Broadcaster cost: Equipment available for lease for several hundred dollars.

Comments: Data transmitted in the VBI are invisible to the viewer but suffer from slow delivery rate; data sent in the visible picture can sometimes be seen by the viewer but the delivery rate is extremely fast. Data containing both program audio and descriptions can be delivered to viewer's computer prior to broadcast and listened to without video. Description-only data can be delivered prior to broadcast but the viewer would have to synchronize the descriptions to the program at broadcast time. Alternatively, the viewer could listen to the descriptions from the computer and watch the program on television, all in real time. This assumes that the computer and television are adjacent, which is not necessarily the case in all households. The complexities of such a system could prove problematic.

5. Horizontal Overscan

Description: Delivery of digitized program audio and descriptions in the horizontal blanking interval (HBI). Description data are inserted into the visible portion of the picture, but far enough off to the left or right to be excluded from the viewer's sight.

Consumer cost: Receivers cost approximately $30.

Broadcaster cost: Undetermined.

Comments: Currently, this method of delivering audio is used by one manufacturer of electronic talking dolls, known as "TV Teddy," which respond to data encoded in the HBI of videotapes. This method has not yet been used in a broadcast situation. Inserting data into the horizontal overscan portion of the picture may cause problems in older television receivers.

6. Intercast

Description: Delivery of data via the VBI to home computers.

Consumer cost: Intercast hardware and software will be included in most PCs sold after June, 1996. Retrofit PC cards will be available for less than $200.

Broadcaster cost: Undetermined.

Comments: Intercast operates at a data rate that is too slow to accommodate quality audio transmissions. Thus, it is not currently a viable option for delivery of audio descriptions.

Digital Methods:

7. Advanced Television (ATV)

Description: Digital method of delivering and viewing television programming, as opposed to the current analog method. ATV will accommodate multiple streams of audio for each program; one of these streams could be a description track.

Consumer cost: Because regulations are not yet final, cost of consumer ATV receivers are not yet known.

Broadcaster cost: Costs to refit broadcast facilities to support both digital and analog estimated to be in the millions of dollars.

Comments: Viewers will have the potential to choose from a variety of audio tracks for each program, one of which could be descriptions. Descriptions could be provided unmixed (to be mixed with program audio by the receiver) or pre-mixed with program audio, as they are today. Once standards are approved by the FCC, ATV implementation will take approximately seven to 15 years. Different ATV receivers will accommodate audio tracks in different manners, depending on the features included in the device.

8. Direct Broadcast Satellite (DBS)

Description: Digital television programming delivered from satellites directly to viewers, received with a stationary 18 inch dish. Can provide four channels of audio per program, with the likelihood of more in the future.

Consumer cost: Hardware costs approximately $1,000-$3,000, including decoding devices and satellite receiver.

Broadcaster cost: Undetermined.

Comments: DBS will probably be the way many viewers receive their first ATV transmissions. Multiple-channel audio capacity does not currently allow for unmixed delivery of audio, so descriptions would have to be mixed with program audio prior to broadcast. No formal standards exist for DBS; extra audio channels have not been dedicated for any specific use. DBS could also be used as an audio-only service, to deliver descriptions and program audio to a user's computer for playback at any time.

9. Integrated Services Digital Network (ISDN)

Description: Delivery of descriptions via a completely digital service which can carry a wide variety of information (phone, fax, computer, television, etc.) over a single interface.

Consumer cost: Approximately $1,000 for hardware and software, plus hourly and/or monthly service charges, which range from approximately $6 per hour to $26 per month or more, depending on service provider.

Broadcaster cost: Undetermined.

Comments: ISDN has the potential to make receiving many different kinds of information a simple process, using a single conventional copper wire or, in the improved B-ISDN form, a fiber cable. Standards exist but development has been slow and equipment is not yet widely available. Copper-wire version of ISDN is faster than current modem-based methods of exchanging data, but is not as fast as B-ISDN. As with video dialtone, slow development may cause ISDN to be surpassed by other technologies.

10. Internet

Description: Delivery of descriptions only or descriptions mixed with program audio via the World Wide Web.

Consumer cost: Minimum monthly charges range from $10 to $20 per month or more, depending on the service provider and how many hours the user is on-line. User must also have a computer, Internet browser software and modem (or direct connection).

Broadcaster cost: Undetermined.

Comments: As an audio-only service, the Internet could provide a relatively low-cost method of receiving and storing descriptions and program audio. Delivering unmixed descriptions alone, to be played back in conjunction with the program audio at the time of broadcast, would create problems of synchronization which may be impractical. Issues of rights to program soundtracks could prove difficult to negotiate.

11. Video Dialtone (VDT)

Description: Delivery of audio and video via telephone line, using digital technology.

Consumer cost: Undetermined.

Broadcaster cost: Undetermined.

Comments: VDT would give viewers access to video-on-demand services, which could allow the viewer to choose described programming specifically, when available. Development and implementation of VDT are somewhat unpredictable, partly due to the lack of regulations from the FCC. Consumer-level devices may not be available for three to five years, by which time other technologies may have superseded this one.

12. Digital Video Disc (DVD) (also known as Digital Versatile Disc)

Description: CD-sized disc which can hold enough data for up to four full-length movies. Has the capability to carry up to eight audio channels, one of which could be used for descriptions.

Consumer cost: Discs will cost approximately $25; DVD players approximately $599.

Broadcaster cost: Not relevant, since DVDs are intended for non-broadcast use.

Comments: DVDs could easily carry closed descriptions on one of the extra audio tracks, eliminating the need for an open-described version of the movie. However, the DVD standards committee did not commit any of the extra channels for specific use (for descriptions or foreign languages, for example).

Audio-only Methods:

13. Audio-only Receiver

Description: Portable device which would receive program audio and descriptions from the SAP channel.

Consumer cost: Approximately $90-$125, depending on features.

Broadcaster cost: No charge.

Comments: In many ways similar to a radio, an audio-only device would receive television audio only or, if the right model is purchased, radio and television audio. Described programs may be listened to by monitoring the SAP channel. This is a fairly simple method of delivery, provided the SAP channel continues to be used for descriptions. As with all audio-only services, issues of rights to program audio would be a problem.

14. Radio

Description: Delivery of program audio with descriptions using conventional radio signal transmission.

Consumer cost: Radios range in price from less than $20 to several thousand dollars, depending on features.

Broadcaster cost: Undetermined.

Comments: Broadcasting program audio with descriptions over radio would be one of the simplest methods of delivery. Radios exist in nearly every household in America. Difficulties with rights clearances and limited bandwidth available for new stations could prove problematic. Public radio stations might be willing to devote certain portions of their broadcast day to airing described soundtracks; however, no one has ever experimented with this idea.

15. Satellite Radio

Description: Delivery of digital audio programming from satellites directly to listeners. Signal is received via silver-dollar sized antenna.

Consumer cost: Approximately $10 per month, excluding hardware, depending on service provider. Designed primarily for listeners in cars equipped with special S-band radios; retrofit devices available for approximately $55. Home devices not yet available but are under development.

Broadcaster cost: Undetermined.

Comments: Satellite radio can provide as many as 30 music channels plus 20 channels for news, sports, talk shows and educational uses. The signal can reach virtually anywhere. Stations would be dedicated to specific types of programming 24 hours a day; thus, descriptions with program audio could potentially be dedicated to at least one station. The service could be used by anyone in a situation where a television is not appropriate. However, broadcasts cannot currently be localized. Carriage of descriptions on satellite radio would suffer from the same rights-clearance problems as other audio-only services.

16. Radio Reading Service (RRS)

Description: Delivery of program audio and descriptions via the already existing Radio Reading Service, using proprietary listening devices.

Consumer cost: Listening devices are provided free to certified blind or print-impaired users.

Broadcaster cost: No charge.

Comments: There are already 31 RRS stations which carry some described programs. The RRS audience is generally fairly small, so this method would not necessarily reach all those who need the service. Unless there were more than one RRS service in the area, the listener would have access to only one program at a time. (Tests are being conducted to carry multiple channels of

services over cable in Asheville, NC; this may allow for the carriage of one or more channels of program audio with descriptions.) Additionally, RRS is undergoing a period of change due to competition for subcarrier space from other data services, such as paging and Radio Broadcast Data Service (RBDS).

17. Telephone

Description: Delivery of descriptions via conventional telephone receiver.

Consumer cost: Service would be toll-free.

Broadcaster cost: The cost of supporting of a toll-free number varies from region to region, depending on telephone company. Local phone companies could provide equipment to broadcaster at no charge or for a rental fee.

Comments: Delivering descriptions via conventional telephone is a relatively low-tech, simple method. Telephones exist in nearly all homes in America. Sound quality would be relatively poor; tying up a user's phone line or holding a telephone handset up to one's ear for an entire program would be inconvenient.

18. Audio Cassette

Description: Delivery of descriptions and program audio on conventional or proprietary audio cassette.

Consumer cost: Potentially free or very inexpensive, depending on implementation. User must have a playback device.

Broadcaster cost: Undetermined.

Comments: As an audio-only service, this would provide a low-cost delivery method of program audio and descriptions. It may also have universal appeal, making it possible for anyone to listen to a program in situations where watching television is not practical. However, clearing rights to soundtracks will be very complex. One way around the rights problem would be to issue cassettes in a proprietary format, as is done currently with Recording for the Blind and Dyslexic or the National Library Service for the Blind and Physically Handicapped.