THE MAGNAVOX PREMIUM T.V. SYSTEM

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The Magnavox Company believes that to a great extent the future growth of the cable industry is tied to CATV's ability to introduce new services beyond the delivery of standard off-the-air T.V. channels. Many ideas for creating additional revenue producing services have been published over the last five years. Some examples of these proposed services are listed below.

1. Premium TV
2. Restricted TV
3. Subscriber Polling
4. Specialized Advertising
5. TV Games
6. Specialty Marketing
7. Home Education

A great deal of effort has been expended by a number of manufacturing companies in an attempt to develop devices and systems which would be capable of providing these services. However, we feel that it has become increasingly clear that the problems of bringing additional services into being are much greater than was initially anticipated. These problems not only have been in the definition and design of hardware but have also included development of software and programming sources, as well as in developing the techniques required to establish a profitable business. As you know very well, the CATV industry is extremely capital intensive. It is doubtful that even the largest MSO's can afford to introduce, on a large scale, whole blocks of services prior to gaining revenue from any of them. Further, the marketability of any of the advanced services mentioned previously has yet to be proven. Thus, it is unreasonable to expect a CATV company to risk the large amounts of capital required for full service operation until a sufficient number of experiments have been conducted to establish that money could be made from such a venture. Because of these difficulties, we believe that the development of advanced services will come as an orderly progression, each service being defined and proven individually. The wired nation will come but we do not believe that it will happen all at once.

Premium T.V. falls into a rather special category when compared with other potential services. First, it is one of the few services which can be established over one-way cable plants and we must remember that today well over 90% of all CATV systems are one-way. Premium T.V. is also one of the simplest services to implement from a technical standpoint. Further, at this point in time, there does appear to be a substantial market demand for the kind of programs which could be supplied over pay T.V. channels. There are today, a number of experiments in this area which appear to be achieving a certain amount of subscriber acceptance. In addition, producers of film material and other software have recently become considerably more willing to sell their products to the CATV industry for an acceptable price. For these reasons, we at Magnavox feel that pay T.V. can serve as the vanguard in the creation of new services providing increased revenue for the cable operator. We would like to emphasize that this growth is only achievable if the basic premium T.V. system is designed to allow for future expansion.

We would like to discuss some of the other system considerations involved in providing pay CATV services. One of the first factors which must be considered is the number of channels which should optimally be supplied over a pay T.V. system. There are two ways of approaching this; one is to examine availability of channel space within the system and the second is to look at the trade-off between number of channels versus the revenue which could be realized from each additional channel.

The only frequency bands that are currently available for pay T.V. services are between 120 and 178 MHz which constitutes channels A through I, and the superband above channel 13. In most existing systems, the trunk and distribution amplifiers do not have sufficient bandwidth to carry superband channels. Furthermore, in many systems, cross modulation products from the low band channels, two through six, preclude operation on the lower midband channels in many systems. Typically there are only two, or at most, four channels which can be used for pay T.V. Data on a number of systems around the country indicate that channels H and I can be used on almost all systems and channels F and G are useable with a minimum of system modification.

From the point of view of programming requirements, cost of supplying software increases directly with the number of premium channels, while the number of viewers who watch each added channel decreases. There is little market research available to indicate the minimum number of channels which would be acceptable in a premium T.V. system. However, there is at this time, a number of experiments in progress using one, or two, or three channels that appear to be having a fair degree of success. We feel that there is little doubt that in the future there will be requirements for three or more premium channels, although at present two should satisfy early market needs.

A second factor to consider in premium T.V. is security of the program material. There are two aspects of security which we would like to consider. First from the point of view of the system operator it would be undesirable to have a system in which a subscriber could obtain premium programming without charge merely by installing a standard multichannel converter. Second, we feel very strongly that the subscriber has the right of not being exposed to programming which he may feel is offensive. It is not acceptable to our way of thinking if a subscriber could view a program merely by turning a channel select knob.

In general, there are two techniques of blocking reception of premium signals in the home. The first is scrambling. This is any technique whereby the video signal is destroyed or deteriorated at the origination point. This signal is then reconstructed prior to reaching the subscriber's television set. Jamming is a technique whereby unaltered video is transmitted down the CATV distribution system. This signal is then distorted at a point between the subscribers tap and television set. Jamming has the advantage of being removable upon purchase with a minimum amount of degradation to the premium channel. However, jamming requires decoding devices at all subscriber drops prior to the time that premium programming can be provided to any subscriber. In the case of scrambling on the other hand, since the signal appearing at subscriber's taps has been previously distorted, the unscrambling device is placed only in the homes of those subscribers who wish to participate in the premium T.V. service.

A third facet of any premium T.V. system is the need to collect revenues accruing from the pay T.V. service. A number of different approaches have been devised to achieve this function. All of these techniques however, fall into two general categories, subscription programming and per-event selection of programming.

Subscription programming has the advantage of system simplicity and low cost. There is no requirement to obtain any information from the subscriber other than his agreement to participate and pay a monthly fee, thus, subscription premium programming is nothing more nor less than a direct expansion of cable channel space for a fixed incremental charge. A major disadvantage of subscription systems is that revenue is not directly related to subscriber usage. Thus, the program operator has no direct feedback on subscriber's acceptance of his material. Further, in the case of showing major attractions, there is no mechanism for achieving the incremental revenue gathering potential of a per-event system. Possibly the greatest disadvantage of subscription systems is that inherently there is no capability of upgrading the system for additional services.

Per-event selection of programming is essentially a two-way service and thus, is inherently somewhat more complex than subscription programming, however, per-event program selections provide direct feedback on the marketability of premium material and allows the subscriber a choice as to the amount of programming he wishes to view and thus, the cost of the service to him. Potentially, this promises an automatic mechanism for achieving a growth of revenues as programming material improves in quality.

There are a number of techniques for implementing per-event selection of programming. For example, tickets could be purchased for special events which would activate the subscribers terminal device. Also, the subscriber could be enabled from the head-end after phoning a service request or, destructible script could be purchased periodically. Probably the most desirable technique, however, would be to allow for purchasing special events by the subscriber's merely activating the home terminal.

Examination of the system trade-offs briefly described above has led to the establishment of the following design constraints which were applied to the development of the Magnavox Premium T.V. system.

1. Any premium T.V. system intended to be economically viable within the next few years must be capable of operation on existing one-way cable systems.

2. The premium T.V. system should employ scrambling both to prevent pirating of programs through use of midband converters and to allow subscribers to avoid exposure to material which would be considered distasteful by them.

3. A keylock will be incorporated to prevent unauthorized use of the subscriber terminal.

4. It is desirable for the premium T. V. system to have the capability of providing both subscription and per-event billing.

5. The preferred method of billing should allow for impulse buying and not require either tickets or the use of the telephone for subscriber authorization.

6. The premium T.V. system should be designed in such a manner as to allow for orderly expansion, both with respect to additional numbers of channels and with respect to allowing for future growth to provide for full two-way services.

7. Program origination equipment should be designed such that a minimum of operator training is required for operation.

8. Preparation of bills should be adaptable both to the manual practices of small system operators and to the automated billing practices of large MSO's.

9. The pro-rated cost of the premium T.V. system should not exceed an amount which would make the operation of the system unprofitable.

We would now like to take this opportunity to describe the Magnavox Premium T.V. system. This system is currently undergoing engineering field tests in the San Bernardino system of TPT (TelePrompTer).

A general block diagram of this system is shown in Figure 1. The main components which are provided by Magnavox are described below.

The central processor and billing computer are located at the head-end or system studio. The central processor controls the operation of the premium T.V. system. The billing computer reduces billing information for cable operator use. Various IDEM units are located throughout the CATV distribution system. Typically, an IDEM (Interactive Data Exchange Module) serves approximately 32 subscribers to the premium T.V. service. IDEM's are located after main distribution amplifiers or immediately following line extenders. It should be noted at this time, that the cable plant between amplifiers is inherently bi-directional, thus, by strategic location of IDEM units, interactive communication can take place between this device and the home terminals. The home terminal units are designed to be small, reliable, attractive, and as inexpensive as can be achieved within the state-of-the-art of present technology. The IDEM is equipped with a read-out unit such that the system operator can periodically retrieve subscriber billing information.

Primary features of the Magnavox Premium T.V. system are listed below.

1. Premium Service Channels
2. Free or Premium Operation
3. Preview Capability
4. Instant Purchase
5. Keylock Authorization
6. Remote Billing
7. Monthly Collection
8. Computer Bill Preparation
9. Automatic Programming

The Magnavox system is designed to offer two additional channels for premium programming. The number of channels may be modularly increased in future units as market demand develops. Any of the premium channels are capable of operating in a variety of modes. First, free programming can be shown unscrambled on any premium channel. Second, unscrambled previews can be inserted at the beginning or during various points in a premium presentation. Third, any premium channel can be restricted by the central processor as to the particular subscribers' who may be allowed to purchase programming on this channel. Thus, if a subscriber does not wish to view questionable material he can cause that his terminal be deactivated when over this material is presented. In addition, the system operator has the opportunity of presenting programs only to special interest groups for example, doctors or other professionals. With the restricted channel capability, only members of these particular groups will be able to purchase specialized programs.

Another feature of the Magnavox system is the capability of providing instant acceptance of a premium program without being required to make telephone calls or to purchase a ticket. A subscriber merely presses a premium accept button if he wishes to purchase a program. In order to prevent use of the terminal by unauthorized people such as children or baby sitters, the Magnavox Premium T.V. terminal is provided with a keylock switch which may be positioned to provide any of the possible combinations of services. The use of the IDEM allows the system operator to collect subscriber billing information on a monthly basis without entering the premises of the individual subscribers. The Magnavox billing process provides the system operator with the capability of generating bills in his own office or through a billing service. An outstanding feature of the central processor unit is its capability to automatically program premium material for both channels including preview periods and alpha-numeric announcements for an entire day's operation of the system, or for as far ahead as the operator has definite plans.

We would like to describe in more detail the functions of the key elements of the Magnavox Premium T.V. system. The central processor unit (Figure 2) is designed to provide control of origination material and of the operation of the system at a minimum cost and complexity. The primary programming input to this device is via punched paper tape. In operation, the control processor is a sequential machine whereby the commands are stored on the tape and processed individually at specific event times. Thus, to activate the central processor, the operator would merely turn the unit on, prepare the program video tape recorders, and then at the appropriate time, start the real-time clock. In the event of failure of the equipment, or last minute program changes, the central processor is equipped with manual controls which can be used to change or bypass any particular section of the premium program.

The IDEM (Figure 3) serves as an on-line switching center for commands being routed from the head-end to the various subscriber terminals. It also acts as an intermediate processor for scrambling codes which are transmitted from the central processor unit. These codes are retransmitted only to those subscribers who purchase the premium program. The IDEM stores the subscriber billing information at specific times under control of the central processor, thus, information

can be retrieved relating not only to which programming subscriber's have purchased but also the IDEM can record the particular segment within the premium program at which the subscriber made his purchase. The IDEM is capable of serving up to 32 subscribers and reduces the cost of the total system by sharing much of the equipment which must otherwise be provied in the subscriber's home. Thus, the IDEM greatly reduces the complexity of the home terminal unit.

Figure 4 shows a photograph of a prototype billing readout unit. The data are retrieved from the readout box through use of a standard audio cassette tape recorder. Collection of billing information is made simply by plugging the recorder into the readout terminal and pressing an operate button. The readout terminal is needed only on existing one-way cable systems and not on two-way systems. For operation in a two-way system the billing information may be transmitted directly from each IDEM to the head-end computer. It might be noted that a low data rate passive return link over a "shadow" cable or a conventional telephone circuit may be employed to connect the IDEM module with the head-end, eliminating the need for the readout terminal.

The subscriber's home terminal as shown in Figure 5 contains the MOS logic for switching, communications, and for descrambling of the pictures and sound normally transmitted as scrambled information from the head-end. It also contains the RF devices which provide signals between IDEM and subscriber, and which receive and convert the audio/video signal to a standard VHF channel on the subscriber's own television receiver. The terminal also permits keylock switch control of the premium programming. There are four switches other than the keylock switches: "Standard TV" which permits normal viewing of any non-premium channel, "Premium A", and "Premium B" each of which permits viewing of premium programming if the appropriate keylock switch is "on" for that channel, and "Accept" which causes descrambling of the audio/video signal, and authorizes the cable operator to make a charge for the premium program selected.

In summary, the Magnavox Company expects that in the relatively near future we will have in production what we believe to be the most advanced premium T.V. system available on the market. A great amount of effort has been spent in attempting to design a system which is not only economically viable in today's market but which offers the promise of expansion to full two-way service capabilities in the future. We would like to acknowledge the cooperation of the TelePrompTer Corporation in defining and developing this system and to note that special appreciation is due to Messrs. Tom Ritter and Hub Schlafly, whose participation has gone well beyond the requirements of our contractual agreements.

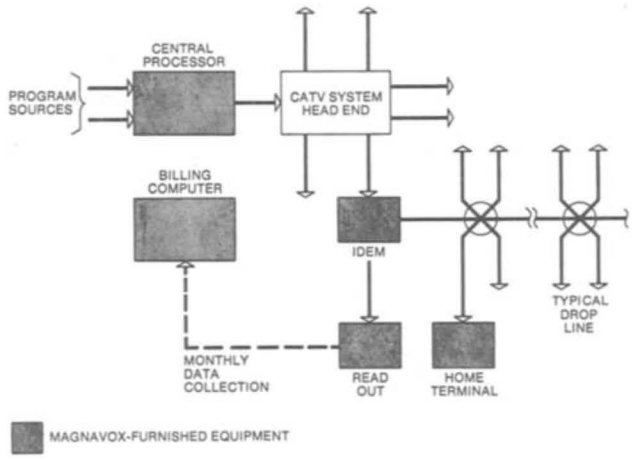

Figure 1. System Block Diagram

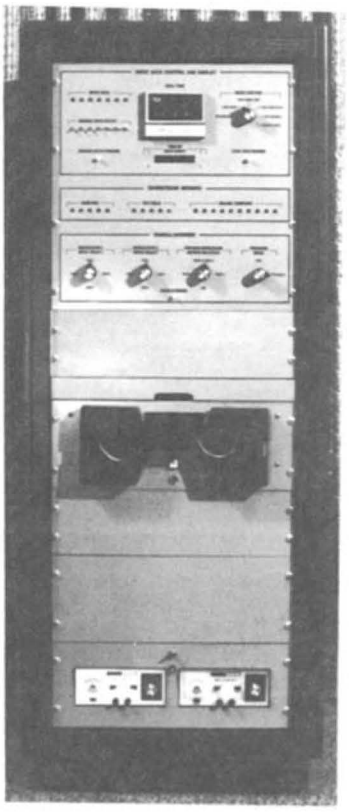

Figure 2. Central Processor

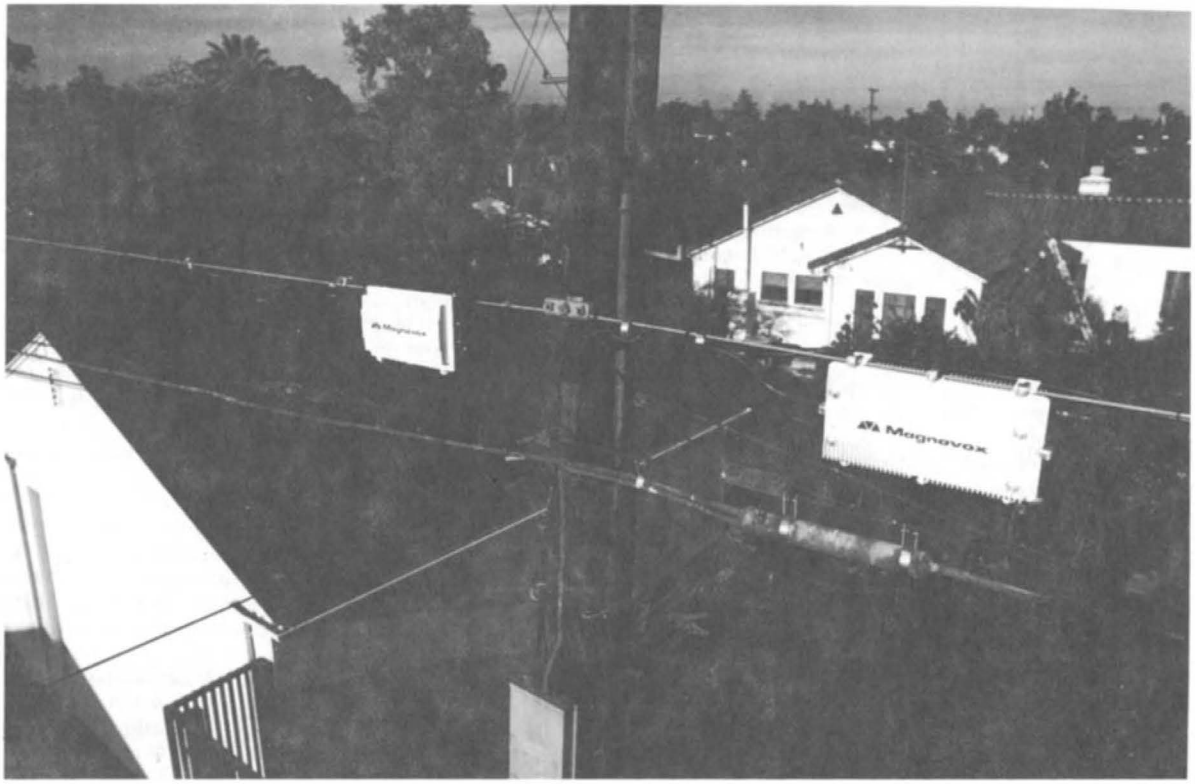

Figure 3. IDEM

Figure 4. Readout Box

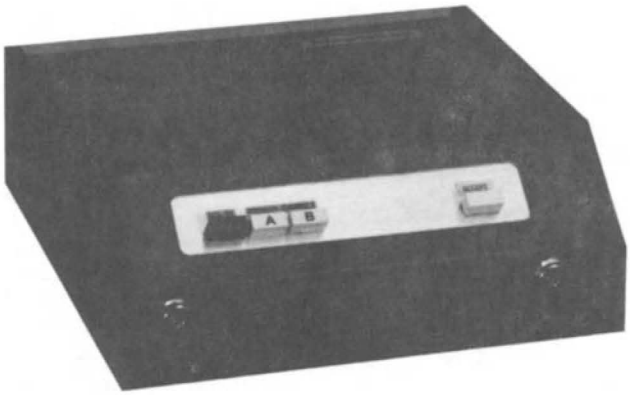

Figure 5. Subscriber Terminal