power measurements. Relative signal level measurements. Measuring digital signal average power. The influence of peak and burst power on signal quality. The nature of non-continuous power. Peak power and peak-to-average power ratio. Peak and burst measurements. Distortion, Noise, and Interference. Effects on digital signals. A new role for noise measurements. Troubleshooting and measuring noise performance. Test equipment for noise and distortion measurements. Performance and Measurement Map. Answers to Chapter Questions.

Chapter 6 : Digital Basics for Cable TV Systems

chasing for digital basics for cable tv systems ebook do you really need this ebook of digital basics for cable tv systems ebook it takes me 58 hours just to find the right download link, and another 8.

Power Considerations Signals in cable systems are measured in dB relative to 1 mV millivolt across 75 ohms. This measure is called dBmV. Expressed in dBmV, the minimum room-temperature noise in a perfect cable system is Starting at the home, the objective is to deliver at least 0 dBmV, but no more than 10 dBmV to the terminal on the television receiver. If a converter or a descrambler is used, its noise figure must be taken into account. There are two reasons for staying toward the low side of the signal range: Low signal levels may cause poor pictures for the subscriber who insists on unauthorized splitting in the home to serve multiple receivers. Working our way back up the plant, we need a signal level of 10 to 15 dBmV at the tap to compensate for losses in the drop cable. Energy diverted to the subscriber is lost from the distribution cable. This loss is called flat loss because it is independent of frequency. Loss in the cable itself is a square-root function of frequency Cable Properties and is therefore contrasted to flat loss. Because of flat losses, relatively high power levels are required in the distribution part of the plant, typically 48 dBmV at the input to the distribution plant. These levels force the amplifiers in the distribution part of the plant to reach into regions of their transfer characteristics that are slightly non-linear. As a result, only one or two amplifiers, called line extenders, can be cascaded in the distribution part of the plant. These amplifiers are spaced to feet apart depending on the number of taps required by the density of homes. Because the distribution part of the plant is operated at higher power levels, non-linear effects become important. The television signal has three principal carriers, the video carrier, the audio carrier, and the color subcarrier. To minimize these effects, the audio carrier is attenuated about 15 dB below the video carrier. In the days when cable systems only carried the 12 VHF channels, second-order distortions created spectrum products that fell out of the frequency band of interest. As channels were added to fill the spectrum from 54 MHz to as much as MHz 1 GHz in a couple of systems , second-order effects were minimized through the use of balanced, push-pull output circuits in amplifiers. The third-order component of the transfer characteristic dominates in many of these designs. The total effect of all thecarriers beating against each other gives rise to an interference called composite triple beat CTB. CTB is measured with a standard procedure involving channel carriers. In a channel cable system, about 10, beat products are created. Channel 11 suffers the most with of these products falling in its video passband. Third-order distortions increase nearly 6 dB for each doubling of the number of amplifiers in cascade. A variety of drivers are energetically pushing the NII. Early efforts came from the telephone industry seeking to justify upgrading heavily depreciated plant. Since the twisted-pair plant did a fine job of delivering plain old telephone service POTS , another reason for replacing it was needed. That reason needed to be a bandwidth hog. Digitized voice did not fill the bill. It could be handled over the existing twisted-copperpairs. Only computer data and digitized video held the promise of providing a justification for declaring twisted-copper pair obsolete. So the telephone systems began a quest for permission to add fiber and digital technology to the rate base. Congressmen caught the bug and decided that a vast government-sponsored program was needed to build the Information Superhigh-way. The NII was born. Fiber is now being installed to upgrade older systems and as part of rebuilds and new builds. The old trunk system of long cascades of amplifiers is now considered obsolete. A bandwidth of 1 GHz contains slots of 6 MHz. The most exciting potential lies with utilizing video-compres-sion technology to squeeze four or more NTSC-like quality signals in a 6-MHz slot.

DOWNLOAD PDF DIGITAL BASICS FOR CABLE TV SYSTEMS

Chapter 7 : Digital Basics for Cable TV Systems | InformIT

Today, U.S. cable systems deliver hundreds of channels to some 60 million homes, while also providing a growing number of people with high-speed Internet access.

Digital Signal Measurement Guidelines. Defining analog and digital for communications. Digital and analog, similarities and differences. Performance and measurements preview. Modulation and Frequency Management. Preparing information for distribution. Frequency and phase modulation. Viewing the signal in the frequency domain. What is in a signal? Analog to digital signal processing. Signal sampling and quantizing. Restoring the analog signal from the digital signal. Distributing, Layering, and Multiplexing. Multiplexing in broadband cable and HFC systems. Introduction to Digital Modulation Formats. Modulation and multiplex formats. Comparing analog and digital video signals. Viewing modulation with vector diagrams. Constellation and eye diagrams. Symbols, symbol rate, and bit rate. Filtering a digitally modulated signal. Error Correction, Equalization, and Compression. The keys to signal quality and efficiency. The causes of errors. Bit, packet and frame error rates. Reed-Solomon error correction coding. What FEC statistics can tell. Adaptive equalization removes linear distortion. Limitations to adaptive equalization. How adaptive equalization works. View system response from the equalizer. Digital video depends on compression. Compression forms and formats. Why measure signal quality? What degrades digital signal quality? Measuring bit error rate. Viewing modulation with constellation and eye diagrams. Troubleshooting with constellation diagrams. MER diagnostics for troubleshooting and margin. Jitter is all in the timing. Instruments for signal quality measurements. What is a power measurement? Digital signals are different. Types of power measurements. Relative signal level measurements. Measuring digital signal average power. The influence of peak and burst power on signal quality. The nature of non-continuous power. Peak power and peak-to-average power ratio. Peak and burst measurements. Distortion, Noise, and Interference. Effects on digital signals. A new role for noise measurements. Troubleshooting and measuring noise performance. Test equipment for noise and distortion measurements. Performance and Measurement Map. Answers to Chapter Questions. THOMAS has worked for Hewlett-Packard for over 25 years on measurement equipment definition and application for the cable television industry. He currently writes application and training materials for use in several RF communications areas, including cellular radio. He is author of Cable Television Proof-of-Performance: Simple fundamentals of digital signals and transport. How digital signals differ from analog signals. Complete coverage of digital testing and proof-of-performance. Key digital measurement techniques, including the use of a spectrum analyzer. Digital signal composition features, such as adaptive equalization, error correction, and compression. Digital Basics for Cable Television Systems is also a great reference, with a convenient glossary of digital terminology, a performance measurement map, a test equipment survey, exercises with answers, and much more. Courses Pearson Higher Education offers special pricing when you choose to package your text with other student resources.

Chapter 8 : Download Digital Basics for Cable TV Systems Ebook Online - Video Dailymotion

In digital TV systems, each TV show is known as an event. Thus, from one point of view each service consists of a number of elementary streams that are transmitted simultaneously, but from another point of view the service consists of a series of individual events broadcast one after another.

Instead, this tutorial will concentrate on what makes a digital TV signal special, the terminology used to describe a DVB digital TV signal and generally helping you to understand what the hell people talking about digital TV actually mean. Another page describes the basics of broadcast engineering , and shows you how an MPEG stream gets from the encoder to the viewer. The ATSC service information tutorial else where on this site describes the major differences between DVB services and digital services in the USA or Canada, but does not include information about the basic details of the transmission mechanism. Each transport stream consists of a set of sub-streams known as elementary streams , where each elementary stream can contain either MPEG-2 encoded audio, MPEG-2 encoded video, or data encapsulated in an MPEG-2 stream. The only restriction on the number of elementary streams in any transport stream is that each elementary stream must have a unique PID value within its containing transport stream. Since this is stored as a bit value, this is not a major restriction. In practise, the number of elementary streams is limited by the total bitrate of the transport stream. A transport stream consists of a number of audio and video streams that are multiplexed together. First, each service in the transport stream will have its audio and video components encoded using MPEG-2 compression. The result of this process is a set of MPEG-2 elementary streams , each containing one video channel or one mono or stereo audio track. These streams are simply a continuous set of video frames or audio data, which is not really suitable for multiplexing. Therefore, we split these streams into packets in order to make the multiplexing process easier. The result of this is a packetized elementary stream , or PES. To create a transport stream, each of these packetized elementary streams is packetized again and the data from the stream is stored in transport packets. Each transport packet has a length of bytes, which is much smaller than a PES packet, and so a single PES packet will be split across several transport packets. This extra level of packetization allows the stream to support much more powerful error correcting techniques â€" PES packets are used to provide a way of multiplexing several elementary streams into one bigger stream, and are more concerned with identifying the type of data contained in the packet and the time and which it should be decoded and displayed. Transport packets, on the other hand, are almost purely concerned with providing error correction. So far, we have just considered audio and video data. We may also want to include data streams as part of our service, for applications, Teletext information or other reasons. These are called private sections , and we will look at them in more detail little later. Since most of the equipment that generates this data will produce a stream of transport packets containing private sections, multiplexing them in to our transport stream is easy. Once we have a complete set of transport packets for the different parts of our services, we can insert them into our final transport stream. When doing this, we have to be careful to insert packets in the correct order. This is not just a case of ensuring that all of the packets within the stream come in the right order â€" MPEG defines a strict buffering model for MPEG decoders, and so we have to take care that each elementary stream in our transport stream is given a data rate that is constant enough to ensure that the receiver can decode that stream smoothly, with no buffer underruns of overruns. A ratio of ten video packets to every audio packet is fairly close to what we would likely see. If we just multiplexed these transport packets together, we would have a transport stream that contains a number of elementary streams with no indication of what type of data is in these streams or how to reconstruct these streams into something that a receiver can present to the user. This data is encoded in a number of elementary streams that are added to the transport stream during the multiplexing process, and is known as service information. So what does this service information look like? We will examine this in more detail later, but at the simplest level it contains a number of tables that each describe one service in the transport stream. These tables list each stream in the service and give its PID and the type of data contained in the stream. The anatomy of a DVB transport stream. Information about the types of stream in a service allow the receiver to not only identify which streams are audio and video, but also to identify different types of data stream â€” separating teletext information from service information from broadcast filesystems for instance. This makes it easy for the receive to know which streams it should pass on to different parts of its software stack for decoding. Describing the structure in this way, rather than embedding it into the elementary streams, means that we can re-use elementary streams across services. This is shown in the example in the next section of a real transport stream â€" two elementary streams the streams with PID values of 32 and appear in more than one service. This allows efficient re-use of streams across services, and is most commonly used for data streams. If our transport stream was to contain more than one service, we can simply multiplex all the audio, video and data streams for all the services together. The service information describes which elementary stream belonged to which service, as well as carrying some other information that is more for the benefit of the viewer than the receiver. This may include channel names and descriptions, information about the TV schedules, and parental ratings information. So, if we take a look at this from a different perspective, we get this picture: Elementary streams within a transport stream. In this case, we have a transport stream containing eight elementary streams, split across two services. PIDs , and contain video, while the other elementary streams contain audio tracks in different languages. As we can see, for both services, the elementary streams containing the video and one audio track continue across services â€" this is typically done simply to make life easier for the broadcaster and is not required. When there are multiple audio tracks, or multiple camera angles, as in the case of service 2 , then there will be several different elementary streams on other PIDs. This does not have to happen at an event boundary. As we can see from the case of the MHP application, this application is only available for part of the event. When it is no longer available, the elementary stream that contains it need not be broadcast any more. The ability to update the contents of a transport stream in this way offers a great deal of flexibility to the broadcasters. A transport stream is different from the type of stream used in DVDs which is known as a program stream. However, there are two major differences between them. The first difference is that a program stream does not contain as much service information as a transport stream. Every elementary stream in an MPEG program stream belongs to the same service. Secondly, transport streams are used in environments where there is much more chance of data corruption. Transport streams, on the other hand, may be transmitted to and from satellites, over terrestrial TV networks or over cable TV networks. This means that they have to be much more resilient, and so transport streams have extra levels of packetization and error-correcting information to help cope with the challenges of the environment that they are used in. Every multiplex is broadcast on a single frequency, and only one multiplex can be broadcast on each frequency. Within a multiplex, each group of elementary streams that makes up a single TV channel is called a service. This can vary between TV shows on that service for instance, some shows may be broadcast in multiple languages or with multiple camera angles , or it may even change within an TV show. These changes are all perfectly legal in MPEG â€" not common, but legal. In digital TV systems, each TV show is known as an event. Thus, from one point of view each service consists of a number of elementary streams that are transmitted simultaneously, but from another point of view the service consists of a series of individual events broadcast one after another. The image below should give you an idea of what a real transport stream looks like. This is a screen grab taken from a transport stream analyzer, showing one of the multiplexes being broadcast on the Astra satellite: An example of a real transport stream. One thing that you will notice is that in this screenshot, services are referred to as programs. This is an MPEG term, and basically means the same thing as a service. One of the reasons an MPEG-2 program stream is so named is the fact that it only contains a single program. As you can see from this image, the multiplex contains a number of different services, where each service contains at least one audio stream, at least one video stream and usually several data streams. The second column shows the PID value for each elementary stream. This is a little less than DVD-quality, but it does allow the broadcaster to fit a reasonable number of services in each multiplex. Broadcasters like to fit as many services as possible into a multiplex, since this means that they can fit more channels into every frequency band remember, every multiplex is broadcast on a single frequency band and so they can use fewer transponders on a satellite to broadcast the same number of services. OK, so now we know what goes into a transport stream. There are some other things that are worth knowing, however. The transport stream physically groups a set of services together, but services in DVB systems can also be logically grouped as well. A logical group of services is called a bouquet. Why do we need this? Assume for a minute that you work at a large broadcaster, where you broadcast 50 channels. So, you need 7 transport streams to contain all your services. You sell access to these services in packages, so that a consumer can choose to buy your basic package which contains 13 channels sports package which contains 8 sports channels or your movie package which contains 5 movie channels. How can you identify in a machine-readable way which channels are part of which package? You could group them in transport streams, but your basic package is too big to fit in one TS. Instead, by assigning a bouquet to each package, you can group the services into transport streams in the most efficient way while still having a mechanism for grouping the services in a logical way. Digital TV systems also have the concept of a network. This is not a computer network: These transport streams will often be broadcast by the same company e. This is especially true in terrestrial systems, where there may be several networks operating at the same time in the same area e. In this case, the receiver will normally use automatic channel scanning to find all of the available channels, rather than relying on service information. The company that owns the network may or may not own the actual delivery medium â€" in the case of a cable TV system, for instance, the owner of the cable infrastructure is usually also the network operator. In the case of a satellite TV system, however, the network operator e. Similarly in terrestrial systems, a network e. So, what we have is: A network consists of one or more transport streams that are broadcast by the same entity A transport stream is an MPEG-2 stream containing several services Each service is a TV channel, and consists of a series of events one after the other Each event is a single TV show, and consists of a number of elementary streams Each elementary stream is a packetized MPEG-2 stream containing MPEG-2 encoded audio, video or binary data. Several services possibly from several different transport streams can be grouped together logically in a bouquet. The structure of a DVB transport stream. Every service in a DVB network can be uniquely identified by three values. These values are the original network ID the ID of the network that originally broadcast the service , the transport stream ID to identify a particular transport stream from that network and a service ID to identify a service within that transport stream. We can actually go further than this. Each elementary stream in a service may have a component tag , that allows the unique identification of a given elementary stream.

Chapter 9 : Satellite TV | Direct Broadcast Satellite System | DBS TV

With the Xfinity Stream app, get your entire channel lineup at home and top networks and live sports on the go, included with your TV service. Plus, get thousands of Xfinity On Demand movies and shows, and access your DVR library anytime, anywhere.

Simple fundamentals of digital signals and transport. How digital signals differ from analog signals. Complete coverage of digital testing and proof-of-performance. Key digital measurement techniques, including the use of a spectrum analyzer. Digital signal composition features, such as adaptive equalization, error correction, and compression. Digital Basics for Cable Television Systems is also a great reference, with a convenient glossary of digital terminology, a performance measurement map, a test equipment survey, exercises with answers, and much more. THOMAS has worked for Hewlett-Packard for over 25 years on measurement equipment definition and application for the cable television industry. He currently writes application and training materials for use in several RF communications areas, including cellular radio. He is author of Cable Television Proof-of-Performance: Digital Signal Measurement Guidelines. Defining analog and digital for communications. Digital and analog, similarities and differences. Performance and measurements preview. Modulation and Frequency Management. Preparing information for distribution. Frequency and phase modulation. Viewing the signal in the frequency domain. What is in a signal? Analog to digital signal processing. Signal sampling and quantizing. Restoring the analog signal from the digital signal. Distributing, Layering, and Multiplexing. Multiplexing in broadband cable and HFC systems. Introduction to Digital Modulation Formats. Modulation and multiplex formats. Comparing analog and digital video signals. Viewing modulation with vector diagrams. Constellation and eye diagrams. Symbols, symbol rate, and bit rate. Filtering a digitally modulated signal. Error Correction, Equalization, and Compression. The keys to signal quality and efficiency. The causes of errors. Bit, packet and frame error rates. Reed-Solomon error correction coding. What FEC statistics can tell. Adaptive equalization removes linear distortion. Limitations to adaptive equalization. How adaptive equalization works. View system response from the equalizer. Digital video depends on compression. Compression forms and formats. Why measure signal quality? What degrades digital signal quality? Measuring bit error rate. Viewing modulation with constellation and eye diagrams. Troubleshooting with constellation diagrams. MER diagnostics for troubleshooting and margin. Jitter is all in the timing. Instruments for signal quality measurements. What is a power measurement? Digital signals are different. Types of power measurements. Relative signal level measurements. Measuring digital signal average power. The influence of peak and burst power on signal quality. The nature of non-continuous power. Peak power and peak-to-average power ratio. Peak and burst measurements. Distortion, Noise, and Interference. Effects on digital signals. A new role for noise measurements. Troubleshooting and measuring noise performance. Test equipment for noise and distortion measurements. Performance and Measurement Map. Answers to Chapter Questions.