A COMPARISON OF PAY-PER-VIEW SOURCES FOR CABLE TV SYSTEMS

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ABSTRACT

Pay-Per-View programming is becoming an increasingly important source of revenue for the cable operator. To increase the subscriber buy rate, it is necessary for the cable operator to offer a wide variety of programming which will entice the subscriber to buy more frequently. The current use of satellite distribution allows many cable systems to provide quality programming as well as frequent "Blockbuster" events. However, the satellite delivered system does not allow for customization of program offerings. Video tape systems allow for customization, but at the expense of lower equipment reliability and higher maintenance requirements. A Laserdisc based system can offer customized programming with low maintenance, high reliability and a quality signal. It is the intent of this paper to present a comparison between the different technologies available to allow the cable operator to determine which system would work best in his particular application.

OVERVIEW OF PAY-PER-VIEW SOURCE TECHNOLOGIES

Satellite Delivered Programming

Geosynchronus orbiting satellites have been used for many years for the distribution of most CATV programming. This technology is a tried and true means for providing nationwide programming for such services as movie and sports programmers and other "Super-Stations". After initial set-up and alignment, the satellite receive system requires relatively low maintenance and only occasional readjustment of the receive components. Maintenance of other support equipment may require more frequent attention, e.g. compressed air or gas feedline pressure hardware. Signal quality is generally very good although occasional problems may appear, such as rain or snow fade, sun-outages, and satellite drift. Although these problems should not pose a long-term threat for the cable operator, the operator must be prepared to deal with customers that call with related complaints and deal with them in as diplomatic a manner as possible.

Video Tape Programming

Video tape has been used for many years as a source for cable for commercial insertion as an economical means for providing fast, flexible service to the advertisers in their systems. It also was used as a Pay-Per-View video source in the early days of cable before the widespread use of satellite delivered signals. Using video tape players for pay-per-view causes many operational problems for the operator, the main problem being maintenance. Unless the operator can spend many dollars on a CART machine, he is forced to use human labor as the means to keep the VTR's stocked with tapes ready for playing. Tapes must be changed every hour if the machines are to provide an uninterrupted source of video. this requires continuous manning. This can become even more costly over the long-term when salaries for the tape operators is considered.

Preventative maintenance on the equipment is also very high requiring frequent headcleanings, lubrication and mechanical repairing of broken or worn parts. The occasional "devouring" of tapes by the VTR's

must also be considered when stocking the movies and ordering tapes. The potential for video noise due to tape drop-outs and/or other problems can cause much customer dissatisfaction with the pay-per-view programs.

Although video tape presents the cable operator with many problems, the one main advantage that is gained is the ability to provide localized programming to the subscribers. This ability to custom tailor the video selection to the market makes video tape a highly desirable means for providing pay-per-view.

Laserdisc Programming

The use of Laserdisc players is fairly new to the cable industry. Laserdisc players can provide the cable operator with the advantages of video tape players without their disadvantages. A clean video signal can be obtained without the degradation caused by repeated playing of the laserdiscs. This is due to the fact that the laserdisc pickup does not contact the disc in any manner, unlike the video tape player head which is constantly spinning in contact with the tape surface. A dirty video tape head can grind the oxide layer off of the video tape causing picture degradation and eventually render the tape useless. Multi-disc players are also available to eliminate the need for the operator to manually remove and insert discs for continuous play.

All of these factors add up to low attending maintenance, consistent program picture and audio quality, and the capability for localized custom programming.

SIGNAL QUALITY COMPARISONS

One of the first considerations almost any operator will make is the overall quality of the signal source available. For a satellite receiver system, the limiting factor of the signal quality is the descrambler unit (assuming a scrambled satellite signal). A Video Cipher II typically has a weighted signa to noise ration of 57dB. This measurement compares to 47dB for a 3/4" (U-matic) VTR,[1] and 57dB for the laserdisc player. When using video tape as the program source, signal degradation caused by the cable plant must be evaluated carefully. Subscriber satisfaction with the Pay-Per-View service will depend on the end point quality of the signal.

Signal to noise comparison:

Satellite Receiver/Decoder	57dB
Video Tape Player	>47dB
Laserdisc Player	57dB

MECHANICAL CONSIDERATIONS

Depending on the particular system being used to provide Pay-Per-View service, the amount of space required for the hardware varies widely. Headend space is usually at a premium and efficient use of the available space must be well planned to accommodate the amount of equipment the operator will be installing for his Pay-Per-View service. Not considered in this comparison is any of the associated headend gear such as modulators and scramblers that would be installed in the headend irregardless of the type of system used.

Satellite System

A satellite system consumes the least amount of space in the headend. Refer to Figure 1. A typical satellite receiver is 3 EIA units high per channel. (An EIA unit is 1.75 inches in height for a normal 19 inch wide rack). Some receiver models, however, can fit two receivers into this same package size. Additional space of at least 1 EIA should be included for proper cooling of the receiver

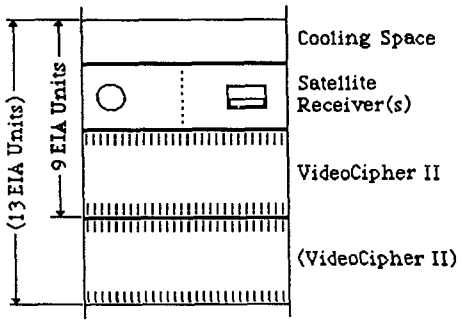

Figure 1. Satellite Hardware

Single Channel / (Dual Channel)

with 2 EIA being the ideal spacing. A Video-Cipher decoder is 4 units high and includes its own cooling space with the unit. The design of the decoder allows cool air to circulate over the main circuit board even in systems without forced-air cooling. This totals 9 EIA units per channel (13 EIA units per two channels if a dual receiver configuration is used). If video switching is implemented to switch to an alternate program source in case of receiver failure (fail-safe system), this equipment will require more space. However, the additional space can be considered to be negligible in this discussion since it usually can be used for multiple channels.

Most satellite equipment is bolted directly into the rack where it is mounted. No special hardware is needed to accommodate normal maintenance procedures. Optional rack mount slides can make maintenance easier for the technician, but is not required. Cabling for the satellite receive system is also very straight forward, consisting mainly of video/audio cabling from the receiver and Video Cipher and an RF feed to the receiver. (Figure 2) Occasionally implemented are special cables from the audio channels for cue-tone or special sub-carrier detection by commercial insertion equipment. Powering requirements for the receiver and decoder are modest. The receiver typically draws 100 watts and the Video Cipher 35 watts.

Video Tape System

Modern video tape players do not consume as much space as their predecessors. VTR's now fit into the standard 19 inch equipment rack, some requiring shelves for support, others able to rack mount directly without adaptation. Refer to Figure 3. However, most VTR's are 5 EIA units high and each channel must have a minimum of two VTR's for continuous play. Other associated equipment for the VTR PPV system is a sync generator/timebase corrector, a video/audio switcher, a preview monitor, and a system controller with high resolution video generator. ALL of these components are necessary to enable the VTR system to operate in an encoding environment. (Figure 4) The sync generator provides a "Gen-Lock" signal to the VTR's to keep the video signals from each unit synchronized to one standard. Without this

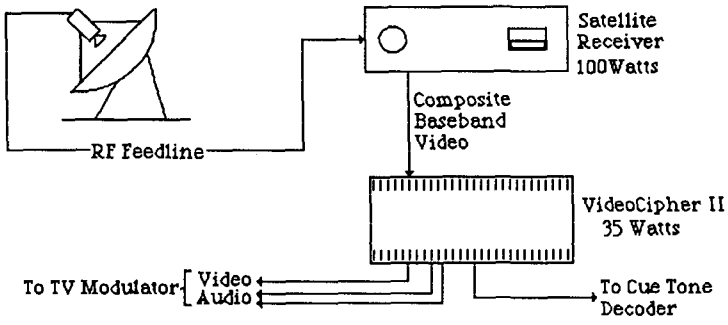

Figure 2. Satellite System Wiring

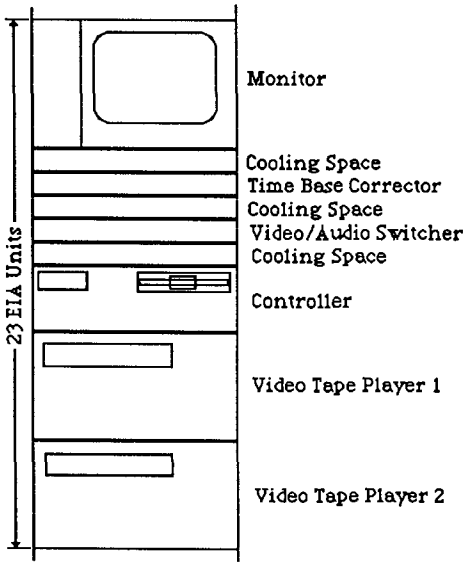

Figure 3. Video Tape Hardware

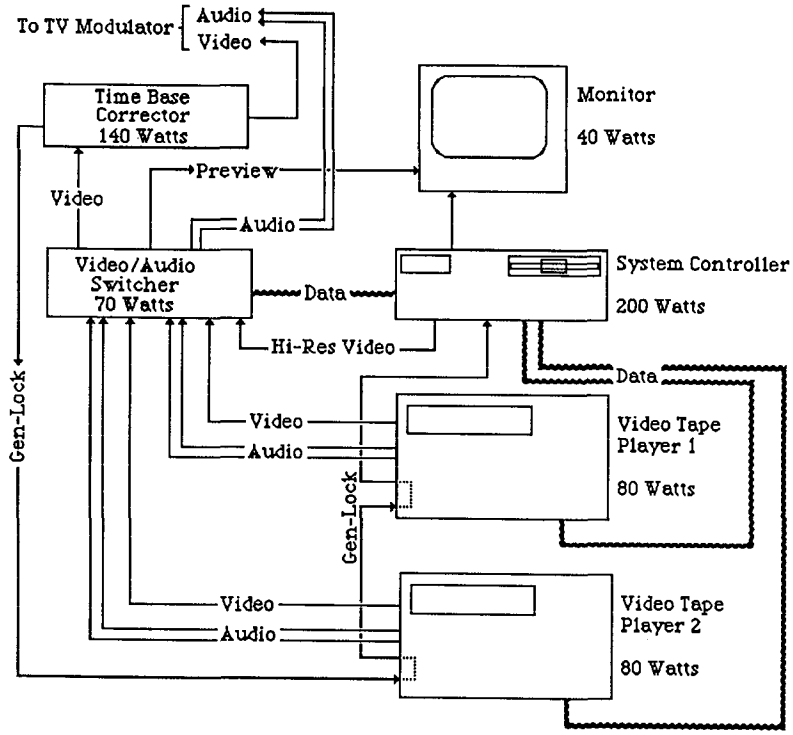

Figure 4. Video Tape System Wiring

the encoder will lose sync with the video signal causing the descramblers to also lose sync, generating an annoying glitch when switching from one VTR to another. A timebase corrector ensures that each video line is of uniform length (in time) and also cleans up any problems encountered with the sync pulses. The video/audio switcher is controlled by the system controller to provide the correct output signal for the channel. The preview monitor, while not necessary, can be used by the operator to verify proper cueing of the next tape before it goes out live on the air. The system controller should incorporate a high resolution video graphics board to enable the system to provide a "Barker" screen to prompt subscribers to purchase, display the program schedule or display a "Please Stand By" screen in case of problems.

The associated hardware can consume up to 14 EIA units of rack space (including cooling space) for a total of 24 EIA units for a system with only two VTR's. Cabling and wiring harnesses for a VTR system can be quite extensive especially if many VTR's are used. Each VTR has a Gen Lock signal (looped through), video and audio output, and control interface cable. All cable outputs must feed the video/audio switcher, which is also connected to the controller by an interface cable. Video from the switcher is fed to the Time-Base Corrector (TBC) where it is buffered and passed on to the modulator.

Powering requirements for a 2 VTR system with the above mentioned hardware is approximately 610 watts and increases by 80 watts for each additional VTR that is added to the system.

Laserdisc System

The Laserdisc system requires some special considerations for location and set-up. Two configurations of the system are possible. The first utilizes two single disc player units. (Figure 5) These units fit in a

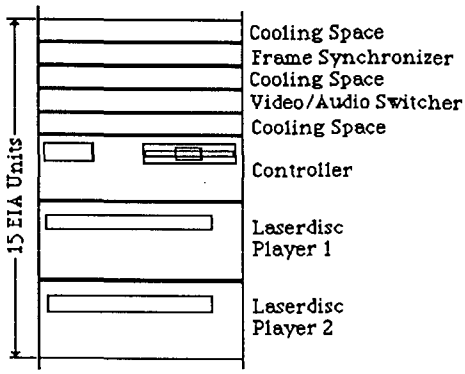

Figure 5. Laserdisc Hardware
Single Disc Player System

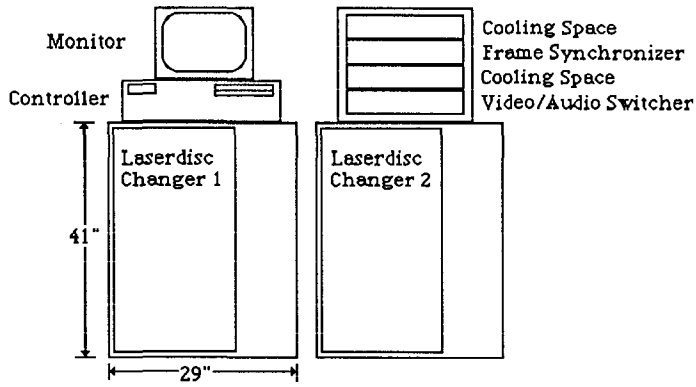

Figure 6. Laserdisc Hardware
Laserdisc Changer Units

standard 19" rack and are 3-1/2 EIA units high. The second system uses two laserdisc changers capable of containing 72 laserdiscs each. (Figure 6) Although the changers cannot be rack mounted in a standard 19" equipment rack, their physical construction allows them to be placed wherever convenient in a headend.

A frame synchronizer is used in a similar fashion as the Time-Base Corrector in the VTR system. It maintains a stable synchronized video signal to feed an encoder and TV modulator when switching between laserdisc players. The frame synchronizer and video switcher take up 1 EIA space each with 1 EIA space needed for cooling for the

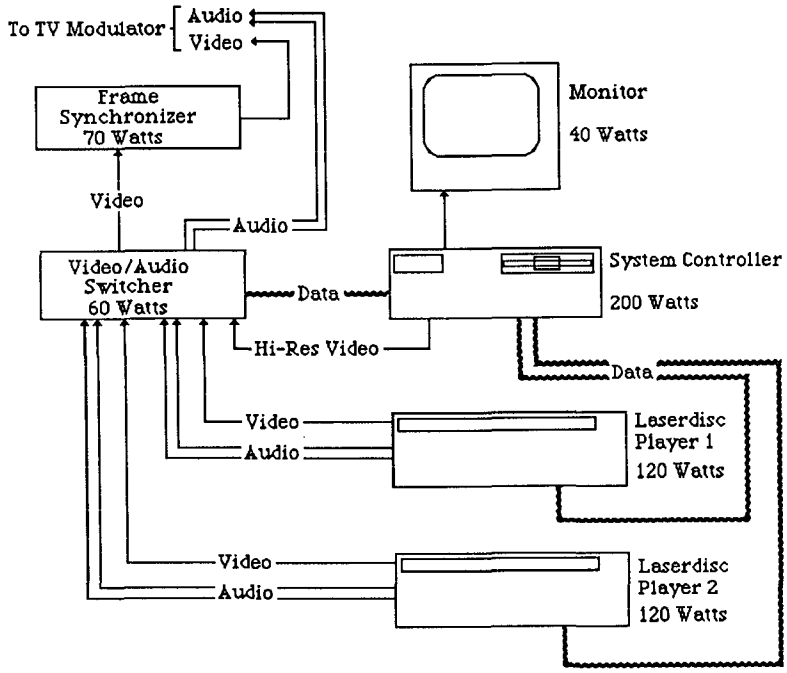

Figure 7. Laserdisc System Wiring

frame synchronizer and video switcher. Cooling space is not needed for the laserdisc changers. A standard amount of cooling for the PC controller is needed although the controller can be placed on one of the changers. It is also possible that the video switcher and frame synchronizer could be placed in a mini-rack and set on top of the other changer eliminating the need for using valuable rack space. (Figure 7) This hardware placement also has the side benefit of eliminating the need for long cables to and from the main rack except for the audio/video cables running from the laserdisc system to the TV modulator.

Power requirements for the Laserdisc system totals approximately 610 watts.

EQUIPMENT MAINTENANCE

Satellite Receiving Maintenance

Even though the satellite receiving system has no real moving parts to wear out, a considerable amount of maintenance may be required if support equipment is used. Most of the support equipment is used to pressurize the RF feedlines from the LNA's to the receivers. The air compressors must be periodically checked for proper lubrication, the air-filters/cleaners must be cleaned to keep contamination from entering the feedlines. This and other required maintenance is common to all channels received by satellite.

Video Tape System Maintenance

Video tape systems for pay-per-view require the most maintenance of all the systems discussed. Even if only one movie is shown per day at regular intervals each day, the tape player will require very frequent cleaning. Regular preventative maintenance should be performed at the intervals recommended by the units manufacturer. This includes extensive cleaning of the tape path, lubrication of moving parts and replacement of worn parts.

A video tape should have a fairly long service life although it won't be useable forever. Each tape should be visually checked for cinching or other problems each time it is inserted or removed from the player. This can help to determine if any potential problems are lurking in the player's mechanism. Eventually a tape player will eat a tape, and a backup contingency will be needed to replace the damaged tape and/or player. A strict schedule of cleaning and preventative maintenance, however, should reduce the probability of this occuring.

A clean environment must be maintained for the tapes also. Any dust or other foreign material (fingerprints) on the tape can damage the tape, be transferred to the VTR and then be transferred to other tapes. Magnetic tape can withstand temperature and humidity extremes for storage, but should be maintained in as stable an environment as practical for playback.

Laserdisc Maintenance

Laserdisc players, by their inherent design, are low maintenance devices. While they incorporate moving parts, the durability of these parts is high and the mechanical designs are sound. This translates into a unit which requires virtually no maintenance.

Laserdiscs have proven to be a sturdy medium. Although "normal" handling of laserdiscs does not affect picture quality or player performance, the utmost of care should be taken to maintain the cleanliness of the discs. The use of the Laserdisc changer helps to keep discs in "like-new" condition by minimizing the amount of handling required to insert and remove the discs. Discs should be inspected before insertion into and after removal from the changer for any signs of damage. A damaged disc inserted into the

changer may cause the changer to fail, and likewise, a damaged disc removed from the changer indicates a mechanical failure of the changer. Putting a dirty disc into the changer can contaminate other discs, and the player mechanism itself and cause intermittent problems or even failure of the player. Clean-room practices are not necessary, but cleanliness will extend the life of both discs and player.

HEADEND INTEGRATION

Recent advancements in technology are making cable systems with double the bandwidth of just five years ago possible. The uncertainties of the needs of HDTV will allow operators to fill some of these channels with Pay-Per-View signals. An operator now does not need to commit himself to only one media for his pay-per-view source.

Different channels may be assigned to the different types of pay-per-view available. Nationally distributed programming and special events from satellite can utilize one (or more) channels. Other movies or local events and promotions can be played back from tape and a locally programmed IPPV service can be provided by laserdisc. Even multiple PPV systems can feed a single channel with a mix of different types of programs depending on time of day, events available and market demands.

Recent rulings regarding Syndicated Exclusivity (Syndex) require the operator to 'blackout" certain programming from distant stations when duplicated on local stations. This valuable "dead" air time can be replaced by a locally originated program or other type of program provided by a VTR or laserdisc based system.

SUMMARY

No one system is the answer to all of a cable operators Pay-Per-View needs. Each system discussed has strong advantages and disadvantages. The operator must weigh the market needs with system cost, availability of programming, maintenance requirements and user friendliness. Video quality, headend space consumption and powering concerns should also be examined before committing to a particular system. It is hoped that this paper has helped the cable operator and the cable system engineer to understand the issues related to different Pay-Per-View sources.

ACKNOWLEDGEMENTS

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REFERENCES

1. National Association of Broadcasters Engineering Handbook. 7th Edition. Section 5.9 3/4" and 1/2" Video Recording Systems. S. Baron, E. Pohl, P. Smith.