AN ANALYSIS OF PROVEN PAY CATV SYSTEMS

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This paper deals with the practical aspects of integrating viable Pay-TV concepts into existing CATV systems.

The problems associated with order taking in one way systems are reviewed and several of the more practical solutions are discussed in detail.

The practical application of a currently available control system which is capable of selectively addressing over one million subscribers is described as it applies to the CATV operators' problems of computer billing and timely response to automated incoming orders.

The trade offs between on channel jamming, scrambling, pay channel converters and all channel converters are examined. Recommendations tailored to several varied but typical system situations are presented. Technical operation of the Tele/Theatre systems currently installed in over 63 hotels is reviewed.

The most significant questions which arise when planning a Pay-CATV system include:

1. Will good program material be continuously available?
2. How can individual orders be economically processed?
3. What will be the ultimate impact on operating costs?
4. How will customer billing be affected?
5. What will capital equipment cost?

The answer to each of these questions is a function of which marketing and technical concepts are selected. There are several from which to choose.

SUBSCRIPTION TV

To most, subscription TV means that some sort of secure channel(s) is programmed throughout the system and each subscriber that wishes may pay a flat rate and be equipped with a "box" which enables reception of that channel. The primary advantage of such a system is simplicity and minimum cost.

This concept has the primary disadvantage that each program producer will maintain that his share of the gross receipts should be greater because of the relative desirability of his product. Each time he is rebuffed, he will reduce the quality of program offered or withdraw his participation. Within a matter of months, the service will degenerate to nothing more than an old movie channel.

PAY PER PROGRAM

Motion picture producers are most comfortable with the "box office" concept where they can logically expect to receive a predetermined percentage of each "ticket" purchased by a customer who wishes to view their product. Therefore, the system which should ultimately prevail for distribution of truly premium programs will provide a convenient means for each subscriber to choose and purchase individual programs. The key word here is convenient.

- Impulse buying must be possible.
- The transaction must be effected from the home, otherwise one of your major selling points will be lost.
- The completion of the transaction must also be convenient for you as the system operator, otherwise your share of the revenue will be consumed in servicing the orders.
- The cost of all this convenience must be reasonable.

COMPUTER CONTROL

The obvious way to process large numbers of individual orders is with a small computer. BEWARE the XYZ Computer Company salesman who says his $7000 beauty will do it all. That's a fair cost for the processor alone but who's going to train 30,000 subscribers to operate the terminals, what will the software, interface and terminals cost, and how will they connect to the processor?

A two-way system would solve the connection problem and a two-way Pay-TV box, properly designed and supplemented with head-end control equipment, can bring the capital cost per subscriber to less than $250. The properly designed Pay-TV box will also require only minutes of customer training.

If you are reluctant to lay out over $250 per subscriber for your first venture into Pay-TV, I don't blame you. Not when a one-way system can be easily adapted to the same end with far less cost. Several systems have been developed for one-way networks but all can be categorized into three main classes.

1. Sell tickets in neighborhood retail outlets which the "box" reads and/or destroys.

2. Accept orders by mail.

3. Accept orders by telephone.

Categories 1 and 2 severely restrict impulse buying and entail a substantial amount of human support at significant cost. Tickets must be coded or controlled to prevent counterfeiting or multiple usage. Mail is slow and must be individually handled. Only the telephone seems to provide the ultimate solution for the one-way system.

SUBSCRIBER TERMINAL

Nearly every conceivable means for controlling the program has been tried experimentally and many have been reduced to hardware. A few are currently in production.

A review of the more popular schemes which are in production or scheduled for release this year is summarized as follows:

1. Transmit on a VHF Channel and filter or jam at each subscriber for the OFF mode.

2. Transmit on Sub or Mid Bands and convert at each subscriber for the ON mode.

3. Transmit a signal with suppressed sync and insert a separately transmitted or reconstructed sync for the ON mode.

4. Transmit 2 or more channels with the program time multiplexed between the channels and provide a means to follow the program through the channel switching sequence for the ON mode.

5. Frequency modulate the entire channel carrier set and provide a means for following this presumably elusive carrier and stabilizing the frequency for presentation to the TV receiver for the ON mode.

It is clear that security of some sort is desirable to reduce the instance of program theft. The primary factor is again economics. Any system can be cheated if enough money and effort is dedicated to that end. It would, therefore, seem foolish to spend an extra 50% per subscriber for a very complex security system to protect against the 1 or 2% who may be willing to spend an equal or greater amount to defeat it.

We must also consider that a significant percentage of those potential cheaters who might substitute their own box will also have the knowledge and bravado to open and modify the box you provide as soon as they find that you have so complex a system as to make it impractical to substitute their own box.

It seems there is no foolproof answer to this dilemma and there may never be. However, you must remember that your real purpose is to sell premium programs and do so in a fashion which will maximize your revenue with respect to your capital expenditures. Therefore, you must guard against the tendency to go beyond practical limits in an effort to eliminate moderate amounts of program theft.

Most protection methods employing filters or jammers used with VHF on channel transmissions eliminate the need for frequency conversion but fall short in other respects. Filters can be easily bypassed and in some cases counteracted with sensitive receivers and/or amplifiers. Jammers will usually tend to interfere with neighboring reception.

On the other extreme, the advocation of frequency modulation of the entire channel carrier set with a descrambler type demodulator circuit located in each subscriber's box seems to have found favor with some system engineers.

However, our studies have demonstrated that some television sets are so forgiving that they present a fairly acceptable picture even when the carrier set is frequency modulated to the maximum practical limit.

The final choice then seems to be between sync suppression or rapid band switching if scrambling is to be used. Transmission on the sub or mid-bands also appears to be essential regardless of the scrambling consideration. However, let us not fail to examine the possibilities of no scrambling at all.

Just operating on the sub or mid-bands will eliminate cheating by over 90% of your subscribers. A simple clause in your subscriber contract can provide for confiscation of bootleg converters connected to your network. This alone will deter a significant percentage of potential cheaters. The ability to add premium program channels for each available channel is possible when scrambling is not considered, simply because most scrambling techniques require band widths in excess of 6 MHz. If, for example, four channels were required to transmit two premium programs by using scrambling techniques, then those same four channels could supply four premium program channels if scrambling is not employed. The ability to add premium program channels on a one-for-one basis should add far more to revenues than the program thiefs would subtract. This coupled with the consideration that the unscrambled sub-band or mid-band converter will reduce your initial expenditure by nearly $25 per subscriber, should prompt some very serious thought before insisting that premium program material be thoroughly scrambled.

SUMMARY OF DESIRABLE SYSTEM FEATURES

1. To assure good program quality and availability - Sell your premium channels on a per-program basis and allow for impulse purchase.

2. To economically process individual orders - Let the customer use the telephone, an already familiar tool, to place his order. Don't provide a gadget to place the order over the phone. Put some of that money into a better and faster automatic answering device and order processor.

3. To minimize the impact on operating cost - Use automatic answering equipment rather than order-taking operators.

4. To minimize the impact on customer billing (Pay-per program coupled with automatic telephone ordering does impact billing) - Select a computer system which will preserve all orders on IBM compatible tape. Use a local computer service to prepare and mail your monthly invoices for a few cents each.

5. To minimize the cost of capital equipment - Select a subscriber terminal that is one way and non-scrambling.

A PROVEN SYSTEM

Since most telephone exchanges throughout the world still operate with dial pulses, a subscriber/computer interface which can count these pulses reliably would allow the use of the telephone for direct order entry. The K'SON Corporation Subscriber Order Concentrator (SOC) provides this feature as well as touch tone compatibility.

Studies have shown that with staggered program starts, as few as 15 incoming phone lines connected to the SOC will serve a 20,000 subscriber system with a 1% probability of a customer getting a busy signal during peak periods. The SOC will answer each line on a 15 line system the moment it rings and respond with a clear 800 Hz sine wave tone of 1.5 seconds duration. This signals the caller to proceed with the entry of his order. He then dials 4 or 5 digits which identify himself and 3 digits which indicate the channel ordered.

Three (3) digits are used to permit verification by complement checking that the order was dialed correctly. The SOC performs this verification automatically on each dialed order. When the order has been checked and validated, the SOC "hangs up" to clear the line for the next call. The order is formated and stored in register at the same instant. The register will be cleared and the order will be processed by the computer and the subscriber's converter will be commanded "ON" in less than 1 second. Provisions are incorporated to release the line if the caller does not enter his order properly in a reasonable time span.

With the advent of the Subscriber Order Concentrator, a Pay-TV system with proven profit potential in over 40 thousand hotel rooms has now been adapted to suit the needs of the cable operator. The concept applies directly to existing one-way systems. Allocation of one VHF channel, four midband, and one narrow band command channel provides the opportunity to sell

four separate and concurrent premium programs to every CATV subscriber. The VHF channel carries promotional previews. This significantly increases pay program sales and also encourages non-participating subscribers to order the new service.

Each participating subscriber is equipped with a 24 channel Program Selector. Each Program Selector is capable of converting any one of 4 premium channels to a standard VHF channel (usually Channel 12). However, each premium channel in each unit may be separately enabled or disabled by a command word issued from a computer at the signal source. To view an enabled premium channel, the subscriber simply selects Channel 12 on his TV. To be enabled, he places a local phone call to the computer which answers with a "ready" tone. He then dials a few more digits which identifies him, indicates the desire channel, and assists the computer in checking the accuracy of his order. Within seconds his premium program is available. Mailed or voice-telephoned orders may also be executed via a keyboard terminal at any convenient location.

The operation at the studio or headend is completely automatic. A printed paper tape lists each order the instant the computer accepts the order. This record includes the subscriber number, channel ordered, date and time. A computer compatible magnetic tape records the same information in a format which permits inexpensive reduction to printed bills by any computer service.

The cost for accepting and processing orders in this fashion on a 20,000 subscriber system is less than 9¢ each including incoming telephone line rental, printed billing service, and full depreciation of all central office control equipment over 5 years.