

Chapter 1:  
**HISTORY OF COMMUNICATIONS**



 **DIGITAL OVERDRIVE**

## Chapter 1: History of Communications

### History of Television

Television had its beginning in the 1920's and started down two different paths: Mechanical and Electronic.

The first path pursued a mechanical system that used a spinning disc to produce an image on a 30 line television set. This method was invented by Charles F. Jenkins in the United States in 1923. On May 11, 1928, General Electric began broadcasting with a 24 line mechanical system that displayed only 5 frames per second. Later on that year, GE sold the first television set for home use that used the mechanical system and had a 3 inch screen.

In 1929, Herbert Ives demonstrated the very first colour TV system that had 50 lines of resolution. These broadcasts were typically done between New York state and Washington D.C. during the latter half of the 20's. But as these inventors were promoting their mechanical system, there were others that were developing electronic television.

Electronic television was invented by Philo T. Farnsworth in 1927. His system did not involve any spinning discs. Instead, he tamed electrons by using an invention he called the image dissector tube. By 1929, this system displayed 120 lines and had 24 frames per second. In 1934 RCA had improved this to 343 lines. Most TV sets were 12 inches by this time but the first 14 inch TV debuted in 1938 setting a new standard for picture size.

The first commercial television was made by RCA (the TRK-12) which was



developed in 1939 and sold for \$600. The TV debuted at the 1939 World's Fair in New York. Farnsworth lost his patent and mass production of TV sets began.

The basis for all analog televisions today was established in 1941, when the National Television System Committee (NTSC) approved a 525 line system that had 30 frames per second. This system is still the standard until all systems convert to digital broadcasting. By that time, the NTSC approved system will be 65 years old, the age of retirement.

Networks started to appear during the 1940's. These new networks would produce programming for TV. NBC had begun as a radio network in 1926 and ABC started airing programs in 1944. CBS began colour broadcasting in 1951 but the system was not compatible with the NTSC approved system so they stopped just 4 months after they began. The NTSC set a standard for colour in 1953 that was compatible with the black and white standard currently in use.

By this time, there were 108 stations in the United States and 9% of the population owned a TV. In contrast, there were 70,000 television sets in Canada in 1951 even though Canadian broadcasting did not begin until September 6, 1952, when the first TV station began broadcasting from Montreal (CBFT).

### Production Notes

- Spinning Disc Television
- Electronic Television
- Philo T. Farnsworth
- First Commercial Television Set
- NTSC
- Network Television



### DID YOU KNOW?

*Philo T. Farnsworth appeared on the television show "I've Got A Secret" in the 1940's where he stumped a panel of players trying to guess what his claim to fame was. Few people know who brought us this amazing invention.*

The “Golden Age” of television came in the late 1940's and 1950's with such shows as the *Ed Sullivan Show* (1948-1971), the *Lone Ranger* (1949-1957), *Today Show* (1952 - present), the *Tonight Show* (1954 - present), and *Gunsmoke* (1955-1975). These years marked the beginning of variety shows, sitcoms, westerns, and talk shows. Every idea was new and was forming the structure of broadcasting.

The 1960's was a decade of reality for television viewers. The evening news went from being only 15 minutes to half an hour, US troops were shown fighting in Vietnam, Martin Luther King was shot in front of the world, President Kennedy's funeral was watched by 93% of Americans, and Apollo 11 showed us the moon's surface. By the end of the 1960's, networks were informing their viewers instead of just entertaining them.

The trend of the 1960's carried through the 70's until the second golden age of television occurred in the 1980's. This is when such TV shows as *Hill Street Blues*, *St. Elsewhere*, *Dallas*, *The Cosby Show*, and *Miami Vice* would dominate the airwaves. CNN was founded in 1980 and MTV in 1981. For the first time in decades, a new national network sprung to life. Fox began broadcasting in 1985.

Many of these hits from the 80's carried over to the 90's and brought new shows with them. Television was starting to challenge what was socially acceptable in the 1990's and would push the limits with controversial

topics such as pregnant unwed mothers. The fifth major national network came on board in 1994 which was known as Warner Brothers or the WB.

The 1990's also saw the birth of satellite television with the introduction of RCA's Direct TV system in 1994. There would be many similar products to follow with many companies jumping on the band wagon at the end of the decade with satellite systems from the Dish Network in the US and Bell (ExpressVU) and Star Choice in Canada. The small 18 inch dishes are portable and receive hundreds of channels making the nightly decision of what to watch even more difficult.

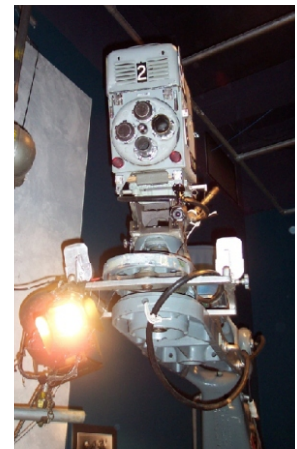


Since the year 2000 was ushered in, we have seen a tremendous growth in satellite TV. There are now dozens of systems available in the United States and Canada that offer unique programming as an alternative to cable. Each system has a gimmick, like the PVR (Personal Video Recorder) which will record hundreds of hours of television onto a set-top hard drive, no VCR needed. It also allows you to pause live TV with its built in buffering system.

The biggest change in television broadcasting since 1939 has also now been completed. High Definition Television (HDTV) is being broadcast using a new digital broadcasting system that has changed the television picture from 525 lines to 1080 giving a much clearer picture. Who knows how far television broadcasting will go in the next decades?

## Production Notes

- Golden Age of Television
- Reality TV in the 1960's
- 2nd Golden Age, 1980's
- New Networks: CNN, FOX, MTV, WB
- Satellite TV
- PVR (Personal Video Recorder)
- First Use of Videotape



One of the first studio video cameras

## History of Videotape

On November 30, 1956, CBS broadcast their evening news from Los Angeles called “Douglas Edwards and the News” using a new piece of technology in the broadcasting industry: the Videotape Recorder (VTR). The VTR allowed networks to broadcast their news at any time that they wanted. You see, all news broadcasts were live up to this point. They originated from either New York or Los Angeles and were sent across the country. This posed a problem for viewers who would receive the news at very inconvenient times. The 4 different time zones across the United States and Canada could not be compensated for. Therefore, news broadcast at 6 p.m. in New York would be seen on the west coast at 3 p.m. in the afternoon. The VTR permitted the news to be videotaped and then rebroadcast at 6 p.m. in the west (9 p.m. in New York). Delayed playback and storage were the most important advantages at the time.

Before magnetic videotape was invented, the news industry relied heavily upon film for storage and playback of images. In fact, the national news used delayed playback with film. They would point a film camera at a television monitor during the live broadcast of the national news. Once the broadcast was finished, the film would then be developed, hung, dried, and loaded for use just two hours later. Needless to say, this process was time consuming, the picture quality was horrible, and the film was not always dry on time.

Magnetic audio tape was introduced in the early 1950's. This invention allowed radio producers to tape shows at an earlier time and play them back later on. Delayed playback had been achieved in radio broadcasting but not in television. Radio producers could even edit the best takes together to get a show that was the best

possible. This too could not be accomplished in television.



Then, in 1956, the Ampex Corporation unleashed its first commercial VTR (the Mark IV) that would record black and white

video signals onto a magnetic videotape. The videotape cost \$248.95US (about \$1700US in today's money). This was such a technological advancement that all of the major networks purchased an Ampex VTR within six months of its first use.

In 1957, Ampex introduced the first colour VTR to replace the black and white format that was only one year old. However, the television industry still did not have the capability of editing the videotape like they could in the radio industry. Television shows still had to be recorded live to tape.

Videotape had established and proven itself as a storage medium but producers wanted to find a way to use this new discovery as a production medium. This could only be accomplished in one way: a method to edit videotape would have to be developed. In 1958, the first editing method was established. It was known as mechanical editing. The same concepts that were employed in film editing were applied to video editing. The editor would sit and splice the videotape with a razor blade and then reassemble it using splicing tape. This method was very inaccurate and time consuming. However it did allow the television industry to record shows in segments to be spliced together later on.

Mechanical editing was replaced in the early 1960's with a process called electronic editing. Ampex had refined the process, replacing the physical cutting with an electronic transfer process. Electronic

## Production Notes

- Delayed Playback
- Magnetic Audio Tape In Radio
- First Commercial VTR From Ampex

## DID YOU KNOW?

*The first VTR's were extremely large. They were the size of a teacher's desk and cost over \$1 million to purchase. The only features they had were Play, Stop, Rewind, Fast-Forward and Record.*



editing involved the transfer of a prerecorded shot from a master videotape to another videotape. Each transfer began and ended at an edit point. Videotape had now reached the point where it could be considered as a legitimate production medium.

The next major step in videotape editing came in 1967 with the invention of a timecode system. The Electronic Engineering Company (EECO) of California developed the system which gave each video frame an eight digit timecode. The code was measured in hours, minutes, seconds, and frames. The visual representation looked like this: 00:00:00:00. This invention allowed editors to access an individual point on the videotape for frame accurate editing. By 1970, the time-code invented by EECO was adopted as an industry standard by the Society for Motion Picture and Television Engineers (SMPTE). Now we refer to this type of timecode as SMPTE timecode.

Slow motion video was also accomplished in 1967 with the introduction of the video disc. Ampex had designed the disc to handle 30 seconds of colour video which could then be played back in slow, fast, or still motion. ABC first used this new technology at the World Series of Skiing to slow down and freeze frames of certain skiers. After this, slow motion became an

important part of sports broadcasting throughout the world.

The first situation comedy to use editing in the early 1970's was *All In The Family*. Each half hour show appeared to the audience to be a continuous live to tape broadcast. This was not so. Each show contained at least 60 different edits. The producers of the show were able to take many different live performances and select what part they wanted from each one. The final show was actually a comprehensive composition of the best shots from each live performance. This series pioneered editing techniques for situation comedies which are still in use today.

The first videotaped made-for-television movie was produced in 1972 and was called *Sandcastles*. The production of this movie depended solely upon video cameras and videotape. Even the editing was done using videotape. This was also the first time that computers were used in the editing process. The computer was coupled with video production equipment to produce editing which had only been available in the motion picture film industry. This technology would enable VTR's to become so portable and versatile that they could be used for Electronic News Gathering (ENG), which is now the most popular use for video cameras in the industry.

### Production Notes

- Electronic Editing
- Electronic Engineering Company
- SMPTE Timecode
- Slow Motion Video
- Fast Motion Video
- First Situation Comedy to use Videotape and Editing
- First Made-for-TV Movie to use Video
- ENG - Electronic News Gathering



### The SMPTE Time-Code Format



*This format is used in motion picture editing as well as digital video editing on computer systems*

## The Past 30 Years

Since the mid 1970's, videotape has evolved into a much smaller and portable format. The first major change was the elimination of 2 inch VTR's as the industry standard. They were replaced in the 1970's with a smaller VTR which would record via helical scanning on 1 inch tape. These new machines had the capability of playing back in slow, fast, and still motion without the need for a video disc recorder. They also could record a much sharper picture and better audio than any machine previous. These machines were portable enough for the television industry, but were not small enough or affordable for home use. But that would soon change.

In 1975, Sony introduced a new videotape format that was aimed at the consumer market. The new format, called Beta, was only half an inch wide and was housed within a plastic shell. It could record 2 hours of high quality video or up to 6 hours of adequate video. The machines were small enough to fit on a table top and the tapes were loaded in through a door. This new home format would revolutionize video in the consumer market.

JVC had also been working on a new videotape format for the consumer market. VHS was introduced soon after Beta in 1976 and would be the eventual winner in the consumer videotape format war. VHS was also a half inch format with the same features as Beta. The machines started out much larger than Beta machines but soon came down to the same size. VHS dominated the market



A VHS Videotape

because of one simple fact. Sony would not license any other company to make Beta tapes and VCR's. JVC did. Higher competition in the VHS market made the prices go down and VHS became a much more affordable format for the home user. Now, almost every home uses a VHS Video Cassette Recorder (VCR).

These new home formats sprouted a new interest in the consumer. Video production was now accessible to the average person at a reasonable price. Cameras were now smaller and referred to as camcorders. A camcorder and a VCR linked together provided the most basic editing system for home videos. If an audio cassette deck was added with an audio mixer, the amateur video maker could produce exciting home videos. This new interest spawned a new market and new videotape formats that are now known as prosumer. Video was stepping into a new realm at a very quick pace.

The early 1980's saw camcorders becoming smaller. Many Japanese and American companies decided to combat JVC's VHS dominance through the camcorder market by introducing a smaller videotape format. The new format introduced in 1983 was called 8mm because that is the width of the videotape itself. The small tape could still record 2 hours worth of video but allowed the physical size of the camcorder to be much smaller. Consumers leaned toward this format because of it's size and portability. In the late 1980's, VHS-C was invented to give users of VHS a small format that would play back in their home VCR's.

## Production Notes

- Consumer VCR's
- Beta vs. VHS
- Smaller Camcorder Formats
- 8mm Videotape
- VHS-C



A VHS-C Camcorder

An 8mm Videotape



From 8mm developed a prosumer format called Hi8 which was an improved version of 8mm. A similar occurrence happened with VHS. Super VHS (S-VHS) was developed for the prosumer market in 1987. Both of these formats were industry standards for prosumers during the late 80's and 90's.

The 1980's also saw new professional formats such as Betacam (1982), MII (1986), and Betacam SP (1986), as well as digital formats like D1 (1987) and D2 (1989). These formats sent the broadcast industry into an era known as the Digital Revolution. The Digital Revolution saw many new broadcast and consumer formats.

The 1990's was one of the most rapid growth times for video. Video evolved into a digital tapeless form in the editing process, but still depended on tape for gathering footage. Digital tape formats introduced in the 1990's include D3 (1991), D5 (1994), Digital Betacam (1993), Mini-DV (1995), DVCAM (1996), and DVCPro (1995). Mini-DV is one of the newest consumer and prosumer level videotape formats that is aimed at the ever expanding home video market. It offers 500 lines of resolution, CD quality audio, and a digital picture which makes editing easier for the home user. All of this packed into a videotape that is only 6mm wide! Since the end of 1995, most manufacturers have developed Mini-DV cameras.

A DVCPro videotape



DVCPro and DVCAM are the broadcast equivalent to Mini-DV. DVCPro was developed by Panasonic while Sony created DVCAM. DVCPro was instantly accepted when it came onto the market. The first major customers for this new digital format were the National Film Board of Canada and the Ottawa Palladium Sports Arena (now the Scotiabank Place, home of the Ottawa Senators).

Since Panasonic was an official sponsor of the 1996 Summer Olympic Games in Atlanta, DVCPro video equipment was used and promoted throughout the 2 weeks. Once the games were over, educational institutions were given the opportunity to purchase the DVCPro equipment used for the event from Panasonic at reduced prices.

Sony took a different approach to their new broadcast digital format. They developed an entire editing system which allowed the user to videotape on the DVCAM format and digitally transfer it into a Sony digital editing system comprised of DVCAM VTR's and computer editing interfaces. The all-in-one system made the production process more enjoyable and powerful.

JVC's digital entry was much more simple. It's called Digital-S and was introduced in 1998 (now known as D-9). They took the extremely popular S-VHS videotape format and made it digital. The same size tape is used and the machines are even able to playback S-VHS tapes as well as Digital-S. This makes it easy for the videographer that already has a large library of S-VHS masters to make the transition to a new digital format. Digital-S is an attractive alternative to DVCPro and DVCAM.

## Production Notes

- Hi8, Super VHS (S-VHS)
- Pro Formats: Betacam SP, MII, D1, D2, D3, D5
- Digital Videotape
- Mini-DV
- DVCPro, DVCAM
- Digital Videotape Options



A Mini-DV videotape

## DID YOU KNOW?

*The Mini-DV format was introduced in 1995 and was a joint venture between many different electronics companies. It is only 6mm wide and can store up to 80 minutes of digital video and audio when set to the highest quality mode.*

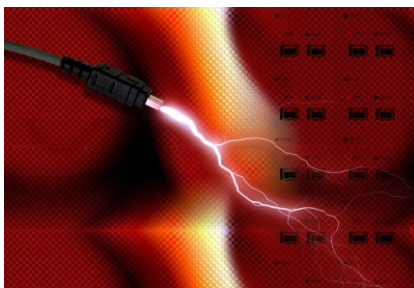
Television History

Video History

Radio History

When we entered the new millennium, the consumer market started to change once again. Mini-DV broke the \$1000 level for home camcorders and Sony invented a new format to compete with the popular digital format. Although Sony made Mini-DV camcorders, they released Digital 8 which uses Hi8 tapes but records digitally on them. No new tape format was invented, just a recording method. Sony also released MicroMV in 2002 which is 60% smaller than Mini-DV but boasts the same 500 lines of resolution. Each of these formats has now disappeared from the consumer market.

All of the digital home formats use a firewire port (also known as IEEE 1394) or a USB cable to transfer video and audio information to the computer. The firewire connection from the camera to the firewire card on the computer also allows the computer to control the camera using onscreen buttons. Firewire cards are now under \$20 and make editing home videos even easier. USB connections are standard on every computer so no additional cards are



required inside your computer when using a hard drive or SD card camera.

Windows XP, Vista, 7 and Mac systems come with built in editing programs. This advancement has made digital video editing more affordable for both schools and professional videographers as well as the home computer user. Now, with the move to tapeless recording, the next few years will see some dramatic changes in production.

## History of Radio

In 1887, Heinrich Hertz made an amazing discovery: radio waves. At the time, he didn't quite know what could be done with his discovery but the world would soon find out.

Guglielmo Marconi was from Italy and would become the father of radio. He created a spark transmitter in 1894 which would eventually make its way with Marconi to Britain in 1896. He was 22 years old. When he formed his company in 1899, his spark transmitter was the primary focus. It could transmit radio waves from one point to another. This invention would land him a deal with the US Navy in 1904.

Reginald Fessenden was a Canadian who was also involved in the radio wave business. On December 23rd, 1900, Fessenden transmitted the first words ever heard using radio waves from his Cobb Island lab near Washington D.C. - "One, Two, Three, Four, - is it snowing where you are Mr. Thiessen, if it is telegraph back to me! It had just started to snow outside the transmitter shack". In 1906, his voice transmitter made a voice broadcast that was heard over the north Atlantic Ocean by boats that had receivers on them. Fessenden sold his patent to Westinghouse in 1910. AT&T developed an amplifying vacuum tube in 1913 which paved the way for the first Trans-Atlantic radio transmission in 1915.

The war years saw many amateurs taking advantage of this new technology. Some were talking to each other while others were broadcasting music. This became such a popular past time that Radio Shack was formed (1921) in Boston to sell radio equipment to amateurs, but the main focus was still in the commercial market.

## Production Notes

- Firewire (IEEE 1394)
- Heinrich Hertz
- Guglielmo Marconi
- Reginald Fessenden
- Radio Shack Opens
- Radio Receivers



*Guglielmo Marconi*





Small radio stations were appearing on the landscape in the early 1920's and would come up with some firsts. The first radio commercial was on August 28, 1922. It was 10 minutes in length and cost \$100. Volume control was invented in 1924 as RCA licensed other companies to build receivers making radios more affordable. Radio began to start regular programming that included news broadcasts, music, and radio plays. This format continued through the 1930's and 40's which were the golden years for radio.

During the years of the Great Depression, families used the radio as a source of entertainment. Two out of every three homes had a radio with 4 national networks broadcasting across the US. North Americans kept up with World War II by listening to news reports from London, England. In between, music was played, but not with the consent of record companies or artists. At this time, 50% of programming on the radio was music.

In 1941, 13 million radios were sold making it the most popular entertainment medium. After the war, the number of AM radio stations would more than

double from just over 950 to 2000 with 3 years. By 1950 94% of homes in the US owned a radio. But by this time, television was starting to enter its golden age which would have a dramatic impact on radio and it's content.



Radios from the 1960's

Radio had managed to hang on to it's market share because of music programming. In the 1950's, the car radio became

a standard feature of new automobiles. This allowed people to listen while driving - a new concept that would help radio compete against television.

Throughout the 1950's, radio was trying to re-invent itself to keep its listeners tuned in. One of the advancements of the decade dealt with FM radio and stereo sound. FM radio had been around since 1939 and was much clearer than AM radio. When it was combined with stereo sound, the result was amazing for the time. The BBC in England began stereo broadcasts in 1958 and the US followed in 1961.

## Production Notes

- Move to Music Programming on the Radio
- The War Years
- FM Radio Introduced
- Stats on Radio

## DID YOU KNOW?

The first FM radio station in the US was W1XOJ, located in Paxton, Massachusetts. They began operation in 1937. The first FM radio station in Canada was CKPC 94.7 located in Brantford, Ontario. The station was granted a license in 1947 and began broadcasting in 1949.



A 1980's radio

By 1962, there were 87 FM radio stations in the US and Canada. During this decade, radio companies began to build receivers making radios more affordable. Broadcasting shifted away from radio plays and focused on news programming and music. News programs filled 20% of radio time with the remainder going to music.

When FM radios appeared in cars during the 1970's both of the broadcast methods could be accessed. The nationwide network of radio stations made it possible to travel across Canada or the US in a car and still receive a radio station, no matter where you were.

The 1980's came and went with no major changes in the radio broadcasting industry. The idea of digital radio was surfacing and was under development during this decade. In 1990, a digital radio system was demonstrated in Canada for the first time which used the L-Band, an alternative to AM and FM that had less static and could not be interfered with by buildings or mountains.

The new L-Band was approved in 1992 and digital radio was on its way. By 1995 L-Band broadcasts began in Canada and digital radio receivers were available for the consumer to purchase. By 2010, all Canadian radio will be replaced by digital broadcasting, signaling the end of AM and FM transmissions.

In the United States, 2 companies who use the L-Band to send signals have merged into one radio company.

Sirius/XM Satellite Radio broadcasts their signals from satellites to receivers on earth. It is a subscription service that delivers crystal clear audio to receivers across North America. The service has become popular with car manufacturers as the next generation of radio. Sirius and XM remain 2 separate companies in Canada.

Today, there are almost 800 million radios in North America - an average of 6 radios per household. More than 260 million people in the US and Canada listen to radio broadcasts for an average of 22 hours per week. Who said radio wouldn't survive after the introduction of television?

## Production Notes

- Radios in Cars
- Digital Radio in the 1990's
- Digital Radio and L-Band
- Radio Today



A DAB (Digital Audio Broadcast) receiver from Arcam. For more information, please visit: [www.arcam.co.uk](http://www.arcam.co.uk)



## DID YOU KNOW?

L-Band is commonly known as satellite radio. Many car manufacturers are starting to partner with satellite radio companies like Sirius/XM Satellite Radio to bring the consumer the next generation car stereo system.

**R E V I E W Q U E S T I O N S**

The first chapter has traced the beginnings of radio, television, and video from the first uses to the newest developments in the new millennium. The following questions will help you review what you have learned in this chapter.

**Chapter One Review Questions**

1. What company invented videotape? When was it first used? What program was it used for? Why was it used?
2. Name and describe the two types of editing invented in the late 1950's and early 1960's.
3. What was the first situation comedy to use editing? What was the first made-for-television movie to use videotape?
4. Create a chart comparing the features of Beta and VHS videotape.
5. The 1980's saw camcorders getting smaller and smaller. How was this accomplished? What new prosumer formats were developed?
6. Who invented electronic television? How did it evolve in the 1930's?
7. What were the key highlights of television from the 1950's to the 1990's?
8. Who were the key people involved in the creation of radio in its first 30 years? What were their contributions?
9. How has digital radio evolved since the 1990's?