

BROADCASTING CABLE

YEARBOOK 2003-2004

- Industry Overview • Television • Cable • Radio • Satellites & Other Carriers
- Programming Services • Technological Solutions • Brokers & Professional Services
- Associations, Events, Education, Awards • Government Agencies

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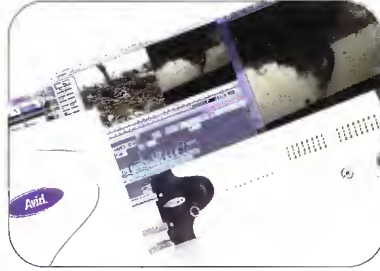
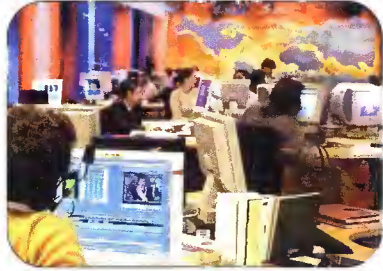
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Overview

The big story in 2003 was the war in Iraq. The broadcast and cable networks covered the military campaign extensively, both live from the battlefield and Baghdad. The anchors, the reporters in the field, and the military analysts all tried to put it into some perspective.

The White House and the Pentagon also were sources of much of the coverage. We learned about shock and awe. We saw anti-war protests on TV and reports about political reaction from around the world. At one point Bryan Whitman, Department of Defense deputy assistant secretary of defense for public affairs, said more than 600 members of the media would be embedded, assigning journalists to particular military units. About 80% of those, he said, represented U.S. media outlets.

Perhaps broadcast journalism will be given some of the credit it deserves when The Freedom Forum, a nonpartisan foundation, opens its new Newseum at Pennsylvania Avenue and Sixth St. N.W. in Washington, D.C., in 2006. The site of the Newseum, an interactive museum of news, had been in Arlington, Virginia, until that location was closed March 3, 2003. The new Newseum (www.newseum.org) will be located between the U.S. Capitol and the White House and across the street from the National Gallery of Art. Another facility worth noting is The Cable Center in Denver, scheduled to open to the public in 2004. To take a virtual tour of the Cable Center go on their web site at www.cablecenter.org. Already open for tours is the Voice of America Museum in West Chester, Ohio. Details on the former Voice of America transmitter site are available at www.westchesteroh.org/parksandrec/voamuseum/index.html. For tour information call Chrisbell Bednar at (513) 759-7305.

The Federal Communications Commission made big media news in 2003 when it adopted new broadcast ownership rules. Under the previous rules the aggregate coverage of TV-station groups was limited to 35% of the nation's 106.7 million TV households. Under the new rules the cap was raised to 45%. The new rules also permitted triopolies (ownership of three TV stations in a market) for the first time, but only in markets with at least 18 stations, commercial or noncommercial. The new rules also eased restrictions on duopolies (ownership of two TV stations in a market). A company may own two stations in markets with five or more TV stations, but only one of these stations can be among the top four in ratings. Under the new cross-ownership rules a

company may own a newspaper and a TV station or radio stations, depending on market size. But in markets with three or fewer TV stations, no cross-ownership is permitted among TV, radio, and newspapers.

Recent FCC actions on media concentration can be found on the FCC web site at www.fcc.gov/ownership/documents.html. On October 1, 2002 the FCC released 12 studies on broadcast ownership. These studies are available at www.fcc.gov/ownership/studies.html. *Broadcasting & Cable* magazine (www.broadcastingcable.com) had an interesting ratings analysis, broken down by company, in the magazine's December 2, 2002 issue. In Canada the Standing Senate Committee on Transport and Communications announced (on April 29, 2003) a comprehensive study of the media in Canada. The last major study on Canadian mass media by a Senate committee was chaired by Senator Keith Davey (the so-called Davey Report in 1970). And in June 2003 the House of Commons Standing Committee on Canadian Heritage issued a report called "Our Cultural Sovereignty: The Second Century of Canadian Broadcasting." This report is available at www.parl.gc.ca/InfoComDoc/37/2/HERI/Studies/Reports/herirp02-e.htm.

Digital developments continued to make news in 2003. The FCC reported there were 503 digital TV stations licensed or on official program test authority as of June 25, 2003. In Canada CITY-TV Toronto, Ontario, was given the first license for a digital TV station in Canada. In the United States the National Cable & Telecommunications Association (NCTA) reported that 55 million TV households were passed by a cable system that offers HDTV. HBO was reported to have approximately 70 percent of its programming in HDTV. On March 30, 2003 ESPN launched ESPN HD. On the radio side on October 10, 2002 the FCC selected the in-band, on-channel (IBOC) technology developed by iBiquity Digital Corp. (www.ibiquity.com) for AM and FM stations wanting to begin digital transmissions. And on January 7, 2003 WDMK(FM) Mount Clemens, Michigan (a Detroit market station owned by Radio One) began transmitting a digital signal.

On December 31, 2002 the FCC released its ninth annual report on competition in video markets. What was new in the report was the statement that "calendar year 2002 may be the first year in which the cable industry as a whole experiences a net loss of

subscribers." And that came after decades of nonstop growth. But also new on the cable front was the share of the TV audience cable networks were getting in prime time. For the first time, ad-supported basic cable grabbed the dominant audience share over the seven broadcast networks, 48% of prime time share compared to 45% for broadcast for 2002,

according to Nielsen Media Research. The final television tidbit concerns the new FCC web site devoted to the technological history of television. The site (www.fcc.gov/omd/history), which has links to museums, libraries, personal collections, and other sites, is one part of a history project the FCC has undertaken.

Order of Sections

The *2003-2004 Yearbook* continues to provide a wide range of information on the ever-changing radio, TV, and cable industries. It presents a well-organized ten-section format containing current data in all areas related to broadcasting and cable.

Section A - Industry Overview provides easy access to industry leaders and the most prominent multi-system operators. Coverage in this section includes broadcast group ownership, newspaper and magazine cross-ownership, historical record of station transactions, and a complete record of television ownership transfers.

Section B - Television contains full station listings by state, the popular Call Letter Index, marketplace statistics, and the appropriate maps. Television Stations and Networks on the Internet helps to locate a broadcaster online. The 2003-2004 edition of *Broadcasting & Cable Yearbook* contains information on 2,811 television stations.

Section C - Cable contains marketplace statistics, information on cable MSOs, independent owners and cable systems, and broadcasters in cable TV.

Section D - Radio contains full station listings by state and the popular Call Letter Index, as well as marketplace statistics. The 2003-2004 edition of *Broadcasting & Cable Yearbook* contains information on 14,631 radio stations, of which 5,098 are AM and 9,533 are FM.

Section E - Satellites and Other Services contains information on satellite ownership, operation, and resale, as well as DBS, teleports, microwave services, and wireless cable.

Section F - Programming Services lists production services as well as radio, TV, cable, and other programming services.

Section G - Technological Services lists thousands of companies that manufacture and distribute equipment for industry use.

Section H - Brokers and Professional Services lists firms that provide research services, technical consulting, legal services, talent agents and managers, employment services, and the like.

Section I - Associations, Events, Education and Awards identifies 44 trade shows for the radio, television, and cable industries in an alphabetical listing. Information on industry associations and awards is also included in this section.

Section J - Government Agencies contains FCC executive and staff listings.

Data updates are provided by several outside sources. The contributions of these outside sources are an invaluable part of *Broadcasting & Cable Yearbook*, and we extend our appreciation to Jessica Benbow, Arbitron; Angela Titone, Electronic Industries Alliance; Maureen Peratino, FCC; Karen Kratz Gyimesi, Nielsen Media Research; Kerry Kielar, Nielsen Media Research; the Radio Advertising Bureau; and the Television Bureau of Advertising.

In addition to providing those in the industry with pertinent information, the Yearbook can also be a vehicle for disseminating commercial messages. Arrangements for classified advertising (professional cards, tie-ins, station headers, boldface listings, annotations) as well as display advertising, including tabs, for *Broadcasting & Cable Yearbook* are coordinated by Yuki Atsumi (646) 746-6949 or Toll Free: (866) 258-1075.

Mailing lists of the radio stations, television stations, and cable MSOs listed in *Broadcasting & Cable Yearbook* are available through Cahners Business Lists. Contact Gina Sharp at (800) 323-4958, ext. 8364.

Your feedback is important to us. We strongly encourage you to contact us with comments on this 2003-2004 edition, as well as suggestions and comments for future editions. Our editorial office can be reached at (908) 286-1090, ext. 3022. The Yearbook is your information tool, and your input is essential.

We trust that you will find this source of information on the broadcasting and cable industries valuable, accurate, well-organized, and easy to use.

The Editors

User's Guide

Broadcasting & Cable Yearbook is organized into ten sections (A through J).

Data may be found through various access points, as well as by browsing through a particular section:

Table of Contents on page iii. Provides a general overview of the entire publication by section.

Indexes

The *Index to Sections* provides keyword access to the listings, indexes, and information included in this directory.

The *Index to Radio and Television by State / Possession / Province* is a one-page quick reference to the first page of each state, possession, or province for both the radio and television directories.

The *Index to Advertisers* is an alphabetical listing of each display and classified advertiser and includes the page number where the ad can be found.

Note on Abbreviations: Abbreviations are used throughout this directory to conserve space. Abbreviations are explained in the *List of Abbreviations*, which can be found in this section.

Note on Filing Rules: Acronyms and initials appear first in the alphabetical order of most listings in this book (except the radio & television directories).

This *User's Guide* provides general guidelines by section and includes specific instructions only when needed.

Section A

Industry Overview

The *Top 25 Media Groups* are listed by revenue.

Group Ownership includes individuals and companies with multiple station holdings—those controlling three or more radio stations and/or two or more television stations. The listing is in alphabetical sequence by company and includes call letters, city and state of stations owned, and the name, address, phone, and fax of the group.

The *Top 25 Station Groups* are ranked by revenue.

Note: Notations in the television directory regarding group ownership and cross-ownership are cross-referenced to information listed here.

Broadcasters in Cable Television lists companies and individuals in alphabetical sequence that have at least partial ownership in radio or TV stations and in MSOs (multiple system operators) or individual cable systems that are not necessarily MSOs.

Newspaper/Magazine Cross-Ownership with Broadcasting Stations includes companies that have interests in both broadcasting and newspaper or magazine publishing. Minority interests are indicated where information is available. In many instances stations and publications are owned by the same interests, but operations are entirely separate. The listing is in alphabetical sequence by company and includes the company name, address, phone and fax, the name of each newspaper and/or magazine with the city and state in which they are published, and the call letters of each station with the city and state in which they operate.

Note: Notations in the television directory regarding group ownership and cross-ownership are cross-referenced to information listed here.

Broadcasting Stations Associated with Newspaper/Magazine Ownership is a state-by-state (or province) cross-reference listing of broadcasting stations and the publishing companies or newspapers with which the companies outlined in the prior listing are associated. The United States is listed first, followed by Canada. The listing is by state or province, then by city, then by call letters.

A chart of *49 Years of Station Transactions* lists the dollar volume of transactions approved by the FCC from 1954 to 2002. Information included in this chart is tracked weekly by the *Broadcasting & Cable* magazine staff. For specific information on station sales see *Broadcasting & Cable* magazine's "Changing Hands" column.

Section B

Television

A sample television station listing with a key to all of the elements contained in an entry is provided on the second page of this section.

The *Directory of Television Stations in the United States and Canada* is organized by state or province, then city, then call letters (except when two or more noncommercial stations are co-owned; the lead station is listed first in the proper alphabetical position, with the trail station following). Stations in the United States are listed first; the stations in Canada follow.

U.S. Television Stations By Call Letters and *Canadian Television By Call Letters* lists television stations alphabetically by call letters, followed by city (or province) and state or possession.

The following listings pull together specific data from the television station listings and FCC sources to aid the user in compiling research, etc. Once a television station has been identified, refer to the *Directory of Television Stations in the United States and Canada* for complete information.

Spanish-Language Television Stations that operate within the United States or near the U.S. border are listed by state, then by market, then by call letters and city. Channel numbers are also provided.

Experimental Television Stations is an alphabetical list of stations authorized by the FCC as of August 2002.

U.S. Independent Television Stations are listed by state, then city, then call letters.

College, University and School-Owned Television Stations are listed by state, then city, then call letters.

U.S. Television Stations Broadcasting in Stereo are listed by state, then city, then call letters.

Television Stations by Channel in the United States and Canada are listed by channel, then by state, then city, then call letters. The frequency is included with each U.S. channel.

Television Assignments by State contains the channels designated for the listed communities in the United States, its territories and possessions by state, then city. Channels designated with an asterisk (*) are assigned for use by noncommercial educational broadcast stations only. A station on a channel identified by a plus (+) or minus (-) mark is required to operate with its carrier frequencies offset 10 khz above or below, respectively, the nominal carrier frequencies.

Digital Television Assignments by State contains the digital channels designated for the listed communities in the United States, its territories and possessions by state, then city. Channels designated by an asterisk (*) are assigned for use by noncommercial educational broadcast stations only.

Television Market Statistics

The *Nielsen DMA Market Atlas* lists Nielsen's 210 DMAs (Designated Market Areas) for 2002-2003 alphabetically by DMA.

The *Multi-City DMA Cross-Reference* assists in use of the atlas.

The chart that follows, *Television Markets by Nielsen Marketing Research Territory*, provides invaluable market information.

Television Markets Ranked by Size lists the 210 DMAs by number of television households.

The next two charts and tables, *U.S. Sales of Television Receivers 1983-2001* and *Record of Television Station Growth Since Television Began* include explanatory notes regarding the data included in the charts, or the organization of the data.

Section C

Cable

A sample MSO/Cable System listing with a key to all of the elements contained in an entry is provided.

The *Directory of Multiple Systems Operators (MSOs), Independent Owners & Cable Systems in the*

United States and Canada contains information on U.S. or Canadian MSOs and independent owners followed by information on their individual large cable systems with 20,000 subscribers or more. Information on their smaller cable systems, those with less than 20,000 subscribers, is included when available. The listings are in alphabetical sequence by MSO.

The *Geographical Index to Large Cable Systems & MSOs in the U.S. and Canada* provides state and city access to the large cable systems, listed with the individual MSOs.

Cable Market Statistics

Cable Penetration by Market is a listing that contains the number of cable homes and the percentage of cable penetration as compiled by Nielsen Media Research. The information is listed by Nielsen's Designated Market Areas (DMAs). The next three charts provide an overview of the top 50 DMAs ranked by percentage of cable penetration, cable television households and television households, respectively. The fourth chart provides an overview of the *Bottom 50 DMA Ranked by Percentage of Cable Penetration*.

Top 50 MSOs, provides the number of subscribers for the top 50 MSOs covered in the *Directory of Multiple Systems Operators (MSOs), Independent Owners & Cable Systems in the United States and Canada*. The last charts in this section list the *Top 100 Cable Systems* by ownership and by number of subscribers.

Section D

Radio

A sample radio station listing with a key to all of the elements contained in an entry is provided on the second page of this section.

The *Directory of Radio Stations in the U.S. and Canada* is organized by state or province, then city, then call letters (except when two or more stations are co-owned; the lead station is listed first, with the trail station immediately following). Stations in the United States are listed first; the stations in Canada follow.

Immediately following the directory are *Miscellaneous Radio Services*: Armed Forces Radio, Radio Free Europe, U.S. International Radio, and Voice of America. Each of these listings contains contact information, personnel (when available), and a description of the service.

U.S. AM & FM Stations By Call Letters and *Canadian AM & FM Stations By Call Letters* list radio stations alphabetically by call letters, followed by city and state (or province) or possession.

The following listings have pulled together specific data from the radio station listings and FCC sources to aid the user in compiling research, etc. Once a radio station has been identified, refer to the *Directory of Radio Stations in the United States and Canada* for complete information.

Table of FM Allotments contains the channels (other than noncommercial, educational channels 201-220) designated for use in communities in the United States, its territories and possessions as of July 2003. The listing is by state, then by city, with the channel listed next to the city.

College, University and School-Owned Radio Stations is a listing by state, then by city, then by call letters of college, university, and school-owned radio stations in the United States.

U.S. AM Stations by Frequency are listed by state, then by city, under the frequency heading, which is listed in ascending numeric sequence. Clear stations appear in boldface type. Refer to the frequency heading to determine if the station is on a clear regional or local frequency. For an explanation of AM station classes, see the *Brief History of Broadcasting and Cable* within this section.

U.S. FM Stations by Frequency are listed by state, then by city under the frequency and channel number. Frequencies are listed in ascending numeric order.

Canadian AM Stations by Frequency are listed by province, then by city under the frequency heading, which is listed in ascending numeric sequence.

Canadian FM Stations by Frequency are listed by province, then by city under the frequency heading, which is listed in ascending numeric sequence.

Radio Formats Defined describes programming and the specific radio formats currently included in the Directory of Radio Stations in the U.S. and Canada. The formats are listed alphabetically.

Radio Formats by State and Possession and Radio Formats by Province include the number of AM and FM stations in each state or province, with a breakdown of the number of commercial and noncommercial stations, followed by a ranked tally of formats. Note: This tally includes only those stations that have provided format information.

U.S. and Canada Radio Programming Formats is a chart that provides totals for format usage in the United States and Canada, broken down by AM/FM and commercial/noncommercial.

Programming on Radio Stations in the United States and Canada provides a quick reference to regular programming formats by radio format, by state or province, then city, then by call letters.

Special Programming on Radio Stations in the United States and Canada provides a quick reference to foreign-language and other specialized programming, such as Agriculture and Farm, Polish language, etc., by radio format, by state or province, then city, then by call letters.

Radio Market Statistics

U.S. Radio Markets contains the Arbitron population ranking in alphabetical sequence by radio market (city). The two charts that follow, U.S. Radio Markets: Arbitron Metro Survey Area Ranking, and U.S. Radio Markets: Population Ranking provide additional information to assist in the use of U.S. Radio Markets.

The next three charts and tables, Growth of Radio Broadcasting Pre-Television 1922-1945, U.S. Radio Set Sales 1958-2001, and Record of Radio Station Growth Since Television Began, include explanatory notes regarding the data included in the chart, or the organization of the data.

Radio Stations Broadcasting on the Internet

Radio Stations Broadcasting on the Internet lists radio stations with streaming online audio.

Section E

Satellites and Other Carriers

Satellite Owners and Operators are listed alphabetically by company name. Information provided includes address, phone, personnel, and a brief description.

Satellite Resale and Common Carriers are listed alphabetically by company name. Information provided includes address, phone, personnel, and a brief description of services.

Direct Broadcast Satellites are listed alphabetically by company name. Information provided includes address, phone, personnel, and a brief description of services.

Teleports are listed by state (although the state is not shown), then city, then company name. Information provided includes address, phone, personnel, ownership, and a brief description of services.

Microwave services are listed alphabetically by company name. Information provided includes address, phone, personnel, regional offices, and a brief description of services.

Wireless Cable Operators are listed alphabetically. Information provided includes address, phone, personnel, and a brief description of services.

Section F

Programming Services

This section is divided into five parts: (1) Producers, Distributors, Production and Other Services, an alphabetical compilation of various services with subject access; (2) Radio Programming

Services; (3) Television Programming Services; (4) Cable Programming Services; and (5) Other Programming Services.

Producers, Distributors, Production and Other Services is provided in two parts: the Alphabetical Index lists the complete name, address, phone, fax, personnel, and a brief description of the company. The Subject Index lists the company name under one or more appropriate subjects.

When a company has been identified, turn to the Alphabetical Index for complete information on that company. When a company name is not known, search under an appropriate heading in the Subject Index.

Radio Programming Services

Major National Radio Networks is an alphabetical listing of the major radio networks, e.g., CBS. Full contact information, address, phone, fax, personnel, and all divisions are supplied. If a network is also involved in TV, that information is also listed here, as well as under Major National Television Networks.

Public Broadcasting - Radio is an alphabetical listing of public radio organizations and networks. Information provided includes address, phone, executives, and directors.

Radio Program Networks is an alphabetical listing of the national radio program networks, more specialized (as far as programming is concerned) than the major national radio networks. Information provided includes address, phone, executives, and a brief description.

Regional Radio Networks is an alphabetical listing of radio networks serving certain states or regions. Information provided includes address, phone, executives, and the area served.

Unwired Radio Networks is an alphabetical listing of non-interconnected networks of radio or TV stations that can be purchased as a group by advertisers. Information provided includes address, phone, and executives.

Canadian Radio Networks is an alphabetical listing of radio networks in Canada. Information provided includes address, phone, and executives.

Radio News Services is an alphabetical listing of audio news services. Information provided includes address, phone, personnel, and a brief description.

Radio Format Providers is an alphabetical listing of firms that provide specific music or talk formats to radio stations. Information provided includes address, phone, executives, and types of programming offered.

Television Programming Services

Major National Television Networks is an alphabetical listing of the major TV networks, e.g., ABC. Full contact information, address, phone, fax, personnel, and divisions are supplied. If a network is also involved in radio, that information is also listed here, as well as under Major National Radio Networks.

Public Broadcasting - Television is an alphabetical listing of the public TV organizations and networks. Information provided includes address, phone, executives, and directors.

Television Program Networks is an alphabetical listing of the national TV program networks, more specifically targeted than the major national TV networks. Information provided includes address, phone, executives, and types of programming offered.

Regional Television Networks is an alphabetical listing of TV networks serving certain states or regions. Information provided includes address, phone, executives, and the area served.

Unwired Television Networks is an alphabetical listing of non-interconnected networks of TV or radio stations that can be purchased as a group by advertisers. Information provided includes address, phone, and executives.

Canadian Television Networks is an alphabetical listing of TV networks in Canada. Information provided includes address, phone, and executives.

Television News Services is an alphabetical listing of video news services. Information provided includes address, phone, personnel, and a brief description.

Closed Circuit Television is an alphabetical listing of closed circuit TV services. Information provided includes address, phone, executives, and a description of the services offered.

Cable Programming Services

Pay Cable Services is an alphabetical listing of premium and pay-per-view cable services. Information provided includes address, phone, executives, and a brief description of the type of services provided.

Basic Cable Services is an alphabetical listing of

cable video networks and superstations. Information provided includes address, phone, executives, and a brief description of the services offered.

Automated Cable Channel Programmers is an alphabetical listing of video alpha-numeric text services, often with enhanced graphics, that provide news, weather, sports, business information and program guide information. Information provided includes address, phone, contacts, and type of text available.

Audio Cable Programming Services is an alphabetical listing of audio programming and cable radio services available for cable channels not occupied by TV stations or cable networks. Music formats, religious and international programs, and background music for alpha-numeric channels are available. Information provided includes address, phone, and type of audio programs offered.

Regional Cable Television News Services is an alphabetical listing of regional cable news services. Information includes address, phone, personnel, and a brief description of services.

Cable Sports Services is an alphabetical listing of national and regional cable sports networks. Information provided includes address, phone, executives, and a description of the type of sports programming offered.

Canadian Cable Programming Services is an alphabetical listing of Canadian cable networks, pay TV services, and specialty services. Information provided includes address, phone, and type of service available.

Other Programming Services

Music Licensing Groups is an alphabetical listing of organizations that provide licenses for the public performance of musical compositions. Information provided includes address, phone, executives, and a brief description.

Videotext Operations is an alphabetical listing of organizations that provide news or other text via a two-way interactive service that uses either two-way cable or telephone lines. Information provided includes address, phone, executives, and a brief description.

Teletext Operations is an alphabetical listing of firms or TV stations that transmit news or other text via an unused portion of a standard television signal. Information provided includes address, phone, personnel, and a brief description.

Subcarrier/VBI Services is an alphabetical listing of firms that provide audio programs or video text or data using portions of FM or TV signals. Information provided includes address, phone, executives, and services offered.

Section G

Technological Services

Equipment Manufacturers and Distributors and Technical Services is provided in two parts: the Alphabetical Index lists the complete name, address, phone, fax, personnel, and a brief description of the company. The Subject Index lists the company name under one or more appropriate subjects.

When a company has been identified, turn to the Alphabetical Index for complete information on that company. When a company name is not known, search under an appropriate heading in the Subject Index.

Section H

Brokers and Professional Services

Station and Cable Television Brokers lists in alphabetical sequence by company name brokers or brokerage firms that service the media field specifically. Information provided includes address, phone, fax, personnel, and a brief description of services.

Consultants lists individuals or companies that provide a variety of services to the media field, i.e., strategic planning, management, facilities design, etc. Listings are in alphabetical sequence by company name and include address, phone, fax, personnel, and a brief description of services.

Station Financing Services lists individuals or companies that provide a variety of financial services to the communications industries. Listings are in alphabetical sequence by company name and include address, phone, fax, personnel, and a brief description of services.

Research Services is an alphabetical listing of various tracking, monitoring and research services that serve the broadcasting and cable industries. Information provided includes address, phone, fax, personnel, regional or satellite offices, and a brief description of the services.

Engineering and Technical Consultants is an alphabetical listing by company or individual; individuals are listed by the last name. Information provided includes address, phone, fax, personnel, and a brief description of the services (when supplied). An asterisk (*) indicates membership in the Association of Federal Communications Consulting Engineers.

Law Firms Active in Communications Law is an alphabetical listing of firms or individuals that practice before the FCC as reported by radio and television stations, brokers, consultants, and the attorneys themselves. Many, but not all, are members of the Federal Communications Bar Association. Information provided includes address, phone, fax, and names of attorneys. A brief description may also be provided.

Talent Agents and Managers is an alphabetical listing by company name. Information provided includes address, phone, fax, personnel, regional or satellite offices, and a brief description.

Employment and Executive Search Services is an alphabetical listing by company name. Information provided includes address, phone, fax, personnel, regional or satellite offices, and a brief description.

Section I

Associations, Events, Education, Awards

Associations

Major National Associations includes those organizations with large memberships and a large roster of departments and personnel. These associations tend to have strong voices in the broadcasting and cable industries. The associations are listed alphabetically by their full names; acronyms are provided in parentheses. Information provided includes the headquarters address and phone, and various personnel—officers, boards, representatives, committees.

National Associations includes national associations and professional societies. Cross-references for the *Major National Associations* are included. Listings are alphabetical by full name. Information provided includes headquarters address, phone, and executive personnel.

State Broadcast Associations and *State Cable Associations* are listed by state (regardless of the association name). Information provided includes headquarters address, phone, and executive personnel.

Union/Labor Groups are listed alphabetically by the union or labor group's full name. Information provided includes headquarters address, phone, executive personnel, and regional offices.

Events

Trade Shows alphabetically lists national and state conferences and trade shows for the communications industries. Information provided includes show management contacts and may include show sponsor, show management statement, show history, profile of exhibitors, and profile of attendees.

Education

Schools Specializing in Radio-TV-Cable includes only those educational institutions that specialize in professional or technical courses in broadcasting. The

listing is alphabetical by the name of the school. Information provided includes address, phone, personnel, other branch locations, and a brief description of the type of training provided or a listing of the courses offered.

Universities and Colleges lists institutions alphabetically by state in three parts: (1) *Universities and Colleges Offering Degrees in Broadcasting*, (2) *Universities and Colleges Offering Broadcasting Courses*, and (3) *Two-Year Colleges Offering Programs in Broadcasting*. The name and address is provided. Degrees offered may also be listed.

Additional information on educational opportunities in broadcasting, cable, and communications may be obtained from the *Broadcast Education Association*, Washington, D.C.

Awards

Major Broadcasting & Cable Awards is an alphabetical listing by name of the award, which may or may not include the sponsoring body. Note: Abbreviations and acronyms appear first in the alphabetical sequence. If a sponsor presents more than one award, each award is listed separately. The awards included are presented in the areas of broadcasting, cable, and the media. Entries include a description of the award, entrant deadline dates, and contact information.

Section J

Government Agencies

FCC Executives and Staff includes a listing of executives and staff by department; information provided includes department phone numbers and titles. Also included is a flowchart of FCC operations.

Government Agencies of Interest to Broadcasting and Cable are listed, those in the United States first and then agencies in Canada. Information provided includes address (headquarters and other locations), phone, personnel, and/or committee members.

U.S. State Cable Regulatory Agencies lists the agencies alphabetically by state, regardless of the agency name.

Glossary of Terms Used in *Broadcasting & Cable Yearbook*

AM—Amplitude modulation. Also referring to audio service broadcast over 535 khz-1705 khz.

Analog—A continuous electrical signal that carries information in the form of variable physical values, such as amplitude or frequency modulation.

Basic cable service—Package of programming on cable systems eligible for regulation by local franchising authorities under 1992 Cable Act, including all local broadcast signals and PEG (public, educational and government) access channels.

Cable television—System that transmits original programming, and programming of broadcast television stations, to consumers over wired network (see page xvii).

CC—Closed captioning. Method of transmitting textual information over television channel's vertical blanking interval; transmissions are deciphered with decoders; decoded transmissions appear as text superimposed over television image.

CED—Capacitance electronic disk (RCA videodisk).

Clear channel—AM radio station allowed to dominate its frequency with up to 50 kw of power; their signals are generally protected for distance of up to 750 miles at night.

Closed circuit—The method of transmission of programs or other material that limits its target audience to a specific group rather than the general public.

Coaxial cable—Cable with several common axis lines under protective sheath used for television signal transmissions.

Common carrier—Telecommunication company that provides communications transmission services to the public.

DAB—Digital audio broadcasting. Modulations for sending digital rather than analog audio signals by either terrestrial or satellite transmitter with audio response up to compact disc quality (20 khz).

DBS—Direct broadcast satellite. High powered satellite authorized to broadcast direct to homes (see page xxviii).

Digital—A discontinuous electrical signal that carries information in binary fashion. Data is represented by a specific sequence of off-on electrical pulses.

Directional antenna—An antenna that directs most of its signal strength in a specific direction rather than at equal strength in all directions. Used chiefly in AM radio operation.

Downlink—Earth station used to receive signals from satellites.

Earth station—Equipment used for transmitting or receiving satellite communications.

EDTV—Enhanced-definition television. Proposed intermediate systems for evolution to full HDTV, usually including slightly improved resolution and sound, with a wider (16:9) aspect ratio.

Effective competition—Market status under which cable TV systems are exempt from regulation of basic tier rates by local franchising authorities, as defined in 1992 Cable Act. To claim effective competition, a cable system must compete with at least one other multichannel provider that is available to at least 50% of an area's households and is subscribed to by more than 15% of the households.

EM—Electronic mail (commonly referred to as E-mail).

Encryption—System for scrambling signals to prevent unauthorized reception.

ENG—Electronic news gathering.

ETV—Educational television.

Fiber-optic cable—Wires made of glass fiber used to transmit video, audio, voice or data providing vastly wider bandwidth than standard coaxial cable.

Field—Half of the video information in the frame of a video picture. The NTSC system displays 59.94 fields per second.

FM—Frequency modulation. Also referring to audio service broadcast over 88 mhz-108 mhz.

Footprint—Area on earth within which a satellite's signal can be received.

Frame—A full video picture. The NTSC system displays 29.97 525-line frames per second.

Frequency—The number of cycles a signal is transmitted per second, measured in hertz.

Geostationary orbit—Orbit 22,300 miles above earth's equator where satellites circle earth at same rate earth rotates.

ghz—Gigahertz. One billion hertz (cycles) per second.

HDTV—High-definition television (see page xxviii).

Headend—Facility in cable system from which all signals originate. (Local and distant television stations, and satellite programming, are picked up and amplified for retransmission through system.)

Hertz—A measurement of frequency. One cycle per second equals one hertz (hz).

HUT—Households using television.

Independent television—Television stations that are not affiliated with networks and that do not use the networks as a primary source of their programming.

Information services—Broad term used to describe full range of audio, video and data transmission services that can be transmitted over the air or by cable.

Interactive—Allowing two-way data flow.
Interlaced scanning—Television transmission technique in which each frame is divided into two fields. NTSC system interleaves odd-numbered lines with even-numbered lines at a transmission rate of 59.94 fields per second.

ITFS—Instructional Television Fixed Service (see page xxvii).

khz—Kilohertz. One thousand hertz (cycles) per second.

LED—Light emitting diode. Type of semiconductor that lights up when activated by voltage.

LO—Local origination channel.

LPTV—Low-power television (see page xxvii).

LV—LaserVision (optical videodisk).

MDS—Multipoint distribution service (see page xxvii).

mhz—Megahertz. One million hertz (cycles) per second.

Microwave—Frequencies above 1,000 mhz.

MSO—Multiple cable systems operator.

Must carry—Legal requirement that cable operators carry local broadcast signals. Cable systems with 12 or fewer channels must carry at least three broadcast signals; systems with 12 or more channels must carry up to one-third of their capacity; systems with 300 or fewer subscribers are exempt. The 1992 Cable Act requires broadcast station to waive must-carry rights if it chooses to negotiate retransmission compensation (see "Retransmission consent").

NTSC—National Television System Committee. Committee that recommended current American standard color television.

PCM—Pulse code modulation. Conversion of voice signals into digital code.

PPV—Pay-per-view.

Program access—Prohibition on exclusive programming contracts between cable operators and program services controlled by cable operators, designed to give alternative multichannel distributors (such as wireless cable and DBS) the opportunity to bid for established cable services (such as CNN or Nickelodeon). The rule expires in 2002.

Progressive scanning—TV system where video frames are transmitted sequentially, unlike interlaced scanning in which frames are divided into two fields.

PSA—Public service announcement.

PTV—Public television.

Public radio—Radio stations and networks that are operated on a noncommercial basis.

Public television—Television stations and networks that operate as noncommercial ventures.

RCC—Radio common carrier. Common carriers whose major businesses include radio paging and mobile telephone services.

Retransmission consent—Local TV broadcasters' right to negotiate a carriage fee with local cable operators, as provided in 1992 Cable Act.

SCA—Subsidiary communications authorizations. Authorizations granted to FM broadcasters for using subcarriers on their channels for other communications services.

Shortwave—Transmissions on frequencies of 6-25 mhz.

SHF—Super high frequency.

Signal-to-noise ratio—The ratio between the strength of an electronically produced signal to interfering noises in the same bandwidth.

SMATV—Satellite master antenna television (see page xxviii).

STV—Subscription television (see page xxvii).

Superstation—Local television station whose signal is retransmitted via satellite to cable systems beyond reach of over-the-air signal.

Teletext—A one-way electronic publishing service that can be transmitted over the vertical blanking interval of a standard television signal or the full channel of a television station or cable television system. The major use today is for closed-captioning.

Translator—Broadcast station that rebroadcasts signals of other stations without originating its own programming.

Transponder—Satellite transmitter/receiver that picks up signals transmitted from earth, translates them into new frequencies and amplifies them before retransmitting them back to ground.

UHF—Ultra high frequency band (300 mhz-3,000 mhz), which includes TV channels 14-83.

Uplink—Earth station used for transmitting to satellite.

VCR—Videocassette recorder.

VHF—Very high frequencies (30 mhz-300 mhz), which include TV channels 2-13 and FM radio.

Videotext—Two-way interactive service that uses either two-way cable or telephone lines to connect a central computer to a television screen.

VTR—Videotape recorder.

List of Abbreviations Used in *Broadcasting & Cable Yearbook*

*	noncommercial	ESPN	Entertainment & Sports Programming Network	pres.	.....	president
a	annual	ETV	..... educational television	PRI	.....	Public Radio International
A&E	Arts & Entertainment	exec	..... executive	progmg.	.....	programming
actg	acting	FCC	..... Federal Communications Commission	progrsv	.....	progressive
admin	administrative	film rev	..... film reviews	prom	.....	promotion
adv	advertising	fortn	..... fortnightly	PSA	.....	presunrise authority, public service announcement
affil	affiliate	Fr	..... French	ptnr.	.....	partner
affrs	affairs	g	..... ground	pub affrs	.....	public affairs
AFRTS	Armed Forces Radio and TV Service	gen	..... general	publ.	.....	publicity
alt	alternate	Ger	..... German	q	.....	quarterly
ant	antenna	govt.	..... government	quad	.....	quadraphonic
AOR	album-oriented rock	HAAT	..... height above average terrain	record rev	.....	record reviews
AP	Associated Press	HBO	..... Home Box Office	rel	.....	relations
assn	association	horiz	..... horizontal polarization	relg.	.....	religion
assoc	associate	hqtrs	..... headquarters	rep.	.....	representative
asst	assistant	ind	..... independent	RFE	.....	Radio Free Europe
atty	attorney	info	..... information	rgn	.....	region
aur	aural	instal	..... installation	rgnl	.....	regional
aux	auxiliary	ISBN	..... International Standard Book Number	RL	.....	Radio Liberty
bcst	broadcast	ISSN	..... International Standard Serial Number	rsch	.....	research
bcstg	broadcasting	illus	..... illustrations	s-a	.....	twice annually
bcstr	broadcaster	irreg	..... irregular	s-m	.....	twice monthly
bd	board	It	..... Italian	s-w	.....	twice weekly
BET	Black Entertainment Television	khz	..... kilohertz	sec	.....	secretary
bi-m	every two months	kw	..... kilowatts	sep.	.....	separate
bk rev	book reviews	loc	..... local	sh	.....	shares
bldg	building	LPTV	..... low power television	SH	.....	specified hours
bor	borough	LS	..... local sunset	sls	.....	sales
btfl	beautiful	lstng	..... listening	SMATV	.....	satellite master antenna television
C-SPAN	Cable Satellite Public Affairs Network	lw	..... long wave	Sp	.....	Spanish
CATV	community antenna television	m	..... meters	sr	.....	senior
CBC	Canadian Broadcasting Corp.	MDS	..... Multipoint Distribution Service	ST	.....	shares time
CEO	chief executive officer	mdse	..... merchandising	stn	.....	station
ch	channel	mfg	..... manufacturing	sub	.....	subscriber
CH	critical hours	mngng	..... managing	supt	.....	superintendent
chg	charge	mgr	..... manager	supvr	.....	supervisor
CHR	contemporary hit radio	mgmt.	..... management	svcs	.....	services
chmn	chairman	mhz	..... megahertz	sw	.....	short wave
circ	circulation	mi	..... miles	t	.....	terrain
coml	commercial	mktg.	..... marketing	tech	.....	technical
contemp.	contemporary	MMDS	..... Multichannel Multipoint Distribution Service	tele rev	.....	television reviews
COO	chief operating officer	mo	..... month	3/m	.....	three times a month
coord	coordinator	mod	..... modification	3/y	.....	three times a year
CP	construction permit	MOR	..... middle of the road	TNN	.....	The Nashville Network
CRTC	Canadian Radio-television and Telecommunications Commission	MSO	..... multiple system operator	traf	.....	traffic
C&W	country & western	mthy	..... monthly	trans	.....	translators
D	day	MTV	..... Music Television	treas	.....	treasurer
d	daily	mus	..... music	twp	.....	township
DA	directional antenna	music rev	..... music reviews	TWX	.....	Teletypewriter Exchange
dance rev	dance reviews	mw	..... medium wave	U	.....	unlimited
DBS	direct broadcast satellite	N	..... night	UHF	.....	ultra high frequency
dev	development	na	..... not available	UPI	.....	United Press International
dir	director	NAB	..... National Association of Broadcasters	UPN	.....	United Paramount Network
div	diverse	natl	..... national	var.	.....	variety
DMA	Designated Market Area	net	..... network	vert	.....	vertical polarization
dups	duplicates	NPR	..... National Public Radio	VHF	.....	very high frequency
Eds	editors	nwspr	..... newspaper	video rev	.....	video reviews
Ed Bd	Editorial Board	off	..... officer	vis.	.....	visual
educ	educational	opns	..... operations	VOA	.....	Voice of America
engr	engineer	per	..... personnel	vp.	.....	vice president
engrg.	engineering	play rev	..... play reviews (theatre reviews)	w	.....	watts
EPG	Electronic Program Guide	Pol	..... Polish	wkly	.....	weekly
ERP	effective radiated power	pop	..... population			
		PR	..... public relations			

Brief History of Broadcasting and Cable

An overview of the evolution and development of radio, TV, cable and other mass communication media

One of the most dramatic developments of 20th-century technology has been the use of radio waves—electromagnetic radiations traveling at the speed of light—for communication. Radio communication designed for reception by the public at large is known as “broadcasting.” Radio waves of different frequencies (number of cycles per second) can be “tuned.” Hence, signals from many sources can be received on a radio set without interfering with each other.

In everyday language, the term “radio” refers to aural (sound) broadcasting, which is received from amplitude-modulated (AM) or frequency-modulated (FM) stations. “Television,” another form of radio, is received from stations making both visual and aural transmissions. AM radio, sometimes called standard broadcasting, was the earliest broadcast service and operates on relatively low “medium” frequencies. FM and TV are newer and occupy considerably higher frequency bands.

Radio communication was born of many minds and developments. In the 1860s, a Scottish physicist, James Clerk Maxwell, predicted the existence of radio waves. Heinrich Rudolph Hertz, a German physicist, later demonstrated that rapid variations of electric current can be projected into space in the form of waves similar to those of light and heat. (His contributions have been honored internationally by the adoption of Hertz as a synonym for cycles per second.) In 1895, an Italian engineer, Guglielmo Marconi, transmitted radio signals for a short distance, and at the turn of the century, conducted successful transatlantic tests.

The first practical application of radio was for ship-to-ship and ship-to-shore telegraphic communication. Marine disasters early demonstrated the speed and effectiveness of radiotelegraphy for saving life and property at sea.

This new communication medium was first known as “wireless.” American use of the term “radio” is traced to about 1912 when the Navy, feeling that “wireless” was too inclusive, adopted the word “radiotelegraph.” The use of the word “broadcast” (originally a way to sow seed) stems from early U.S. naval references to “broadcast” of orders to the fleet. Now it is used to describe radio service to the public.

The origin of the first voice broadcast is a subject for debate. Claims to that distinction range from “Hello, Rainey,” said to have been transmitted by Nathan B. Stubblefield to a neighbor, Rainey T. Wells, in a demonstration near Murray, Ky., in 1892, to an impromptu program from Brant Rock, Mass., by Reginald A. Fessenden in 1906, which was picked up by nearby ships.

There were other early experimental audio transmissions. Lee De Forest put singer Enrico Caruso on the air in 1910, and there were transatlantic voice tests by the Bell Telephone Co. in Arlington, Va., in 1915. But it was not until after World War I that regular broadcasting began.

The identity of the “first” broadcasting station also is a matter of conflicting claims. This is due largely to the fact that some pioneer AM broadcast stations developed from experimental operations. Although KDKA Pittsburgh did not receive a regular broadcasting license until Nov. 7, 1921, it furnished programs under a different authorization before that date. Records of the Department of Commerce, which then supervised radio, indicate that the first station to receive a regular broadcasting license was WBZ, Springfield, Mass., on Sept. 15, 1921. (WBZ is now assigned to Boston.)

There was experimental network operation over telephone lines as early as 1922. In that year, WJZ (now WABC) New York and WGY Schenectady, N.Y., broadcast the World Series. Early in 1923, WEAf (now WNBC) New York and WNAC Boston picked up a football game from Chicago. Later that same year, WEAf and WGY were connected with KDKA Pittsburgh and KYW Chicago (now Philadelphia) to carry talks made at a dinner in New York. President Coolidge’s message to Congress was broadcast by six stations in 1923.

In 1926, the National Broadcasting Co., a subsidiary of the Radio Corporation of America, started the first regular network with 24 stations. For

its first coast-to-coast hookup, in 1927, it broadcast a football game. In that same year, the Columbia Broadcasting System, first called the Columbia Phonograph Broadcasting System, was organized. In September 1934 a radio network called the Quality Group was formed by three radio stations. The network was almost immediately renamed the Mutual Broadcasting System, and operated under various owners until April 18, 1999. At that time Westwood One decided to deliver Mutual news under its CNN Radio brand.

For some years NBC operated two networks, the Red and the Blue, but when the FCC adopted chain-broadcasting rules in the early 1940s, one organization was prohibited from operating two networks serving the same area at the same time. RCA sold the Blue Network to Edward J. Noble in 1943. It ultimately became the American Broadcasting Co. (In 1968, ABC itself was given a limited exception to the dual-network rule in order to operate four radio networks, each providing a specific service.)

FM and TV broadcasting emerged from their experimental stage just before U.S. entry into World War II. Wartime restrictions retarded expansion of radio facilities, although the emergency produced new techniques and apparatus that are in use today. In the decades following the war, broadcasting expanded domestically, and the development of communication satellites has opened new possibilities for international relay.

Regulation of Broadcasting

The Wireless Ship Act of 1910 applied to use of radio by ships, but the Radio Act of 1912 was the first domestic law for general control of radio. It made the Secretary of Commerce and Labor (then a single department) responsible for licensing radio stations and operators.

Early broadcasting was experimental and, therefore, noncommercial. In 1919, radiotelephone experiments were enabled to operate as “limited commercial stations.” In 1922, the wavelength of 360 meters (approximately 830 khz) was assigned for the transmission of “important news items, entertainment, lectures, sermons and similar matter.”

Recommendations of the first National Radio Conference in 1922 resulted in further regulations by the Secretary of Commerce. A new type of AM broadcast station came into being, with minimum power of 500 watts and maximum of 1,000 watts (1 kilowatt). Two frequencies (750 and 833 khz) were assigned for program transmission.

So rapid was the development of AM broadcasting that, upon recommendation of subsequent National Radio Conferences in 1923 and 1924, the Department of Commerce allocated 550 to 1,500 khz for standard broadcast and authorized operating power up to 5,000 watts (5 kilowatts).

Increasing numbers of AM stations caused so much interference that, in 1925, a fourth National Radio Conference asked for a limitation on broadcast time and power. The Secretary of Commerce was unable to deal with the situation because court decisions held that the Radio Act of 1912 did not give him this authority. As a result, many broadcasters changed their frequencies and increased their power and operating time at will, regardless of the effect on other stations, producing bedlam on the air.

In 1926, President Coolidge urged Congress to remedy matters. The result was the Dill-White Radio Act of 1927.

Federal Radio Commission—The Radio Act of 1927 created a five-member Federal Radio Commission to issue station licenses, allocate frequency bands to various services, assign specific frequencies to individual stations and control station power. The same act delegated to the Secretary of Commerce authority to inspect radio stations, to examine and license radio operators and to assign radio call signs.

Much of the early effort of the Federal Radio Commission was required to straighten out the confusion in the broadcast band. It was impossible to

accommodate the 732 broadcast stations then operating. New regulations caused about 150 of them to surrender their licenses.

Communications Act of 1934—At the request of President Roosevelt, the Secretary of Commerce in 1933 appointed an interdepartmental committee to study electronic communications. The committee recommended that Congress establish a single agency to regulate all interstate and foreign communication by wire and radio, including telegraph, telephone and broadcast. The Communications Act of 1934 created the Federal Communications Commission for this unified regulation. This is the statute under which the FCC operates and which it enforces. Several of its provisions were taken from the earlier Radio Act.

Federal Communications Commission—The FCC began operating on July 11, 1934, as an independent federal agency headed by seven commissioners, who are appointed by the President with the advice and consent of the Senate. Under legislation passed in 1982, the FCC was cut back to five commissioners in June 1983.

FCC Broadcast Regulation—One of the FCC’s major activities is the regulation of broadcasting. This has three phases.

The first is the allocation of space in the radio frequency spectrum to the broadcast services and to many nonbroadcast services which also must be accommodated. In view of the tremendously increased use of radio technology in recent decades, the competing demands for frequencies are among the commission’s most pressing problems. Fortunately, as technology has advanced, frequencies higher and higher in the spectrum have become usable. Apart from the frequencies used for broadcasting, frequencies in other portions of the spectrum are allocated for “broadcast auxiliary” use by remote pickup and other transmitters auxiliary to main broadcast stations (see Auxiliary Broadcast Services).

The second phase of regulation is the assignment of stations in each service within the allocated frequency bands, with specific location, frequency and power. The chief consideration, although by no means the only one, is to avoid interference with other stations on the same channel (frequency) or channels adjacent in the spectrum. If an application is granted, the applicant for a new station or for changed facilities receives a construction permit. Later, when the station is built and it is capable of operating as proposed, a license to operate is issued.

The third phase is regulation of existing stations: inspection to see that stations are operating in accordance with FCC rules and technical provisions of their authorizations, modifying the authorizations when necessary, assigning station call letters, licensing transmitter operators, processing requests to assign the station license to another party or transfer control of the licensee corporation and processing applications for renewal of license. At renewal time, the commission reviews the station’s record to see if it is operating in the public interest.

Although educational and other noncommercial stations share the airwaves, the American broadcasting system for the most part is a commercial system. In this respect it is supported by revenues from those who advertise goods or services to the audience. Advertising messages are presented as commercial “spot announcements” before, during and after programs, or as a part of “sponsored” programs.

Broadcast stations are licensed to serve the public interest, convenience and necessity. By law, each license must contain a statement that the licensee does not have any right to operate the station or use the frequency beyond the term of license. The maximum term of licenses for both radio and television stations is eight years.

Under requirements of the Communications Act, applicants must be legally, technically and financially qualified, and they must show that their proposed operation would be in the public interest. They must be citizens of the United States. Corporations with alien officers or directors or with more than one-fifth of the capital stock controlled by foreign interests may not be licensed.

Year in Review: Broadcasting & Cable Yearbook 2002

Broadcasting

There were 13,331 radio stations operating in the United States at the end of 2002. Of these, 4,804 were commercial AM stations, 6,173 were commercial FMs and 2,354 were noncommercial FMs. There were 1,719 operating television stations: 583 commercial VHF, 755 commercial UHF, 127 noncommercial VHF and 254 noncommercial UHF. Most commercial TVs are network affiliated; approximately 476 operate as independents. (See U.S. Independent Television Stations in Section B.) There were 503 digital TV stations licensed or on official program test authority as of June 25, 2003. There are over 2,100 low power TV stations.

There is no limit to the number of AM, FM, or TV stations an entity may own. Although there are no national radio ownership limits, the number of stations a company can own in a particular market depends on the size of the market. In markets with 45 or more commercial radio stations, a broadcaster may own eight stations, but no more than five of a kind (AM or FM). In markets with 30-44 stations, seven total, four of a kind. With 15-29 stations, six total, four of a kind. With 14 or fewer stations, five total, three of a kind (but no more than half the stations in the market). In TV an entity may own as many TV stations as it wants, as long as they don't reach more than 45% of the nation's television homes.

Daily newspaper owners may purchase TV properties in the same market if there are at least four TV stations in the market. In markets with three or fewer TV stations, no cross-ownership is permitted among TV, radio and newspapers. TV stations may no longer acquire cable TV franchises in the same city.

In 2002, according to estimates by the Television Bureau of Advertising and the Radio Advertising Bureau, commercial broadcasting had total advertising revenues of approximately \$61.5 billion. Television advertising accounted for \$42.0 billion (68.3%) of revenues; radio advertising, for approximately \$19.5 billion (31.7%). Public broadcasting had a 2001 gross revenue of \$2.4 billion—16.9% from the federal government.

In 2002, television billings for stations and networks amounted to \$18.0 billion (national network and national syndication), \$10.9 billion (national non-network) and \$13.1 billion (local), according to estimates by the Television Bureau of Advertising. The Radio Advertising Bureau estimated radio billings for stations and networks were \$1,020,000,000 (national network), \$3,275,000,000 (national non-network), and \$15,280,000,000 (local).

There are more than 106 million U.S. homes (98% of all homes) with television sets, about 75% of which have more than one set. About 100% of the TV homes have

color. It is estimated that about 91% of TV homes are equipped with a VCR, and that about 70% are linked with cable systems, according to Nielsen Media Research.

The Consumer Electronics Association estimates that 98% of all U.S. consumers own home radio sets.

The average American home watches TV eight hours and 00 minutes a day, according to the September 2002-August 2003 broadcast year data reported by Nielsen Media Research. And a 1997 study by Roper-Starch Worldwide Inc. shows that 69% of the U.S. public turns to TV as the source of most of its news, and that 53% believe news reports on TV are the most credible.

The average 30-second prime-time network television announcement now costs \$120,000 (spots on a top-rated series cost \$450,000; low-rated spots average about \$55,000). An estimated 137.6 million people watched the 2003 Super Bowl telecast. Thirty-second announcements during that event cost \$2.2 million. Thirty-second announcements on individual TV stations range from \$20,000 in top-rated specials in major markets to as low as \$10 in the second-hundred markets. Radio spots cost from \$1,500 or more in major markets to less than a dollar in small towns.

Cable

There are over 10,000 operating cable systems in the U.S. Operating systems currently reach about 69 million subscribers, perhaps over 182 million people—70% of the nation's TV households. The largest (the Eastern Division owned by Comcast) has over 5 million subscribers. Some have fewer than 100. Comcast Cable Communications is the largest multiple system operator (MSO), with over 21 million subscribers. Industry revenues last year totaled approximately \$50 billion.

Most systems offer 40 or more channels. Systems constructed after March 1972 must have a minimum 20-channel capacity. The average monthly fee (basic service) is \$40. The National Cable & Telecommunications Association reported that 20 million consumers, or more than 25% of all cable customers, had chosen to subscribe to digital cable services. By June 1, 2003 cable operators offering HDTV service passed 55 million homes.

Cable systems accept advertising on their local origination channels (excluding automated channels),

with rates from \$2 to \$600 per 30-second spot. Cable systems can also generate advertising revenue from the sale of the two minutes per hour that comes with each of the cable networks they carry. Most cable systems derive about 10% of their gross revenues from advertising. Pay cable is on approximately 9,300 systems and reaches 44 million subscribers in 50 states. Nielsen Media Research reports that 40% of all TV homes receive pay cable. Home Box Office Inc. initiated the first national satellite interconnected pay network Sept. 30, 1975, using transponder time leased on the Satcom satellite. Aside from contracting for packaged pay programs, like HBO, cable operators can lease a channel to a pay program operator or secure their own programming directly from a supplier. Many systems have multiple cross-ownership ties.

Although wireless cable systems offer programming similar to cable systems, the subscriber receives the programming in a different way. A wireless cable system uses a microwave transmitter to send video

programming to the rooftop antennas of subscribers. According to the Wireless Communications Association International, there are more than 250 wireless cable systems. Another alternative to cable is provided by DBS (direct broadcast satellites). United States Satellite Broadcasting Co. and DirecTV Inc. began operation in 1994. EchoStar began DBS service in 1996. The DBS operators transmit via high-power satellites to small antennas on the ground. A midpower DBS company, Primestar Partners, provided DBS service until it ceased to exist September 30, 1999. Midpower DBS systems also transmit via satellite but require bigger antennas on the ground. In 1999 DirecTV merged with United States Satellite Broadcasting Co. and acquired Primestar. There are four companies licensed to provide DBS service: DirecTV, EchoStar (marketed as the DISH Network), Dominion Video Satellite Inc. (marketed as Sky Angel) and Rainbow DBS (owned by Cablevision Systems Corp.). There are over 18 million DBS subscribers.

Penalties for violation of FCC rules by broadcast stations, depending upon the degree of seriousness, range from reprimands, fines and short-term probationary licenses to denial of license renewal, or even license revocation. Cease-and-desist orders may also be issued.

In 1965, the commission provided for public inspection of certain records of broadcast stations in the communities they serve. These are mainly duplicate copies of records in the public files of the commission in Washington, and include licenses, records of ownership, applications to the FCC and related material, network affiliation contracts and employment reports.

The commission is forbidden by law from censoring programs. The Communications Act, Section 326, states: "Nothing in this Act shall be understood or construed to give the commission the power of censorship over the radio communications of signals transmitted by any radio station, and no regulation or condition shall be promulgated or fixed by the commission which shall interfere with the right of free speech by means of radio communication." Despite the prohibition, the federal government has promulgated limited rules and laws regulating content of broadcast stations.

Fairness Doctrine—The Fairness Doctrine evolved in the 1930s and 40s after a series of decisions by the (now-defunct) Federal Radio Commission and the FCC. That doctrine required broadcast stations to air issues of public importance and to present all sides of those issues. The Fairness Doctrine was first formally described in the FCC's 1949 Report: "Editorializing by Broadcast Licensees." In 1959, the Communications Act of 1934 was amended in section 315 to include it.

Congress suspended part of the amendment in 1960 so that broadcasters could air a presidential debate between Democrats and Republicans. Otherwise, broadcasters would have been required to invite the candidate from every party to debate even if they had no possible chance of prevailing in the election. Congress made that exception a law in September 1970.

In 1967, the FCC codified the two corollaries to the Fairness Doctrine - the personal attack and political editorial rules.

Those rules required stations to notify persons when personal attacks were made on them in discussion of controversial public issues (with certain exceptions such as newscasts). The same requirement was also applied to station editorials endorsing or opposing a political candidate. These rules were upheld by the Supreme Court in 1969 in *Red Lion Broadcasting v. FCC*. In that case, the court held that the "scarcity of radio frequencies" made broadcasters subject to a lower level of constitutional scrutiny, which broadcasters argued diluted their free speech rights.

The National Association of Broadcasters began petitioning the FCC in August 1980 to repeal the personal attack and political editorial rules, arguing that the burden of having to provide equal responses chilled broadcasters' speech. Three years later, in 1983, the FCC proposed eliminating both rules. In 1985, the commission issued a report declaring that the changing marketplace had rendered broadcast communications no longer scarce, thus undercutting the Supreme Court's decision to uphold the Fairness Doctrine in *Red Lion*.

In August 1987, the Commission, under the chairmanship of Dennis Patrick, voted to eliminate the Fairness Doctrine. While most broadcasters cheered the action as one that elevated their First Amendment standing, many members of Congress called for resurrection of the doctrine in federal law. While the FCC repealed the general fairness doctrine, the personal attack and political editorial rules stayed on the books.

The matter largely lay dormant until September 1996, when the Radio-Television News Directors Association asked the U.S. District Court of Appeals to order the FCC to respond to a petition RTNDA had filed on the personal attack/political editorial rules in 1990. The court did so and the FCC again began collecting comments on the matter.

On August 8, 1997, the FCC announced that "after extensive discussion and consideration of various alternatives, a majority of the Commission is unable at this time to agree upon any resolution to the issues presented in this docket." The RTNDA and NAB refused to accept this non-committal response. On June 22, 1998, after the two associations repeatedly asked the court to force the FCC to rule on the matter, the FCC brought the matter to a vote, but split two to

two. Commissioners Susan Ness and Gloria Tristani endorsed keeping the rules, while commissioners Harold Furchtgott-Roth and Michael Powell recommended repealing them. Chairman William Kennard did not participate.

The NAB and the RTNDA again challenged the FCC's decision-or lack thereof-at the U.S. District Court. The U.S. Court of Appeals told the FCC to repeal the rules in October 2000.

Advertising—The FCC mostly stays out of broadcasters' advertising decisions. The commission eliminated advertising time limits for all types of programming in 1984 as part of a general deregulation of TV broadcasting. The FCC does regulate in the areas of political advertising, advertising during children's television programming and gaming advertising. The commission has tried to regulate liquor advertising, but so far has been unsuccessful.

i) Political Advertising-

The FCC requires broadcasters to make commercial time available to all qualified political candidates on the same terms as they would make that time available to any advertiser. Broadcasters must offer candidates their lowest price for spots 45 days before a primary election and 60 days before a general election. Lower-priced spots can be preempted if the broadcaster deems that necessary as long as this possibility is disclosed to the candidate prior to buying the ad.

In an attempt to lower the costs of campaigning, the Clinton Administration and some members of Congress have pushed broadcasters to offer political candidates free airtime, claiming that the expense of broadcast advertising is what has pushed campaign costs so high. Broadcasters have fought hard against this idea, so far successfully.

Senators John McCain (R-Ariz.) and Russell Feingold (D-Wis.) included free airtime in their 1997 bill meant to reform campaign finance reform. It was too controversial, however, and McCain and Feingold were forced to remove the provision. Even then, the Senate deadlocked over the issue in the spring of 1998. After a struggle between House Republican leadership and the rank and file members, the House passed a campaign finance reform bill in the fall of 1998, but the Senate refused to take the issue back up.

In 1997, at the behest of Vice President Al Gore, the White House convened a group of hand-picked experts to examine what the public interest obligations of digital broadcasters should be. Dubbed the Gore Commission, the group was specifically intended to advance the administration's desire to have broadcasters provide free air time. But the commission included broadcasters and they refused to agree that they should have to give politicians free time. The commission finally recommended in December 1998 that broadcasters should volunteer to give candidates five minutes of free air time per night during the 30 days leading up to an election.

The administration also tried to have the FCC look into the issue, but Congress bolted at the suggestion. In his 1998 State of the Union address, President Clinton recommended that the FCC open a rulemaking on free airtime. FCC Chairman William Kennard promptly said he would do so, and received a barrage of letters from angry Congressmen and Senators who threatened to pull the FCC's funding if Kennard took one step toward such a proceeding. Kennard did not move ahead.

ii) Advertising during children's TV-

The commission's rules forbid stations to air more than 10.5 minutes of ads during children's TV programs on weekends and more than 12 minutes of ads during children's TV programs on weekdays. (See *Children's Television*)

iii) Lotteries and Gaming Advertising-

Broadcasters can advertise state-supported lotteries and gaming on Indian reservations but cannot run ads for casinos if they show gambling.

In early 1999, the Supreme Court agreed to hear a case that would decide whether broadcasters could air casino gambling ads. A federal appeals court in San Francisco decided in 1997 that it was unconstitutional to forbid broadcasters from airing the ads if the activity was legal. Meanwhile, a federal appeals court in New Orleans in 1998 ruled that the government had a public interest reason to keep broadcasters from airing the ads. The split in appeals court decisions brought the case to the Supreme Court, which heard the case in the summer of 1999. On June 14, 1999 the Supreme Court struck down the ban on casino ads.

iv) Liquor Advertising-

The Supreme Court decided in June 1996 that it was unconstitutional to forbid advertising of liquor prices (44 *Liquor Mart v. Rhode Island*). After that, liquor distiller and distributor Jos. E. Seagram & Sons Inc. decided to break the liquor industry's voluntary 48-year-old ban on broadcast advertising by running an ad for Crown Royal Canadian whiskey on KRIS-TV, an NBC affiliate in Corpus Christi, Texas. Later that year, the Distilled Spirits Council of the United States reversed its self-imposed ban on advertising.

Those moves quickly got the attention of the FCC and lawmakers. In late 1996, Rep. Joseph Kennedy (D-Mass.) and other Democratic House members introduced legislation banning liquor advertising, although no bill ever passed because Republican members wanted the FCC, and government in general, to stay out of the matter. FCC Chairman Reed Hundt made the fight against liquor advertising one of his top priorities, but Congressional opposition as well as disagreement from two Republican commissioners kept the issue off the FCC's slate during Hundt's term.

Hundt's successor, William Kennard, tried to reintroduce the issue as soon as he took office in November 1997, but his plans were shot down by Congressional Republicans as well as Republican commissioners.

Although broadcasters can legally air liquor ads, the stir has been enough to keep broadcasters convinced that the ads - with an occasional exception - need to stay off the air. Broadcasters earn approximately \$600 million annually in revenue from beer and wine advertising. They would prefer to protect that income rather than angering policymakers by accepting new liquor ads.

"Payola" and "Rigged Quiz Shows"—Revelations about programs in the late 1950s led to amendments to the Communications Act in 1960. These made more explicit a station's obligation to make an announcement when money or other consideration is received for the presentation of broadcast material (e.g., money received by a disk jockey for playing a record). They made illegal the presentation of programs purporting to be contests of knowledge or skill where the result is in any way prearranged.

Indecency—Broadcasting of obscene or indecent programming is against the law. Enforcement of the obscenity prohibition is up to the Justice Department, but it is left to the FCC to take care of indecency.

In 1978, the Supreme Court affirmed the FCC's authority to act against stations that broadcast indecency during times when the likelihood of children being in the audience was high. It was not until April 1987 that the FCC began enforcing the law in earnest, however. Since then, it has generated a small, but steady, stream of fines against stations.

Congress adopted a 24-hour indecency ban in 1988 that was reversed in the courts. First Amendment advocates argued the ban violated the 1978 Supreme Court decision. Congress tried again in 1992, passing an indecency band covering all except the "safe harbor" hours of midnight-6 a.m. In July of 1995, a U.S. Court of Appeals in Washington upheld the FCC's enforcement of the indecency rules.

Networks—The commission does not license networks as such, only individual stations. Station licensees are subject to the chain broadcasting regulations adopted by the commission in 1941 to further competition in broadcasting. These rules have been supplemented by further regulations adopted from time to time.

In 1995, the FCC repealed the Financial Interest and Syndication rules as well as the Prime Time Access Rule (PTAR). The commission set a one-year sunset period on PTAR, which generally prohibits network-affiliated stations in the top 50 markets from broadcasting more than three hours of network or former network programming during the four prime time viewing hours.

In 1995, the commission also repealed the "network station ownership" rule and the "secondary rule". The network station rule prohibited networks from owning TV stations in markets with few stations or station of "unequal desirability." The "secondary affiliation rule" prohibited networks from establishing a secondary affiliation with an already affiliated station in markets where two stations had affiliations and there was at least one independent unaffiliated station.

The commission also proposed modifying or eliminating a series of network rules. Those under review in 1995 were:

The right to reject rule, which ensures that a

Brief History of Broadcasting and Cable

network affiliate retains the right to reject network programming;

The time option rule, which prohibits a network from holding an option to use specified amounts of an affiliate's broadcast time;

The exclusive affiliation rule, which prohibits a network from preventing an affiliate from broadcasting the programming of another network;

The network territorial exclusivity rule, which prohibits an agreement between a network and an affiliate that prevents another station in the same community from broadcasting a network program not taken by the affiliate. The rule also prohibits an agreement that would prevent another station in a different community from broadcasting any of the network's programming.

In 2001 the FCC repealed the dual network rule, which prevents a single entity from owning more than one broadcast television network.

Broadcast Ownership— The Telecommunications Act of 1996 changed many of the broadcast ownership rules.

i) Radio-

Prior to the act, radio station owners could not own more than four radio stations in a market. Radio owners now are allowed to own as many radio stations as they want, with certain limits. In a radio market with 45 or more commercial radio stations, a party may own, operate or control up to 8 commercial radio stations. Not more than 5 of these stations can be in the same service (AM or FM). In a radio market with between 30 and 44 commercial radio stations, a party may own, operate or control up to 7 commercial radio stations, with not more than 4 of them in the same service. In a radio market with between 15 and 29 commercial radio stations, a party may own, operate or control up to 6 commercial radio stations, with not more than 4 of them in the same service. In a radio market with 14 or fewer commercial radio stations, a party may own, operate or control up to 5 commercial radio stations, with not more than 3 of those in the same service. In those smaller markets, a party may not own, operate or control more than 50% of the stations in that market.

The changes in the radio ownership rules has led to widespread consolidation in the industry, so that some radio groups own hundreds of stations. That has caused FCC Chairman William Kennard to complain that minorities and women are being pushed out of the industry. To remedy this, Kennard has proposed eliminating local marketing agreements, in which a party owns one broadcast station but runs another in the same market. The broadcast industry and Congress have reacted strongly against that suggestion, but the proposal still remains on the table at the FCC.

In 1999 the FCC voted to create a new class of low-power FM radio stations that would allow less wealthy members of the community to own and run broadcast operations. Two noncommercial FM services were authorized: LP 100, with power from 50 to 100 watts and a service radius of about 3.5 miles; and LP 10, with power from 1 to 10 watts and a service radius of about 1 to 2 miles. The new low-power FM licenses were to be awarded throughout the FM radio band and were not limited to the channels reserved for use by noncommercial educational radio stations. For the first two years, no entity will be permitted to operate more than one low-power FM station nationwide. After the second year, eligible entities will be able to own up to five stations nationwide, and after three years, up to ten nationwide.

ii) Television-

Prior to the act, television station owners could only own 12 stations nationwide. After passage of the act, they could own as many stations as they wanted as long as the reach for those stations did not exceed 35% of the national viewing audience. In 2003 the limit was changed to 45% of the national viewing audience. Broadcasters still were only allowed to own one TV (VHF or UHF) station per market, until the FCC decided, in 1999, to permit them to own two TV stations under certain conditions. In 2003 a company was allowed to own three TV stations in a market if there were at least 18 TV stations (commercial or noncommercial) in the market. A company may own two TV stations in a market if the market has five or more TV stations. But only one of the two stations can be among the top four in ratings. Waivers for duopolies among the four top-rated stations will be considered on a case-by-case basis in markets with 11 or fewer TV stations.

iii) Attribution-

On Aug. 5, 1999 the FCC adopted new broadcast

and cable/MDS attribution rules. Under the new rules minority shareholders in TV stations are counted toward ownership limits if they own more than 33% of the voting stock. Interests of voting shareholders or direct partners are counted toward limits if the voting shareholders own more than 5% of the voting stock. Mutual funds, insurance companies and bank trust departments are counted toward limits if those entities hold more than 20% of a broadcast company's outstanding voting stock.

iv) One-to-a-market rule-

The Telecommunications Act loosened this rule, which allows an entity to own only one AM, FM or TV per market. The new local ownership rules issued by the FCC Aug. 5, 1999 permitted a company with two TV stations to own up to six radio stations in a market if the market has at least 20 separately owned broadcast, newspaper and cable "voices." In those markets one TV and seven radio stations are also allowed. Up to four radio stations (any combination of AM or FM stations, and to the extent allowed under the local radio ownership rules) in any market where at least 10 independent voices would remain post-merger.

v) Cross-ownership-

The radio-television cross-ownership rules depend on the number of independent voices in a market. All independently owned, full-power, operational commercial and noncommercial TV stations licensed to a community in the designated market area in which the TV station is located are considered to be independent voices. All independently owned operational commercial and noncommercial radio stations licensed to, or, with a reportable share in, the radio metro market where the TV station involved is located are considered to be independent voices. Daily newspapers that are published in the DMA with a circulation over 5% in the DMA are independent voices. A wired cable service, provided cable service is generally available in the DMA, is counted as a single voice. In 2003 the radio-television cross-ownership rules changed when the FCC eliminated the newspaper-broadcast cross-ownership ban and the television-radio cross-ownership ban in markets with nine or more TV stations. But the owners in markets with nine or more TV stations are limited by individual radio and TV limits applicable to specific markets. In the medium-sized tier (4-8 TV stations), certain media outlet combinations will be allowed in these markets without harming viewpoint diversity. The FCC found certain other combinations would threaten viewpoint diversity and are thus prohibited. In the tier of smallest markets (3 or fewer TV stations), no cross-ownership is permitted among TV, radio and newspapers.

Children's Television

Providing children with regularly scheduled, quality educational programming became more of a priority for Congress and the FCC starting with the passage of the Children's Television Act in 1990. That law requires broadcasters to serve the educational and informational needs of children through its overall programming as well as through specifically-designed core educational programming. That law also limits the amount of advertising during children's programming to 12 minutes per hour on weekdays and 10.5 minutes per hour on weekends.

In August 1996, the FCC made that law more specific when it adopted rules that require broadcasters to air three hours of core children's educational programming per week. These programs must be shown between 7 a.m. and 10 p.m., be regularly scheduled each week, be at least 30 minutes in length and have as their main purpose educating or informing children. If stations do not air three hours of core children's programming each week, then they need to show the FCC when their licenses are up for renewal how they have served the educational needs of children in other ways.

In 1997, ABC, CBS and NBC asked the FCC to give them some leeway in rescheduling children's programming if it is bumped by live sports. The commission responded that it would prefer the networks to find those programs a "second home" on their line-up, so kids would know where to find their favorite shows if they get bumped, but the FCC told the networks it was willing to approve their request for greater flexibility with the "expectation that stations will make other good-faith efforts to maintain scheduling predictability."

Equal Employment Opportunity—The FCC's 27-year-old rules requiring broadcast stations to actively recruit minority employees were struck down

by the U.S. Court of Appeals in Washington in April 1998. The court found the rules unconstitutional and said that they were not tailored narrowly enough. The FCC currently is rewriting those rules to try and please the court while still having an equal employment opportunity recruiting program in place. Most broadcasters and cable operators have pledged to continue recruiting minorities and women even in the absence of the rules.

V-Chip/TV Ratings—The Telecommunications Act of 1996 requires broadcasters to include a "V-chip" in half of new 13" or greater size sets sold by July 1, 1999 and in all new sets by January 2000. That chip will allow parents to screen out violent or sexual programming using a TV ratings system the industry agreed upon through a long set of negotiations that took place throughout late 1996 and the summer of 1997.

That system rates programs both by age groups for whom it is appropriate and by content. The age ratings are TV-Y, for young children; TV-Y7, for older children; TV-G, for general audiences; TV-PG, parental guidance suggested; TV-14, parents strongly cautioned; and TV-MA, for mature audiences only. The content ratings are V for violence; FV for fantasy violence, such as that found in cartoons; D for adult dialogue or innuendo; L for foul language and S for sexual content.

The industry also established an oversight monitoring board to ensure that the ratings are applied accurately and consistently throughout programming. That board provides a place where complaints and requests can be addressed.

Receivers—The advent of "wireless" prompted amateurs and others interested in listening in on Morse code radiotelegraph transmissions to acquire receiving sets. Homemade sets with crystal detectors gradually gave way to commercially manufactured receivers. Then the rise of broadcasting aroused public interest in owning sets, battery-operated at first, to receive regular programs. Receivers operated by house current came on the market about 1928. Development of the transistor in 1948 led to their use in place of tubes in sets. Successive stages in TV receiver development have taken sets from black-and-white to color, and VHF-only to all-channel (VHF and UHF) capability (see chapter on TV Broadcast).

The commission does not license receivers. However, it does require manufacturers to limit radiation that may interfere with radio or TV reception.

Call Letters—International agreement provides for national identification of a radio station by the first letter or first two letters of its assigned call signal, and for this purpose the alphabet is apportioned among nations. Broadcast stations in the United States use call letters beginning with K or W. Generally, those beginning with K are assigned to stations west of the Mississippi River while W is assigned east of the Mississippi.

During radio's infancy, most of the broadcast stations were in the East. As inland stations developed, the Mississippi River was made the dividing line between K and W calls. However, KDKA Pittsburgh and some other eastern stations authorized before this system went into effect have retained their K calls, and similarly some pioneer stations west of the Mississippi have kept their W calls. Most of the early broadcast call signs contained only three letters. These combinations were soon exhausted and stations were assigned four-letter calls. Since many AM licensees also operate FM and TV stations, a common practice is to use the AM call letters followed by "-FM" or "-TV."

National Defense—In cooperation with military and civil defense agencies, the commission has established the Emergency Broadcast System, based on voluntary participation by the broadcast industry. EBS facilities are for the primary purpose of giving emergency warning and advice to the public in event of attack, but they are put to peacetime use in alerting audiences to serious weather and other emergencies threatening life and property.

In 1994, the commission adopted a digital "emergency alert system" (EAS) intended to replace the EBS. In 2003 the commission created an Office of Homeland Security within the Enforcement Bureau to provide consolidated support for its homeland security and emergency preparedness responsibilities.

Broadcast Operation

Frequencies and Station Assignments—Radio frequencies differ in characteristics, and each service is assigned to a frequency band to suit its needs.

The AM aural service, sometimes called standard broadcast or simply AM, occupies the band from 535 kHz to 1705 kHz. Radio waves travel with the same speed as light, and are of different "frequencies" (cycles per second) and "wavelengths" (distance between points in successive cycles). "Frequency" and "wavelength" vary inversely with each other. The latter term was formerly used generally to describe a particular radio wave, and still is in some other countries; but in the United States the use of "frequency" is much more common. The usable frequency spectrum has constantly expanded upward with developing technology, so that what were once "high" frequencies are near the low end of the total spectrum used.

FM broadcasting occupies the frequencies from 88 to 108 mhz, with 100 channels of 200 kHz width each, the lowest 20 of them reserved for educational use. Both the center frequency (e.g., "93.1 mhz") and the designated channel number from 201 to 300 are used (e.g., "channel 201" is "88.1 mhz"), although channel numbers are not in popular usage since they are not on FM receivers.

In television, where wider channels are required to carry both picture and sound, each channel is 6 mhz wide. The very high frequency (VHF) portion of the television service occupies the frequencies 54 to 72 mhz (channels 2, 3 and 4), 76 to 88 mhz (channels 5 and 6) and 174 to 216 mhz (channels 7 through 13). The ultra high frequency (UHF) portion of the television service occupies the frequencies from 470 to 890 mhz (channels 14 through 83). Designated channel numbers identify the frequency assignments (e.g., 54-60 mhz is "Channel 2"). There is no "channel 1" in television.

Although "AM" and "FM" are often used to refer to the standard broadcast and FM broadcast services, these terms more properly apply to the methods, "amplitude modulation" and "frequency modulation," used to impress aural or visual intelligence on the carrier wave. The "AM" principle is used not only in the standard broadcast service but also in the picture portion of television and in the international "shortwave" service. The "FM" principle is used both in the FM broadcast service and in the sound portion of television.

In all the broadcast services, the same aural or visual channel can be used in different places if the stations are far enough apart not to interfere with one another or with stations on adjacent or technically related channels. A TV station may be required to "offset" 10 kHz above or below its normal carrier frequency. The channel assigned to such a station is then designated "plus" or "minus" as the case may be. This makes more TV assignments possible and reduces the possibility of interference.

AM and FM Systems—Without being too technical, this is how an aural station works:

A person talks into a microphone as if it were a telephone. His voice sets up vibrations of varying intensity and frequency. The lower the pitch the slower the vibration. A cycle, or wavelength, is one complete performance of a vibration.

In the microphone, these vibrations are converted into electrical impulses which are then greatly amplified at the transmitter before being put on the "carrier" wave. The intensity and frequency of the carrier wave are constant. This wave, by itself, does not transmit music or speech, so it is varied to correspond with fluctuations of the speech or music received at the microphone. This is called "modulation."

In AM broadcast, the audio waves are impressed on the carrier wave in a manner to cause its amplitude (or power) to vary with the audio waves. The frequency of the carrier remains constant. This is known as amplitude modulation. In frequency modulation (FM), the amplitude remains unchanged but the frequency is varied in a manner corresponding to the voice or music to be transmitted.

These modulated waves radiate from the antenna tower at approximately 186,000 miles per second (the speed of light). Some of them follow the contour of the ground and are called "groundwaves." Others dart upward and are called "skywaves." At night, the skywave portions of transmissions in the standard broadcast (AM) frequencies are reflected back to earth by electrical particles in the "ionosphere" portion of the atmosphere. This gives the listener a choice of more distant AM stations at night, but also increases interference. Daytime reception is largely dependent upon groundwaves.

Radio waves may pass through buildings and other objects but are subject to absorption or interference. As in the case of ripples on water, radio

vibrations weaken with distance. Seasonal disturbances and sunspot periods can throw them off course and cause "freak" reception.

AM broadcast stations use "medium waves." That is to say, they transmit 540,000 to 1,700,000 waves a second, or 540 to 1700 kHz. At 540,000 waves a second, the distance between waves is approximately 1,800 feet.

The so-called "shortwave" (international long-distance) broadcast stations transmit in the frequency range 6 mhz to 25 mhz. These waves are sent out one after another so rapidly that the distance between their crests (wave length) is only about 37 to 150 feet.

FM and TV stations, broadcasting in the very high and ultra high frequencies, send out even shorter, or very short, waves. (The word "shortwave" came into use before there was technology to use these other parts of the spectrum.)

The modulated radio wave from the radio station is picked up by the home receiving antenna. In other words, the wave sets up in the receiving antenna a current having the same frequency characteristics as the one transmitted. In the receiver, the audio and carrier waves are separated by a device called a detector or demodulator. The carrier wave, no longer needed, is dissipated while the audio wave is relayed to the loudspeaker where it is transformed back into the sound that is heard by the listener. (Television operation is discussed in TV Broadcast.)

Stereophonic Service—Stereophony is not really a 20th century innovation but dates back to experiments performed over wire lines by telephone engineers in the 1880's. Even at that time, contemporary accounts spoke of being able to "localize" a singer's position on an opera stage by virtue of the signal strength in either the right or left telephone. Over the next few decades, there were other experiments in transmitting binaural sound, but the general impetus to development came only with post-World War II technology in which multiplexing techniques were applied to FM broadcasting. In 1959, the National Stereophonic Radio Committee was created to examine the many proposed systems of FM stereo and submit a final recommendation to the commission. In the summer of 1960, six systems were field tested over KDKA-FM (now WLTX) Pittsburgh, with receivers set up at Uniontown, Pa. The system of stereo transmission proposed by the General Electric Co. and the Zenith Corp. was adopted, with broadcasting authorized to start on June 1, 1961. The FCC authorized AM stereo in 1982, but refused to select a standard from among five incompatible systems. In July 1982, KDKA(AM) Pittsburgh and KTSA(AM) San Antonio, Tex., began AM stereo programming with a Kahn system, the first to win FCC acceptance. The Motorola system ultimately emerged as the most popular system. Under a congressional mandate, the FCC in 1993 finally picked a stereo standard. And to no one's surprise, it was Motorola's.

Nonetheless, AM stereo has not caught on, principally because many AM stations have given up on music formats and no longer care. Stereo did nothing to overcome AM's other weaknesses as a music medium: susceptibility to interference and low fidelity.

Television stereo was approved by the FCC in spring 1984. Although the FCC did not adopt a single standard, it did provide interference protection for an industry committee-selected Zenith/dbx transmission system. The authorization allowed not only for stereocasts, but also a second audio program channel for bilingual or narrative broadcasts and a third channel for professional uses. Noncommercial WTTW(TV) Chicago became the first stereo TV broadcaster in August 1984. Within one year, 100 stations were providing multichannel sound. TV stereo is now commonplace.

Transmitting Antenna—In the AM service, antenna height above ground is not usually a matter of much importance. The entire antenna structure acts as the antenna and usually varies in height with the frequency of the transmission. Few AM antennas exceed 1,000 feet in height and most are considerably less. By contrast, in FM and TV, where transmission follows "line of sight," service depends on the location of the receiver in relation to the transmitting antenna. Here, antenna height is extremely important. While FM and TV antennas themselves are short, they are often situated, for greater overall height, atop natural or man-made structures, such as tall buildings, mountain tops, or tall towers specifically built for this purpose.

In the interest of safe air navigation, authorizations for broadcast transmitting antennas must usually be

coordinated with the Federal Aviation Administration. Those over a certain height (usually 200 feet) must be painted and lighted. To further minimize the hazard to air traffic, shared use of tall towers, or location of all tall antennas of a given area on an "antenna farm" is encouraged.

Radio and TV broadcasters must also limit public and occupational exposure to radio frequency radiation emissions from antenna towers. Following enactment of new regulations by the FCC in January 1986, exposure levels will be routinely considered for construction permits of new or modified facilities and for renewal applications. The rules also apply to TV translators, low power TV, satellite earth station transmitters and experimental stations.

"Directional antennas" consist of more than one radiating element (the tower in AM), with phasing of the radiation from a series of towers so arranged that radiations cancel each other in some directions and reinforce each other in other directions. Sometimes they are used to increase radiation and service in a particular direction. More commonly, the purpose is to restrict radiation in one or more directions, usually to avoid interference to other stations.

As AM stations began to multiply on shared channels, it became necessary to employ directional antennas to prevent interference. Since 1937, directional antennas have helped new stations squeeze into the congested AM broadcast band. Most full-time (day and night) AM stations operate directionally at night. Directional antenna arrays can produce "figure eight" and more complicated service patterns. A complete array may include 12 towers. Directional antennas also are used in international communication and microwave relay to beam transmissions to particular points. Some FM and TV stations now use directional antennas.

In 1995, the commission adopted rules placing tower upkeep responsibilities primarily on the tower owners. The commission also adopted a streamlined antenna registration procedure unifying a series of rules for registering different types of antennas and incorporating Federal Aviation Administration painting and lighting rules.

AM Broadcast

AM is the oldest system of broadcasting. The pioneer AM service started operation on the 535-1605 kHz band. In a sweeping reform of the service in 1991, the AM extended the upper end of the band to 1705 kHz.

Classes of AM Stations—As part of its reforms, the FCC adopted a new classification system.

Classes of AM Broadcast Channels and Stations—Clear channel. A clear channel is one on which stations are assigned to serve wide areas. These stations are protected from objectionable interference within their primary service areas and, depending on the class of the station, their secondary service areas. Stations operating on these channels are classified as follows:

(1) Class A station. A Class A station is an unlimited time station that operates on a clear channel and is designed to render primary and secondary service over an extended area and at relatively long distances from its transmitter. Its primary service area is protected from objectionable interference from other stations on the same and adjacent channels, and its secondary service area is protected from interference from other stations on the same channel. The operating power shall not be less than 10 kw nor more than 50 kw.

(2) Class B station. A Class B station is an unlimited time station which is designed to render service only over a primary service area. Class B stations are authorized to operate with a minimum power of 250 watts and a maximum power of 50 kw or 10 kw for stations that are authorized to operate in the 1605-1705 kHz band.

(3) Class D station. A Class D station operates either daytime, limited time or unlimited time with nighttime power less than 250 watts. Class D stations shall operate with daytime powers not less than 250 watts nor more than 50 kw. Nighttime operations of Class D stations are not afforded protection and must protect all Class A and Class B operations during nighttime hours. New Class D stations that had not been previously licensed as Class B will not be authorized.

Regional Channel. A regional channel is one on which Class B and Class D stations may operate and serve primarily a principal center of population and the rural area contiguous thereto.

Local Channel. A local channel is one on which stations operate unlimited time and serve primarily a community and the suburban and rural areas immediately contiguous thereto.

(4) Class C station. A Class C station is a station operating on a local channel and is designed to render service only over a primary service area that may be reduced if found to cause interference with other stations. The power shall not be less than 250 watts, nor more than 1 kw. Class C stations that are licensed to operate with 100 watts may continue to do so.

Day and Night Service—Of the two types of signals—groundwave and skywave—groundwave service is steadier, more reliable and is called "primary" service. Skywave or "secondary" service is available at night because skywave signals, lost in the daylight, are reflected from the ionosphere. Since skywaves cover tremendous distances, Class A stations can render skywave service across 700 miles or more. This service is subject to "fading," varying with changes in such factors as time of day, weather, latitude, atmospheric noise and sunspot activity, hence the name "secondary." Because of the high power and extent of protection required for skywave signals to afford useful service, only Class A stations are authorized for skywave service.

Because skywave transmission is a factor in the AM frequencies at night, the number of AM stations operating at night must be limited. Therefore, slightly more than half of U.S. AM stations are licensed for daytime-only operation, sunrise to sunset, although on many frequencies most of them are also permitted to operate, usually with reduced power, starting at 6 a.m. when that is before sunrise (so-called "presunrise" operation). More than 2,000 such stations may operate up to two hours after local sunset.

In the early 1960s, the AM band was experiencing congestion and interference. At the same time, some service needs, such as night-time primary service to large portions of the country, were not being met. Therefore, in 1964, the assignment rules for new AM stations, or for more powerful facilities, were tightened to prevent interference and preserve the AM potential for more efficient use.

Facilities authorized from 1964 to 1968 involved minimal interference and provided the first local radio outlets for a number of communities. Still, there were unfulfilled service needs, particularly at night, and so in July 1968, the commission stopped accepting AM applications while it studied how to utilize the limited potential for new stations in the AM band. At that time, there were 4,215 AM stations on the air in this country; another 100 that had been previously authorized were expected to come on the air in succeeding months. There were more than twice as many AM as FM stations on the air.

The next year, new rules were proposed under which the commission would, to a greater extent, regard AM and FM as a single aural service. New AM stations would be authorized only where they would bring a primary service to a substantial area not receiving such service from existing AM or FM stations, and would not be granted if an FM channel were available which would bring the same service benefits. FM development would be encouraged because of technical qualities of this service, including ample nighttime coverage and relative lack of interference when new stations were added.

FM Broadcast

Frequency modulation broadcast has several advantages over the older amplitude modulation. FM has higher fidelity characteristics and is freer of static, fading and background overlapping of other stations.

FM's greater tonal range is due primarily to the fact that it uses a wider channel than that employed for AM broadcast. Then, too, it occupies a higher portion of the radio spectrum where there is less static and other noise than at lower frequencies. FM receivers have the particular ability to suppress weaker stations and other interference.

Since the frequencies on which FM operates do not ordinarily reflect back to earth from ionospheric layers (in skywaves), it is possible for many scattered FM stations to use the same frequency without interference, night or day, unlike the AM band.

History—The principle of frequency modulation has long been known, but its advantages for broadcasting were not realized until shortly before World War II. Largely as a result of interest evoked by extensive developmental work by Edwin H. Armstrong in the 1930s, the commission authorized increased FM experimentation, and in 1940, after extensive

public hearings, provided for FM operation to start Jan. 1, 1941. It set apart 35 channels for commercial and five channels for noncommercial educational FM.

On Oct. 31, 1940, the commission granted construction permits for the first 15 FM stations. By the end of that year, there were 10 more. Though all radio construction was frozen during World War II, more than 40 pre-war FM stations continued to serve some 400,000 receivers.

FM stations were initially assigned call letters with numerals added, but in 1943 the present letter system was adopted. There is optional use of the suffix "FM" to distinguish these stations from jointly operated AM stations.

Because of skywave interference experienced on the original FM band of 42-50 mhz per second, the commission in 1945 moved FM to its present higher and less vulnerable position of 88-108 mhz. At the same time, it increased the number of channels to 100, providing 80 for commercial and 20 for noncommercial educational use.

FM Zones and Classes—In 1962, the commission revised its commercial FM rules to divide the country into three zones (instead of the previous two). Zone I includes part or all of 18 northeastern states, plus the District of Columbia; Zone I-A is limited to Southern California, and Zone II includes the rest of the country.

Three classes of commercial FM stations (instead of the previous two) were created. Class A stations are assigned to all zones; Class B stations are assigned to Zones I and I-A, and Class C stations are assigned to Zone II.

Class A stations are low-powered with a maximum of 6 kw effective radiated power. The maximum power for Class B stations is 50 kw and for Class C, 100 kw.

An important factor in FM operation is the height of the antenna above surrounding terrain (see earlier section on Transmitting Antennas, line-of-sight transmission). Therefore, stations have maximum antenna heights in relation to power; 300 feet above average terrain for Class A, 500 feet for Class B and 2,000 feet for Class C. If the antenna height above average terrain is greater, power must be reduced commensurately. Minimum power requirements are also prescribed.

FM reception varies with location of the receiver in relation to the transmitting antenna. With maximum power and antenna height, good service extends about 15 miles for Class A stations, 33 miles for Class B, and 64 miles for Class C. The rules also include minimum mileage separations between stations on the same or adjacent channels. This is to protect the service from interference.

Subsidiary FM Service—To aid FM broadcasters, the commission in 1955 enabled them to apply for subsidiary communications authorizations for supplemental service such as background music. Sometimes called "functional music," this specialized service is offered to stores, factories and other business subscribers.

Originally, subsidiary communications were permitted on a simplex basis, the station devoting part of the time on its channel to regular broadcasting and part to this specialized service. Later, rules were adopted requiring subsidiary communications to be on a multiplex basis, that is, using one or more subchannels with the main channel used for regular broadcasting. The FCC permits FM broadcasters to use their subcarriers for a broad variety of new services.

TV Broadcast

Television broadcasting is synchronous transmission of visual and aural programs. The picture phase is accomplished by sending a rapid succession of electrical impulses which the receiver transforms into scenes and images. Here is a brief explanation of a complex process.

Monochrome—The scene to be televised is focused on a special tube in the television camera which has a small "screen" covered with about 367,000 microscopic dots of a special photo-sensitive substance. This can be likened to a tiny motion picture screen and is called a "mosaic." The varying light from each part of the scene being televised falls upon these dots and gives them an electrical charge, the strength depending upon the amount of light falling upon the individual dots. Thus each dot becomes a tiny storage battery and the scene is formed in a pattern of electrical charges on the mosaic.

The mosaic is "scanned" by a tiny beam of

electrons, no larger than the head of a pin, moving from left to right and progressing downward (just as the printed page is read by the human eye). This complete process is repeated 60 times per second, and the horizontal lines of alternate scanning are interlaced so that 30 complete pictures or "frames" composed of 525 horizontal lines are produced each second.

As the electron beam strikes each dot on the mosaic, the dot is discharged through the electron beam and the electrical impulses produced are used to modulate the signals of the TV transmitter. Each time the dots are discharged by the electron beam they are recharged by the light produced by the succeeding scene falling upon them. The succession of individual "still" scenes creates the illusion of motion just as in the case of motion pictures made on film.

The reproduction by the TV receiver of the pictures transmitted is just the reverse of the transmission. The incoming succession of electrical impulses is separated from the "carrier" and, after amplification, is impressed on the picture tube grid and progresses downward on the face of the picture tube.

The face of the tube is coated with a material which fluoresces or gives off light at the point where it is struck by the electron beam. In the absence of a television signal, the whole face of the picture tube is illuminated equally by a series of closely spaced horizontal lines. When a TV signal is placed on the grid of the picture tube, it controls the strength of the electron beam and hence the amount of light on the face of the tube. If the scanning of the electron beam in the picture tube is kept in perfect step with the scanning of the electron beam in the TV camera, the picture tube will reproduce the lights and shadows of the subject scene, and the succession of such scenes produces the illusion of motion.

In brief, the picture seen by the viewer is actually produced by a flickering spot of light moving rapidly across and down the face of the picture tube. The viewer sees the "whole" picture because the screen continues to glow for a tiny fraction of a second after the electron beam has passed. Coupled with the retentive ability of the eye, this creates the illusion that the picture is there all the time. The high rate of repetition of the picture produced by the beam minimizes flicker and lends smoothness to motion.

The TV transmitter is, in effect, two separate units. One sends out the picture and the other the sound. Visual transmission is by amplitude modulation. Sound transmission is by frequency modulation.

Color—In color TV, a brightness component is transmitted in much the same manner as the black-and-white picture signal is sent. In addition, a color component is transmitted at the same time on a subcarrier frequency located between the visual and aural carrier frequencies.

Color standards are based on a simultaneous system of color transmission. Signals representing red, blue and green are transmitted simultaneously. These are the "primary colors," and when they are combined in various amounts, they produce all other colors. A magnifying-glass examination of the scene on a receiver will reveal that it is made up only of red, blue and green dots, no matter what color is being shown. Even scenes not transmitted in color and seen as varying shades of gray to white are made up of red, blue and green dots.

Only color receivers have the special picture tubes and the necessary circuitry to illuminate the colored dots. Under the "compatible color" system, color programs can be received in black-and-white on monochrome sets, and black-and-white programs can be received as they are on color sets.

TV History—Men of many lands contributed to the development of television. Like aural radio, TV was made possible by electronic discoveries in the late 19th and early 20th centuries. In 1884, Paul Nipkow, a German, patented a scanning disk for transmitting pictures by wireless. In this country, Charles F. Jenkins began his study of the subject about 1890. The English physicist, E.E. Fournier d'Albe, conducted experiments in the early 1900s. In 1915, Marconi predicted "visible telephone."

In 1923, physicist Vladimir Zworykin, a Russian-born American, applied for a patent on the iconoscope camera tube. In the years following, there were experiments by E.F.W. Alexanderson and Philo T. Farnsworth in this country and John L. Baird in England. An experimental TV program, in which Secretary of Commerce Herbert Hoover participated, was sent by wire between New York and Washington by the Bell Telephone Laboratories in 1927. The next year Bell experimentally televised outdoor programs.

The Federal Radio Commission (predecessor of

the Federal Communications Commission) reported that a few broadcast stations were experimenting with television in 1928. In that year, WGY Schenectady, N.Y., broadcast the first TV drama. Large-screen TV was demonstrated by Radio Corp. of America (now RCA Corp.) at a New York theater in 1930. RCA tested outdoor TV pickup at Camden, N.J., in 1936.

By 1937, there were 17 experimental TV stations operating. The first incumbent U.S. President seen on TV was Franklin D. Roosevelt, when he opened the New York World's Fair in 1939. That year saw the first telecast of a major league baseball game, a college football game and a professional boxing match. In 1940, the Republican and Democratic conventions were first televised. Pioneer use of coaxial cable for long-distance relay was made for the Republican convention.

The first President's message to Congress over network TV was that of Harry S. Truman in 1950. The first TV debate between presidential candidates was in 1960 between John F. Kennedy and Richard M. Nixon. The first presidential message to Congress televised in color was that of President Lyndon B. Johnson in 1966.

Early Commercial Operation—The Journal Co. of Milwaukee, now licensee of WTMJ-TV, filed the first application to broadcast TV on a commercial basis. At a 1940 hearing the FCC found industry divided on technology and standards, but a committee appointed to work on the questions reached agreement on the present standards of 525 lines and 30 frames per second, and on Apr. 30, 1941, the commission authorized commercial TV operations to start the following July 1 on 10 commercial stations which were on the air by May 1942, six continuing during the war.

In 1945 the commission allocated 13 VHF channels between 44 and 216 mhz for commercial television, but it noted that there was not enough spectrum space below 300 mhz for an adequate nationwide system. Twelve of the VHF channels had to be shared with nonbroadcast two-way radio services. To prepare for TV expansion, the UHF frequencies between 480 and 920 mhz were made available for experimental TV and those between 1,245 and 1,325 mhz for TV relay.

In 1948, because of interference with commercial TV, the VHF sharing was ended. TV channel 1 (44-50 mhz) was deleted and assigned to land mobile or two-way radio service.

TV Proceedings 1948-1951—As the commission had foreseen, it was increasingly evident that the available channels were too few for nationwide service. On Sept. 30, 1948, the commission stopped granting new TV applications in order to study the situation. This was the so-called TV "freeze" order. On July 11, 1949, comprehensive changes were proposed to improve and extend TV service. These included engineering standards, opening UHF channels for TV, consideration of color systems, reservation of channels for noncommercial educational use and a national assignment plan for all channels.

Color was considered first. Three competitive systems were offered for commission consideration. They were the "field sequential" system of Columbia Broadcasting System, the RCA "dot sequential" system and the Color Television Inc. "line sequential" system. The commission found that the field sequential system was the only one that met its criteria for color operation, even though this system could not be received in monochrome on existing receivers (the others claimed theirs could). This method of operation was adopted in 1950, but the door was left open for development of a better system.

CBS began limited color broadcasts on June 25, 1951, but ran into problems. Because of a materials shortage, Defense Mobilization Chief Charles E. Wilson, in October 1951, requested the suspension of manufacture of color TV sets for the public and interest in the field sequential system lagged.

Thereafter, new standards for "compatible color," receivable both in color and monochrome, were developed by RCA and advocated by the industry through its National Television System Committee. These standards were adopted by the commission on Dec. 17, 1953.

Freeze Lifted 1952—On Apr. 14, 1952, the commission reopened TV to expansion. It added 70 UHF channels (between 470 and 890 mhz) to the 12 VHF channels (54-216 mhz). It adopted a table making more than 2,000 channel assignments to nearly 1,300 communities. These included 242 assignments for noncommercial educational use.

The minimum effective radiated visual power of TV stations was set at 100 watts. The maximum varies

with antenna height. (No minimum height above average terrain is specified.) On VHF channels 2-6, maximum power is 100 kw; on channels 7-13 it is 316 kw; and on UHF channels 14-83 it is 5,000 kw. With very high antennas, the amount of power is reduced.

Separation of stations on the same channels is determined by three geographic zones. In Zone I, minimum co-channel separation is 170 miles for VHF channels and 155 for UHF. This zone covers Massachusetts, Rhode Island, Connecticut, New Jersey, Maryland, Pennsylvania, Delaware, District of Columbia, Ohio, Indiana, Illinois and parts of Maine, New Hampshire, Vermont, New York, Virginia, West Virginia, Michigan and Wisconsin.

In Zone II, minimum co-channel separation is 190 miles for VHF and 175 miles for UHF channels. This zone includes Kentucky, Tennessee, North and South Carolina, Missouri, Iowa, Minnesota, Arkansas, Kansas, Nebraska, Oklahoma, North and South Dakota, Utah, Idaho, Arizona, New Mexico, Montana, Wyoming, Nevada, Colorado, Oregon, Washington, California, Alaska, Hawaii and parts of Maine, New Hampshire, Vermont, New York, Virginia, West Virginia, Georgia, Alabama, Mississippi, Louisiana, Michigan, Wisconsin and Texas.

In Zone III, the separation is 220 miles for VHF and 205 miles for UHF channels. This zone includes Florida and parts of Georgia, Alabama, Louisiana, Mississippi and Texas.

The first commercial TV grants after the freeze were made July 11, 1952, to three Denver stations. The first commercial UHF station to go on the air was KPTV Portland, Ore., on Sept. 20, 1952.

TV Service—Commercial TV stations are required to broadcast at least 28 hours a week, at least two hours every day, although they are allowed a shorter schedule when they begin operation.

TV service may be expanded to new areas through use of "satellite" stations—regular stations largely rebroadcasting the programs of parent stations—and "translators," lower power automatic installations which pick up and rebroadcast programs of parent stations on a different frequency. The rules also provide that UHF stations may use "boosters," low-power stations rebroadcasting on the same frequency, to fill in "shadow" areas within their normal service areas. These have not proved satisfactory and none are now in operation. Rebroadcasting requires the consent of the originating stations.

Unlike AM networking over ordinary telephone wires, TV networking requires special relay adjuncts. Network TV was made possible in large measure by the development of coaxial cable and microwave relay facilities. As early as 1937, motion pictures were televised and sent over the coaxial cable link between New York and Philadelphia. Network operation was begun by WNBT (now WNBC) New York City, WRGB Schenectady, and WPTZ (now KYW-TV) Philadelphia in 1944.

Regular coaxial-cable relay service was inaugurated between Washington and New York in 1946. The following year microwave relay service was extended as far as Boston. A Midwestern relay system, opened in 1948, was joined with the Eastern system in 1949. The first link in the transcontinental relay system was opened between New York and Chicago in 1950. It reached San Francisco the following year and on Sept. 4, 1951, it carried telecasts of the Japanese peace treaty conference there.

Today, most broadcast networks use satellites to distribute their programming to affiliates.

UHF Development—Economic and technical problems have impeded full utilization of the UHF channels. Because of the large number of VHF-only receivers originally in use, advertisers preferred VHF stations which limited UHF revenues.

In 1956, the commission outlined plans to promote comparable TV facilities as a means of extending service throughout the nation. In the years following, it considered and rejected the idea of moving all or most of TV to the UHF band. It sought the cooperation of industry to find ways to increase the range of UHF stations. It made certain areas all-UHF and took other steps to put UHF and VHF on a more competitive basis. In 1966, it revised the table of channel assignments to make additional UHF assignments.

Networks—The three broadcast networks carried most available TV programming until cable started its own networks in the early 1980s. All of the sudden, ABC, CBS and NBC had to compete with niche programming such as MTV, TBS, ESPN and CNN - and not just for viewers but for programming and sports rights.

The big three's universe was further split by the arrival of Fox Broadcasting Co. in 1986. At first brushed off, Fox finally answered all questions as to whether it could play with the big boys in late 1993 when it paid \$1.58 billion to air National Football games for four seasons, the most money ever paid for football. That risk proved worthwhile, as Fox now stands firm as the fourth major network.

Meanwhile, ABC, CBS and NBC were increasingly losing viewers to cable networks and Fox. In response, each network cut costs and eventually was sold to a larger corporate interest. General Electric purchased RCA/NBC in 1986 for \$6.28 billion. Capital Cities bought ABC in 1985, and then Disney swallowed up ABC/Capital Cities in August 1995 for \$18.5 billion. In the same week, Westinghouse Electric Co. purchased CBS for \$5.4 billion. In 1998, after also buying radio company Infinity Broadcasting Co., Westinghouse spun CBS Corp. back off from its industrial interests as an independent entertainment company. Viacom Inc. merged with CBS Corp. on May 4, 2000. In 2001 the FCC gave Viacom permission to own both the CBS and UPN TV networks.

In 2003, the networks still are trying to figure out how to deal with declining market share. Cable is stronger than ever and now the networks have to deal with the Internet. The networks have handled this, to some extent, by investing in the Internet. But they also are having to work with their affiliates to find new business models that will handle their changing businesses.

Public Broadcasting

AM—Educational institutions were among the pioneers in experimental broadcasting, and held many early AM licenses.

By 1925, educational groups had 171 AM licenses. For various reasons, notably the increased competition from commercial broadcasting, most of these stations were off the air by 1934 when the FCC was created. However, there are still two dozen educational stations operating in the AM broadcast band, although there are no longer any educational allocations there (see section on FM below).

As directed by Section 307(c) of the Communications Act, the commission in 1934 studied a proposal that Congress allocate fixed percentages of radio facilities for nonprofit programs. On Jan. 22, 1935, the FCC recommended against such a statutory allocation but recognized the need for extending broadcasting to education. It expressed its intention "actively to assist the determination of the rightful place of broadcasting in education and to see that it is used in that place."

FM Educational Stations—When regular FM broadcasting was authorized in 1941, five channels were authorized for noncommercial educational use as a substitution for AM allocations previously made to education.

In 1945, as part of an extensive revision of frequency allocations, the commission reserved 20 FM channels between 88 and 92 mhz for noncommercial educational FM stations. This part of the FM band is contiguous to the commercial portion, and FM receivers can tune both noncommercial and commercial stations. Since then, the number of noncommercial educational FM stations has grown slowly but steadily.

In 1948, the commission authorized 10 watt operation on educational FM channels. With such low-power equipment, easily installed and operated, schools may broadcast to a limited area of two to five miles for an outlay of a few thousand dollars. High-power equipment may be added when desired. In 1951, as a further aid, the commission authorized remote control operation of low-power educational stations. Approximately half of all educational FM stations use power of 10 watts.

Educational FM stations traditionally have been assigned on an individual-application "demand" basis, as AM stations are assigned. To permit planned development of the 20 reserved channels, it is proposed to adopt a table of assignments like that adopted in 1963 for commercial FM channels to allocate specific frequencies to communities.

Stations in the educational FM service are licensed principally to school systems, colleges and universities for student-teacher programs as well as for public education and information.

TV Educational Stations—The commission allocated TV facilities for noncommercial educational use after a lengthy study in the general television proceedings (see Broadcast). It determined that "the

need for noncommercial educational stations has been amply demonstrated," that it would take longer for the educational service to be developed than for the commercial service, and that special channels should be reserved. Consequently, in 1952, channel assignments were made to 242 communities exclusively for noncommercial educational stations. Forty-six of these were made to primary educational centers. Of the total 242 channels, 80 were VHF and 162 UHF. There have been more assignments since. In 1966, a revised table of channel assignments was adopted for UHF, containing many more educational assignments than before. The new table contains altogether over 615 educational TV assignments in the mainland states, more than a third of all channel assignments.

The first educational TV station to go on the air was KUHT Houston on May 25, 1953. The first state educational TV network was established in Alabama on April 28, 1955.

A 1962 law enabled the Department of Health, Education and Welfare to make matching federal grants of money to build educational TV stations, and a 1967 law extended these benefits to educational radio.

Public broadcasting in its present form emerged with the passage of the Public Broadcasting Act of 1967. That act authorized the establishment of the Corporation for Public Broadcasting, whose primary function is to funnel federal funds to qualified noncommercial licensees. National Public Radio was established in 1971 to provide interconnection and programming service for public radio stations. The Public Broadcasting Service started operating in 1970. PBS provides interconnection and distributes programming to public television stations.

Cable Television

Cable TV got its start as CATV (community antenna television) in the late 1940s when entrepreneurs seized upon it as a method for boosting television receiver sales in areas that were underserved or unserved by standard broadcast stations. According to legend, one backwoods Pennsylvania appliance dealer rigged a large antenna on a mountaintop, then connected it to homes in the area with a network of wires. The gentleman's system reportedly did stimulate receiver sales, and his idea caught on.

After it was discovered that CATV could present consumers with better reception and could, via microwave relay stations, be used to import television signals from distant television stations, CATV systems began sprouting up in areas that already were served by local broadcast stations.

During the 1960s, equipment was developed that increased the capacity of CATV systems to 20 channels. Further advancements in the early 1970's permitted the transmission of more than 100 channels over dual-cable systems.

Attempts to wire the major urban areas in the early 1970's largely fell flat, with major companies discovering that laying coaxial cable in cities was far more expensive than they thought and that there wasn't an overwhelming demand for CATV in those areas, which were already well served by standard broadcast stations.

Demand for cable increased dramatically, however, in the mid-1970's when Time Inc.'s Home Box Office began distributing its pay TV service via satellite. Other entrepreneurs followed HBO's lead, distributing programming of their own, via satellite, and cable started looking far more attractive to consumers in suburban and urban areas. By the early 1980's, most cities were either wired or franchising battles were being fought for the right to wire them.

The FCC started regulating cable TV in April 1965, adopting rules for CATV systems served by microwave. The commission required CATV operators to carry the signals of local stations and to refrain from duplicating the programs of local stations (by carrying other stations broadcasting the same programs) within 15 days of the local broadcast.

In 1966, the commission required all cable TV systems to carry local and nearby stations (the must-carry rules), and to protect their programs from duplications. Nonetheless, the 15-day protection requirement was repealed, and cable operators were required to provide that protection only on the day of the broadcast. In 1969, the broadcast requirements of fairness and sponsor identification were extended to cable.

In 1972, the FCC began deregulating cable,

dropping most of its cable regulations over the next 10 years. In 1980, the FCC eliminated its distant-signal and syndicated exclusivity rules, and the Court of Appeals in New York upheld that decision the following year. In July 1985, the Court of Appeals in Washington repealed the must-carry rules. In August 1986, the FCC issued new rules which are much less burdensome on cable operators, but they too failed to pass judicial muster.

In 1984, Congress essentially deregulated cable with passage of the Cable Communications Policy Act of 1984. The law removed local franchising authorities' rights to regulate cable rates. It also banned crossownership of cable television systems and cable programming networks with telephone companies in their local telephone service areas.

Before long, pressure mounted for a new law to reregulate the cable industry. In 1992 Congress enacted the Cable Television Consumer Protection and Competition Act over the only veto by President Bush ever to be overturned. Several cable system operators and program networks have pending suits to overturn major provisions of the Act.

The Act reinstates local regulation of basic-tier rates for systems not subject "effective competition," requires cable programmers controlled by cable operators to make their services available to cable's competitors, and grants broadcasters must carry and retransmission consent rights.

In implementing the Act in April 1993, the FCC adopted rate regulations and ordered roll backs to bring rates in line with benchmarks—the lower rates cable systems would charge if they were subject to head to head competition. At the time, the FCC claimed the roll backs would save consumers \$1.5 billion.

However, as the regulations went into effect, many subscribers saw their actual monthly bills go up. The reason: systems were allowed to increase or decrease rates for particular services as long as the average monthly rate did not increase.

Pressed by congressional Democrats, the FCC ordered an additional 10% rate reduction in March 1994. When the action went into effect, most subscribers saw cable bills go down and the industry complained it would lose \$3 billion in revenues.

In 1995, the U.S. Court of Appeals for the District of Columbia upheld the bulk of the FCC's cable rate regulations. The court also rejected a First Amendment challenge to the must-carry provisions.

The 1996 Telecommunications Act deregulated the extended basic cable tier rates for large systems three years from enactment in 1996. Rates were deregulated immediately for smaller systems—defined for the Act as those with fewer than 1% of all U.S. subscribers and not affiliated with companies with annual revenues exceeding \$250 million.

In April 1996, the FCC issued interim rules exempting cable operators from rate regulation if a local exchange carrier or its affiliate offers comparable, competitive video programming service by means other than direct broadcast satellite. According to reports, cable rates rose about 5% on average in 1998 and about 3.8% in 1999. At the beginning of 1999, lawmakers were concerned cable rates would start rising even faster because of a provision in the Telecommunications Act of 1996 that deregulates cable's upper programming tier at the end of March 1999. For this reason, lawmakers have warned the cable industry to keep rates down, or face reregulation.

Lawmakers also tried to quickly usher in competition to cable by allowing direct broadcast satellite companies to offer local signals. (see Direct Broadcast Satellites)

The must carry/retransmission consent provision gave broadcasters the option of requiring carriage on local cable systems or negotiating for a carriage fee. Most broadcast stations who opted for the latter failed to win compensation, although they did successfully negotiate for cable channels. As a result, many of the broadcast networks also run successful cable programming franchises, such as Disney/ABC's ESPN channels and the Disney Channel, NBC's CNBC and MSNBC, and Fox's Fox News Channel, Fox Sports Net, FX, Fox Sports World and Fox Movie Channel.

The cable industry challenged must carry at the Supreme Court in 1996 with most expecting the court to strike it down. Instead, the court surprised the industry in early 1997 by upholding the rules, which continue to require cable operators to carry all local broadcasters.

As broadcasters convert to digital technology, the issue of must carry is coming around again. Broadcasters want cable operators to carry both their analog and their digital signal as they make the transition to digital. The cable industry argues that they do not have the capacity to carry all those signals and would have to unfairly bump off cable networks to make room for all the local broadcast stations. Broadcasters argue that the transition to digital will be stymied if smaller stations do not have guarantees that the public will see their new signals after they put in a lot of time and money to make the transition. A proceeding to decide the matter is underway at the FCC.

Related Technologies

Satellites—In presenting programmers and common carriers with a relatively inexpensive alternative for transmitting their services nationally, satellites have probably done more to speed the communications revolution than any other technology.

A satellite, in essence, is a radio relay station in the sky, one that receives transmissions from the earth, then retransmits them back to receiving stations on the ground. The satellite's actual transmitter/receivers are called transponders; they are generally able to relay a single color TV channel (or 1,000 telephone conversations) at any one time, but methods for increasing that capacity are being developed. Most communications satellites have either 16 or 24 transponders.

Communications satellites are launched into positions 22,300 miles above the equator, where they orbit the earth at the same rate the earth is rotating, which makes them appear to be stationary and permits the use of fixed earth stations.

The first live transatlantic telecast was relayed by Telstar I on July 10, 1962. That same year's Communications Satellite Act provided for the U.S. portion of a global satellite system that would be operated by the Communications Satellite Corp., a private corporation subject to federal regulation.

Intelsat I on Apr. 2, 1965, became the first commercial satellite to be put into orbit with its foreign partners in the International Telecommunications Satellite Consortium. During the following year, some 80 hours of television were transmitted between the U.S. and Europe.

The real rush for satellite video transmission didn't begin until after 1975, when Time Inc.'s Home Box Office began transmitting its pay-TV programming over RCA's Satcom I to cable systems scattered across the country. Over the past 10 years, scores of companies have followed HBO's lead. By late last year, most of the transponders on three satellites were dedicated to the distribution of cable programming.

Cable programmers aren't alone in realizing the benefits of satellite distribution. The Public Broadcasting Service started transmitting programming via satellite to its noncommercial affiliates in 1978, and in the mid-1980s the major commercial networks have switched to satellites for the distribution of their programming as well.

Although the FCC has traditionally regulated domestic satellites as common carriers, it has been loosening its grasp. In 1982, the commission permitted some operators to sell transponders on their satellites (they previously have had to lease those on a first-come, first-served basis, at rates approved by the FCC). The commission decided to reduce orbital spacing between satellites to two degrees. This move will be phased in over several years and will permit more satellites to be launched.

In 1995, the FCC proposed revising its satellite rules to eliminate barriers between international and domestic satellite service.

In 1998 and 1999, one of the foremost priorities of House Commerce Committee Chairman Tom Bliley (R-Va.) was to privatize the international satellite industry, particularly Comsat and Intelsat. On March 17, 2000 the Open-Market Reorganization for the Betterment of International Telecommunications Act (the Orbit Act) was enacted, allowing Lockheed Martin Corp. to acquire control of Comsat. On July 18, 2001 Intelsat was transformed from a treaty-based organization to a privately held company.

Subscription Television (STV)—The major difference between STV and conventional TV is that you have to pay for the former.

STV stations are standard VHF or UHF television stations that scramble their signals. The STV operator then charges customers a fee for a decoder in addition to decipher the scrambled signals.

Authorized in December 1968, STV did not really get off the ground until the late 1970's. It grew rapidly for a few years, and counted about 1.4 million subscribers in the summer of 1982. But it's been in a steep decline ever since, the victim of piracy and stiff competition from cable systems offering more channels for less money.

Low-Power Television (LPTV)—LPTV stations are essentially television translator stations (stations that have traditionally been limited to rebroadcasting the signals of full-service stations) that are permitted to originate programming.

In authorizing the service in 1982, the FCC estimated that as many as 4,000 new stations would be spawned by the rules, adding to the more than 4,000 existing translators that can rise to LPTV status simply by notifying the FCC. However, the new medium has gotten off to a slow start, raising doubts about whether it will ever meet the FCC's original expectations.

Under the rules, LPTV stations were given "secondary status," which essentially means they cannot interfere with full-power stations. They were also limited to 10 watts VHF and 1,000 watts UHF.

LPTV stations have few regulatory obligations and there are no crossownership or multiple-ownership restrictions. The stations must observe statutory prohibitions against broadcast of obscenities and lotteries; however, they only have limited equal time and fairness doctrine obligations.

On November 29, 1999 President Clinton signed the Community Broadcasters Protection Act, legislation that granted "Class A" status to low-power TV stations. That gives low power stations a permanent license if they have been broadcasting 18 hours per day, seven days per week and airing three hours of public affairs programming. It does not allow low power TV stations to ask cable operators for carriage or other privileges allotted to full-power broadcasters.

Wireless Cable—More than an oxymoron, wireless cable is a pay television service that delivers multiple cable programming services to subscribers via omnidirectional microwave (2 ghz) broadcasts. To receive the broadcast, subscribers are equipped with special antennas and tuners.

Wireless cable operators use a combination of 2 ghz channels licensed to three different services: the multipoint distribution service (MDS), the Instructional Television Fixed Service (ITFS), and the Operational Fixed Service (OFS). There are 31 such channels available in each market.

MDS is a common carrier service. Wireless cable operators may own and program certain MDS channels, or lease the capacity from others. ITFS is a broadcasting service, intended primarily for nonprofit groups interested in broadcasting instructional programming. The FCC permits ITFS licensees to lease a portion of each of their channels to wireless cable operators as long as a "substantial portion" is retained for its intended educational purpose. OFS is regulated by the FCC's Private Radio Bureau.

In 1995, the commission initiated an auction of the remaining wireless cable frequencies.

In July, 1996 the FCC gave the go-ahead to the wireless cable industry when it granted permission to go digital. The commission adopted the Digital Declaratory Ruling, which allowed wireless companies to, in effect, quadruple channel capacity and increase the wireless industry's ability to compete with other video service providers—such as cable and direct broadcast satellite.

Direct Broadcast Satellites (DBS)—The FCC authorized direct broadcast satellite service in 1982, which meant that companies could purchase by auction the license to use high-frequency spectrum for a variety of services. The most valuable of those licenses were three high-power slots that allowed a satellite to cover the entire United States - either at 101, 110 or 119 degrees west longitude. Medium-power licenses that covered regions of the U.S. also were available from the FCC.

The first DBS satellite was launched in December 1993. DBS satellites work the same way as other communications satellites, beaming signals to stationary satellite antennas scattered over vast areas - countries or even continents. But since the DBS birds are more powerful, their signals can be received with relatively small antennas—in most cases, just 18 inches across.

Today, there are over 18 million DBS subscribers and two major DBS companies: DirecTV and EchoStar Communications Corp. In 1999 Congress also gave the DBS industry the right to retransmit local

TV signals to make it a direct competitor to the cable industry.

Before DBS reached this level, several companies stumbled in the DBS business, which is complicated, expensive and unpredictable to launch. The most notable failure was Comsat's Satellite Television Corp. The first DBS applicant, it dropped its plans in November 1984 after five and a half years of planning and \$140 million invested. In 1990, Hughes, NBC, Cablevision and Rupert Murdoch's News Corp. announced plans to combine forces to pursue the business, but never did.

As a manufacturer of satellites, Hughes had the greatest incentive to get DBS off the ground. Not giving up, it struck a deal with United States Satellite Broadcasting, a subsidiary of Hubbard Broadcasting, which was among the first DBS applicant in 1982.

Under terms of the agreement, Hughes built a 16-transponder satellite, sold five to USSB and kept 11 for its own DBS venture, DirecTV. Hughes successfully launched the satellite in December 1993.

The two companies began offering service to subscribers in June 1994. During 1994 and early 1995, DirecTV also signed deals with the NFL, NBA and NHL to carry packages of out-of-market games.

Also adding professional sports program packages was PrimeStar, a competing direct-to-home satellite system owned by a consortium of cable companies. Unlike DirecTV and USSB, PrimeStar offered a medium-powered service, which requires subscribers to use a dish larger than the 18-inch model.

In 1995, the commission adopted rules to auction a reclaimed DBS construction permit, which resulted in high bidding for the slot. MCI won the license for \$685 million, and formed a partnership with News Corp. to form American Sky Broadcasting Corp. or ASkyB.

Getting ASkyB off the ground would have cost more money than Murdoch was willing to spend, and he soon began looking for partners. He thought he had found one in entrepreneur Charlie Ergen, whose own DBS company, EchoStar, had purchased part of a full continental U.S. DBS slot at 119 degrees.

Ergen's EchoStar had started off selling big satellite dishes in the C-Band market, but Ergen's real goal was to get an 18" high-power dish in every home in America. By partnering with Murdoch, Ergen hoped to launch a service that would carry all the local TV signals in every market, thereby offering a national service to compete with cable. In 1997, Murdoch shook hands with Ergen and agreed to foot what would have amounted to a \$3.4 billion bill.

The deal appeared to be done, but the cost of launching enough satellites and building enough uplink centers to carry every local TV signal in the country soon overwhelmed Murdoch, and he walked away. Murdoch soon had made another deal to sell his license to cable-owned Primestar.

But the Department of Justice refused to allow the cable industry to be a major participant in an industry that was supposed to be competing with cable. In early 1998, Justice refused to approve Primestar's purchase of News Corp.'s and MCI's satellite license on antitrust grounds. Justice did say, however, that it would have approved the News Corp./EchoStar deal.

By the end of 1998, EchoStar announced that it was buying News Corp.'s satellite assets for \$1.2 billion in EchoStar stock.

Once the EchoStar deal was announced, PrimeStar was left without a partner because consumers were not interested in buying big, unsightly satellite dishes. And DirecTV needed to get aggressive in order to stay competitive with the newly huge EchoStar. In December 1998, DirecTV bought USSB for \$1.3 billion and, in April 1999, purchased the formerly cable-owned PrimeStar for \$1.36 billion. PrimeStar went out of business finally on September 30, 1999.

Satellite Master Antenna Systems (SMATV)—SMATV systems, cloned from cable systems, look like cable systems, and, in most cases, are operated like them. The essential difference is that SMATV systems operate on private property—apartment buildings, condominium complexes or private housing developments and mobile home parks. Instead of getting a franchise (the right to string or bury wire along city streets and rights of way) from local governments, SMATV operators sign contracts with property owners, allowing them to bring cable television into the homes on the property.

In most cases, that's done by hooking up an earth station that's aimed at a cable satellite to a multi-unit building's master antenna system. In other cases, it

also sometimes involves wiring buildings with nonexistent or inadequate master antenna systems and interconnecting two or more buildings of a single complex with overhead or underground cable. One advantage SMATV operators have over their cable counterparts is that they are free from regulation. Because they don't need a municipal franchise, they aren't burdened with the local regulations that go along with those. Since SMATV operators are generally excluded from the FCC's definition of a cable system, they are also exempt from federal regulation.

High-Definition/Digital Television—In 2003, television is in the first wave of its transition to digital. Broadcasters plan to provide some mix of high-definition and standard-definition digital TV offerings, although they still are not certain how their business plans will shake out.

HDTV provides at least twice the resolution of today's analog display. It also offers vastly improved color fidelity and compact disc-quality audio. The most widely known HDTV video production system was developed by the Japanese Broadcast Corp. (NHK). First demonstrated in the U.S. in 1982, the NHK system records video with 1,125 scanning lines of information at a field rate of 60 hertz. NHK also was the first to demonstrate HDTV in terrestrial and satellite transmission with its MUSE (multiple sub-Nyquist encoding) system.

In 1987, the commission, under the leadership of then-Chairman Dick Wiley, established an industry advisory committee on advanced television service to recommend a transmission system for standardization.

The advisory committee oversaw the testing of several systems vying to become the national HDTV broadcast standard. The system proponents included General Instrument, NHK, a joint effort by AT&T and Zenith Electronics and the Advanced Television Research Consortium (Sarnoff Research, Philips Research, Thomson Consumer Electronics and NBC).

With testing near completion in May 1993, the leading proponents reached an agreement to work together and merge their systems to produce a single standard. Among other things, the so-called "Grand Alliance" agreed to use a process called "progressive scanning" to build the picture on the screen.

The Grand Alliance, which consists of Philips Consumer Electronics, Thomson Consumer Electronics, MIT, General Instrument, David Sarnoff Research Center, AT&T and Zenith Electronics Corp., was working to complete construction of a prototype system in early 1995. A preliminary test of the Alliance transmission system during the summer of 1994 found the digital technology performing better than NTSC signals over VHF and UHF channels.

In late 1996, the FCC adopted the digital TV standard offered by the Grand Alliance. A compromise agreement was reached by broadcast, computer and consumer electronic industry negotiators, which called for acceptance of the Grand Alliance standard minus controversial picture formats that had divided the industries.

Broadcasters delivering digital TV now will be required to use the remaining elements of the Grand Alliance standard, which includes specifications for compressing video, delivering sound and sending the signals over the airwaves. Problems still exist because the broadcast industry and the cable industry have chosen different modulation standards (VSB and QAM) to accomplish the same task, and those need to be rectified in order to work together.

The FCC also decided not to define which format broadcasters should use, although there are 18 formats defined thus far. Those formats declare the following about the digital picture: how many lines of vertical resolution, how many pixels, the aspect ratio, the frames per second and the scanning format.

A copyright protection standard also needs to be integrated into the system. One exists - the 1994 or "fireworks" standard - but so far it is not included in the first generation of digital televisions. Until that happens, Hollywood is unwilling to make any of its products available in digital. One performance of a HD movie that is not copyright protected would make it easy for someone to make one perfect digital copy and then reproduce that millions of times for inexpensive resale. The consumer electronics industry did not expect that standard to be available in new digital TV sets until fall of 1999 at the earliest.

As of June 25, 2003, 503 TV stations broadcasting digitally were covering approximately 98% of U.S. TV households. Affiliates of the big four networks (ABC, CBS, Fox and NBC) in the top ten markets were required to go digital by May 1, 1999, and the big-four

affiliates in markets 11 through 30 were scheduled to flip the switch by November 1999. All TV stations must be broadcasting digitally by 2006.

The cable industry had managed to give digital boxes to 9.7 million of its 68 million customers. But it won't be until the next generation of digital boxes arrive that cable can pass through the digital TV signal with copyright protection. Three cable programmers - Fox Family Channel, HGTV and Nickelodeon - had begun producing and airing HDTV programming in 1999.

Auxiliary Broadcast Services—Broadcasters take portable or mobile transmitters to the scene of events to relay aural programs back to the station for on-the-spot coverage of sporting events, parades, conventions, fairs, disasters and other newsworthy events. These remote-broadcast pickup stations use frequencies in the 26, 153 and 450 mhz portions of the spectrum.

TV stations also use small portable transmitters operating in the 2, 7 and 13 ghz-per-second (microwave) portions of the spectrum for visual coverage of out-of-studio events.

Other Broadcast Activity

International Broadcast—Under international agreement, certain high-frequency bands are allocated for broadcast between nations.

Authorizations for non-government international broadcast stations in the United States are issued by the FCC. Only a handful of these international stations are now authorized. A single station uses a number of frequencies between 5950 and 26100 khz, and it may need more than one transmitter because of seasonal considerations and other factors in broadcasting different programs simultaneously to different parts of the world. The minimum power for these stations, sometimes known as short-wave stations, is 50 kw.

During World War II, international broadcast stations in the United States were taken over temporarily by the Office of War Information and the Office of Inter-American Affairs of the Department of State, which programmed them in the interest of the war effort.

Under the peacetime program of the Department of State, the United States Information Agency assumed the responsibility of broadcasting daily in

many languages to other parts of the world through the Voice of America. The U.S. Information Agency consolidated with the Department of State on Oct. 1, 1999, and responsibility for the Voice of America was given to the International Broadcasting Bureau. The International Broadcasting Bureau (IBB) is an autonomous U.S. government civilian broadcast service, and is under the authority of the Broadcasting Board of Governors. VOA stations are not licensed or regulated by the FCC. The International Broadcasting Bureau's Office of Engineering and Technical Services maintains a network of satellites, relay stations, and leased facilities to transmit the radio and TV broadcasts of the Voice of America, WORLDNET Television and Film Service, Radio and TV Marti, Radio Free Europe/Radio Liberty, and Radio Free Asia.

VOA is not the U.S.'s only foreign broadcast service. Radio Liberty and Radio Free Europe, funded by Congress and supervised by the Broadcasting Board of Governors, serve as surrogate stations for the countries to which they broadcast—the former Soviet Union, in the case of RL, and other countries of the Eastern bloc in the case of RFE.