CONSUMER ELECTRONICS FRIENDLY CABLE

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ABSTRACT

This paper reviews the issue of the interface between Cable Television systems and Consumer Electronics hardware. The current status is summarized along with some possible solutions to the problems. The impact of new technologies is projected.

INTRODUCTION

The Consumer Electronics Interface problem has been with us for a long time. It is now more serious than ever for a number of reasons including: high penetration of "cable ready" consumer hardware, increased interest in Impulse Pay Per View, IPPV, multi-channel IPPV, and Near Video On Demand, NVOD, and an emphasis in the political arena.

The promise of new technologies such as Digital Video Compression, DVC, GHz cable bandwidths, and High Definition Television, HDTV bring increased concerns about the Consumer Electronics interface. There may be opportunities to make progress if work is done during the formative stages of these new technologies.

Some progress has been made. Solutions and partial solutions have been found; but some have not been implemented.

In issues as complex as these, there are a variety of opinions and priorities. There are even misunderstandings. This paper presents my views on this complex subject.

WHAT ARE THE PROBLEMS

The fundamental problem is one of failed expectations and a resulting frustration. Some of the subscribers' expectations come from the belief that technology should make things simple. When it doesn't, it's only human to want someone to blame. That is often the last entity to come onto the scene. In most cases, that is the cable com-

pany. A major factor in failed expectations is the use of the term "Cable Ready" by the Consumer Electronics Industry. This is discussed below.

Placing ourselves into the shoes of the subscriber, several problems with the usage of Consumer Electronics products connected to cable become readily apparent:

a) Connecting up a collection of hardware to cable is confusing and difficult.

b) The subscriber would like to use the remote controls that came with his TV and VCR—and not need to use any others.

c) Programming the VCR to tape shows is difficult. There are a number of constraints added by a cable connection that are bothersome.

d) It is difficult to know what is on cable. As more channels are added, the confusion grows.

e) Certain features of Consumer Electronics products, like Picture-In-Picture, PIP, become impaired when cable is added.

Upon initial connection to cable, the cable installer helps the consumer. Occasionally, the installer will arrive at the subscriber's residence to find a new VCR still in its box. The subscriber expects the installer to connect it and provide instructions on its use! Imagine buying a telephone answering machine from the corner drug store, bringing it home, calling the phone company and asking them to install it and demonstrate its use. While this sounds preposterous, subscribers have these kinds of expectations when it comes to cable. The cable company gets no credit or recognition for the assistance and education it provides on Consumer Electronics product installation and usage. The Consumer Electronics retailers have managed to escape responsibility for this instruction.

Remote Controls

Remote controls are probably the biggest subscriber headache. A decade ago, when a remote controlled TV was a high end purchase, the cable box with remote control rental provided a welcome service for a dollar or so a month. Two things happened to change that. First the availability of remote controls on Consumer Electronics products became pervasive. Today, only the very cheapest products come without a remote control. Second, the relatively low monthly rental for cable remote control has also grown. The subscriber is confused by the usage of the cable remote and irritated by the rental fee.

Most likely, the subscriber must use both the remote control that came with his TV or VCR and the one that came with his cable box. The TV and/or VCR must be turned on. Older, simpler products could be plugged into a switched convenience outlet on the back of the cable box. Turning on the cable box also turned on the TV. Now, most TV's and VCR's have a single "on/off" light-touch button. If the TV or VCR is unpowered at its line cord, it will not come on when re-powered. The switched convenience outlet on the cable box becomes useless. The latest TV's and VCR's go through an automatic set-up procedure when powered up at the line cord and first turned on. This takes several minutes. If the cable box's convenience outlet is switched, its use with such products presents major inconveniences.

Even if the cable box has a volume control feature, the TV's volume must be properly set to avoid noisy audio or a loss of stereo separation. This is a complication most subscribers don't understand or quickly forget.

Universal Remote Controls

The advent of the universal remote control has caused more problems. The subscriber expects to be able to buy one and use it with his cable box. If the cable company disables the remote feature on the cable box, the subscriber becomes angry. Another problem with universal remote controls is that they aren't always "universal". They don't accommodate all brands of cable boxes, TV's, and VCR's. If the subscriber's cable box is not accommodated, the subscriber is likely to blame the cable operator.

Sometimes the subscriber expects the cable technician to set up and provide instructions on the usage of the universal remote control. If the universal remote control doesn't have non-volatile memory, the set up codes will be lost when the battery dies. The subscriber may expect help with this, especially if he has lost the instructions that came with the device.

VCR Usage

The use of a set-top box ahead of the VCR presents further complications and aggravations and failed expectations.

The first problem subscribers face is attempting to tape shows from different channels at different times. Consecutive taping from different channels is accommodated by a large fraction of cable TV set-top descramblers, but not all. Most popular brands of these devices have models with built-in clocks and timers that allow them to be programmed to change channels. These units are similar to VCR's in their complexity of operation. Older models are like older VCR's before On Screen Displays. They rely on cryptic symbols on the channel indicator. The limiting factor is the subscribers' ability to program his VCR. If the subscriber can program his VCR, he can program the set-top descrambler using the very same skills to allow the consecutive taping from different channels. This, of course, is easier said than done.

In addition, a number of "universal remote controls" from third party vendors have timers built into them. These units will change channels at different times even if the set-top descrambler does not have this feature. This is only the case if the subscriber can master the programming of both his VCR and the extra device.

Subscribers often want to be able to tape one show while watching another. There are some limitations in scrambled cable systems. If the subscriber has only one descrambler, he may:

1) Watch a scrambled channel while at the same time taping that same channel.

2) Watch a scrambled channel while at the same time taping a non scrambled channel.

3) Watch a non scrambled channel while at the same time taping a scrambled channel.

If the subscriber has two descramblers, he can watch one scrambled channel while taping another. However, he has a remote control problem. Likely, his remote control changes both set-tops' channels at the same time.

The "VCR Plus" product has been very successful. It uses specially coded numbers printed in the TV guide. These numbers tell it when to issue commands to the VCR to turn on and what channel to tape. It sends the channel number commands to the cable box.

While the "VCR Plus" product works very well, there are some constraints. The subscriber must leave the VCR "off" but tuned to the output channel of the cable box and the cable box "on". Most importantly, he must put in a blank tape with adequate remaining capacity.

The most important limitation to VCR Plus usage is that the VCR Plus numbers must be available to the subscriber. If the cable operator provides them in his guide, he may be viewed by the subscriber as endorsing VCR Plus. This then invites service calls when the subscriber has problems with the device. The second constraint is that the device must be initialized. This is not a trivial procedure. In fact, it is difficult to believe that someone who can initialize the VCR Plus device can't operate the VCR! Perhaps the answer is that only one family member needs to be able to initialize the VCR Plus so all can use it. The most difficult part of initializing the VCR Plus is entering the cable channel line up. The cable operator could facilitate this by providing this information in an easy to use form. Once again, this invites inquiries if the subscriber has troubles.

Other Feature Difficulties

TV's and some VCR's come with a Picture-In-Picture, PIP, feature that operates in one of at least two modes. In the first mode, two channels can be watched simultaneously. The big picture and the little picture can be interchanged with the push of a button. The sound comes from only the big picture. The second mode fills the screen with still pictures taken from successive channels. This provides a way of scanning channels to determine which to watch. The scanning mode of usage for PIP is frustrated in scrambled cable systems by the fact that the TV does not control the cable box's tuner.

In fairness it must be noted that only the most expensive TV receivers have two tuners built into them for use with PIP. Most intend for the consumer to use the base-band outputs of his VCR or the output of a video camera for the second input. This results in the need to use the VCR's remote control for the PIP display and the TV's remote control for the normal display. When the unit is used with cable, the same options remain. Most subscribers do not understand this and blame cable for the complications.

In the case where a viewer wishes both the main picture and the PIP picture to come from scrambled channels, two descramblers are required. MultiPort technology can facilitate this function.

It cannot scan channels and provide still pictures in a matrix filling the screen.

THE POLITICAL PROBLEM

Senator Leahy has proposed amendments to cable bills and has proposed stand alone bills involving the Consumer Electronics interface. The following quotes from the Congressional Record give his opinions:

"...they show little regard for their customers when they choose a means of protection that will sabotage the customer's television and VCR."

"...you will not be able to use any of those features you paid for. But as far as the cable company is concerned, that is your hard luck."

"My amendment is designed to create more user-friendly connections between cable systems on the one hand and televisions and VCR's on the other so that consumers will actually get to use the TV and VCR features they paid for."

"...require cable operators to allow customers to buy their own remote control units from any source rather than having to pay $3 or $4 a month —month after month, year after year—for a re-

mote control that probably does not cost more than $30..."

"...to create a user-friendly connection between cable systems and consumer electronics is more important now than ever before."

A lot of what is in the amendment and Bill is emotional and an oversimplification of the situation. Yet these comments are representative of what subscribers feel. While we can argue with the details, the big picture of discontent and frustration is undeniable.

"CABLE READY"

The terms "cable ready" and "cable compatible" are frequently applied to TV receivers and VCR's. Major cable subscriber frustrations are due to this terminology being used too loosely by the Consumer Electronics industry. Purchasers of these products are often led to believe that these products can be directly connected to the cable system without loss of functionality of either the cable service or the features included in the TV or VCR. This is generally not the case. There frequently are technical deficiencies in these products that impair performance when they are directly connected to the cable. Consumer Electronics manufacturers should not unilaterally declare their products to be "cable ready" without the consent and concurrence of the cable system for which they are supposedly "ready"! This is only logical and fair. The Consumer Electronics industry shouldn't be allowed to call products "cable ready" if they don't work properly when directly connected to cable!

The concept of "cable ready" is really very straight forward. If a product is truly "cable ready", it can be connected directly to the cable system and a) not interfere with the reception of others, b) provide all the services the subscriber has paid for without the need of additional hardware installed between the cable system and the product, and c) comply with the FCC rules concerning radiation.

The goal is simple: avoid the need for a set-top cable box. If a set-top box is needed to enjoy a paid-for cable service, the TV or VCR is not "cable ready".

For a Consumer Electronics product to be truly "cable ready", there are a number of basic technical requirements:

1) The TV or VCR must **conveniently** tune <u>all</u> channels offered on the cable system. Otherwise a set-top converter is required for access to channels the subscriber has paid for.

2) The tuner must be of sufficient quality to function with **all the channels simultaneously available at its input terminals without introducing distortions** or noticeable noise. The tuners used in cable converters are generally of higher quality than those used in TV receivers or VCR's in order to accommodate these needs.

   a) If the tuner is not of adequate quality, it will combine signals from several channels in a manner that produces disturbing moving background bars and patterns in the picture.

   b) Cable converters use a more expensive "double conversion" tuner that eliminates "image response". Without this added expense, an unwanted channel's signal may be mixed with the desired channel, distorting the picture.

   c) Cable converter tuners typically have a lower "noise figure" which introduces less "snow" into the picture than a TV or VCR tuner.

   d) The tuner must not feed back extraneous interfering signals into the cable system to cause reception problems on other receivers.

3) The internal circuits of the TV or VCR must be adequately shielded so as not to pick up signals off-air directly. When this shielding is inadequate, signals directly picked up off-air are mixed inside the TV (or VCR) with signals from the cable producing an unpleasant (and sometimes unwatchable) mess. In

many of these cases, the only solution is to add a set-top converter with its superior (and more expensive) shielding.

4) If the cable system uses scrambled signals, the TV or VCR must accommodate a descrambler that can be plugged into the rear of the TV or VCR to allow descrambling after the TV or VCR's tuner and remote controls. This approach has been defined by the Electronic Industries Association's (EIA) and the National Cable Television Association's (NCTA) Joint Engineering Committee and has been endorsed by the American National Standards Institute, ANSI, as the ANSI/EIA 563 MultiPort. Without the MultiPort plug, a set-top descrambler is required to give access to scrambled signals.

5) If the cable system uses two-way cable technology for conveniently ordering Impulse Pay Per View, IPPV, services, the MultiPort implementation must include the pass through of remote control signals to the descrambler module. In the case of multiple start times for movies, the descrambler module must be able to send remote control signals to the TV or VCR's tuner. Otherwise a set-top box is required to enjoy IPPV services.

It will be appreciated that this is a situational definition. For example, in the new 150 channel system in Queens New York, no existing TV or VCR can satisfy the definition of "cable ready" since none can tune the 1 GHz spectrum containing 150 cable channels. For subscribers to be able to enjoy all the signals they have paid for, a set-top converter must be supplied by the cable operator. As another example, the same TV receiver that gave acceptable performance in a suburb far away from any broadcast television transmission towers may require a set-top converter to reject these signals if the subscriber moves near a broadcast tower. If the TV receiver's internal shielding is inadequate, direct pick-up interference may be experienced which spoils the picture reception. The only solution available to the cable operator is to install a set-top converter with superior internal shielding.

Another source of confusion generated on the TV sales floor is the manner of specification of the number of channels a "cable ready" television can tune. The number is given as the sum of the broadcast VHF (12) plus VHF (69) plus cable channels that can be tuned. A purchaser who is told that the TV will tune 116 channels can be forgiven for being impressed and thinking that it is adequate. Yet this only accommodates 35 cable channels. More and more, this is inadequate. Under this counting scheme, a "cable ready" TV for use in the Queens New York 150 channel system needs 12+69+150 = 231 channels!

Some VCR's sold as "cable ready" have sixteen little wheels behind a door. Each wheel can be tuned to one channel. The remote control selects which wheel controls the tuner. While the VCR may be able to tune all cable channels, it can only do sixteen conveniently. Will this make for a satisfied customer?

It is not well recognized that the invention of the cable converter was not to tune more channels. The first converters tuned less than twelve channels. The cable converter was invented to overcome deficiencies in TV receiver tuners. They were meant first to combat the direct pick-up problem described above. Then, as more channels were added to cable service, the cable converter took on added technical burdens. The cable converter was required to counter the effects of non-linear performance and "image response" of less expensive tuners. Improved noise performance is also important. Lastly, the tuner must not back feed interfering signals into the cable system.

Without more discipline in the use of terms such as "cable ready" and "cable compatible", there is the potential for continued consumer anger, confusion, and losses as money is spent on product features erroneously thought to be usable when directly connected to cable.

CONSEQUENCES

The obvious consequences of Consumer Electronics Interface problems are frustrated and unhappy subscribers and the resulting political pressures. More subtle consequences also exist. Pay penetration is reduced because subscribers simply don't want the box. This is also true of IPPV sales.

Another consequence of the poor Consumer Electronics Interface with cable is that fewer channels are scrambled than might otherwise be the case. Consequently, there is more signal theft.

Some cable operators have undertaken a "de-addressing" campaign in response to the subscriber backlash over interface problems.

POTENTIAL SHORT TERM SOLUTIONS

There are a number of potential short term solutions and partial solutions that should be considered for implementation as soon as possible.

Perhaps the two most important are Multi-Port and a Digital Program Guide. MultiPort is a solution waiting to be implemented. It requires no further development, only cooperation between industries and commitment. This doesn't mean MultiPort cannot evolve to even more useful versions. Yet this potential for upgrade should not get in the way of a speedy implementation to help those presently living in scrambled cable systems. "Backwards compatible" upgrades that accommodate new technologies while continuing to serve older implementations are a feature of the Electronic Industries Association's standards process.

A second short term solution is the Digital Program Guide. This is an urgent matter because a number of agencies are working on conflicting versions. This has the potential of becoming another lost opportunity for cooperation between the Cable and the Consumer Electronics industries.

A third short term solution is the cable set-top box with two descramblers in it. One descrambler is intended for the TV receiver while the other serves the VCR.

Yet one more short term solution is the in-line descrambler that descrambles one channel at a time and places it on the cable at the point where the cable enters the house. All TV's and VCR's receive the descrambled channel just as if it were a trapped service.

MULTIPORT

What is MultiPort?

"MultiPort" is the commonly used name for the technical standard for the connection of descramblers to the backs of TV receivers and VCR's that are equipped with a special plug. The standard was developed and tested over a period of several years by engineers from the Cable and Consumer Electronics industries. The Joint Engineering Committee that did the work was sponsored by the Electronic Industries Association, EIA, and the Engineering Committee of the National Cable Television Association, NCTA. The standard developed by the EIA/NCTA Joint Engineering Committee was submitted to the American National Standards Institute, ANSI, and is now formally know as "The EIA/ANSI 563 Decoder Interface Standard".

The name "MultiPort" comes from the original intention of the Joint Engineering Committee to develop a standard that would have multiple applications in the consumer, cable, computer, and other related video fields. At one time the standard was referred to as "IS-15". This was while it was an "Interim Standard". It is no longer interim. It is a fully negotiated and accepted technical standard between the engineers of the two industries.

The MultiPort plug has 20 pins and looks somewhat like the plugs on the back of computers. It allows access to the internal circuitry of television receivers and VCR's in a manner that facilitates the operation of descrambler circuits. The video and audio signals go into and out of the television receiver or VCR and then into and out of the descrambler. In addition, a very critical signal is conveyed to the descrambler: the Automatic Gain Control, AGC adjustment. Without this signal, descrambling would not be possible for most systems.

An optional enhancement allows the television receiver's or VCR's remote control to communicate with the descrambler and the descrambler to communicate with the tuner in the TV or VCR. This means that Impulse Pay Per View, IPPV, ordering with the TV or VCR's remote control is accommodated. In addition, the descrambler can "force tune" the receiver to the correct channel to make certain functions such as Emergency Alert or pre-ordered Pay Per View programs easy to use.

Because video signals exit and enter the

MultiPort plug, such functions as On-Screen Displays, OSD's, for assisting the subscriber in ordering PPV and for electronic program guides are possible. In fact, because the video signals do not have to go through the tuner of the television receiver, the OSD will be much crisper and easier to read.

It is possible to connect multiple devices to a TV or VCR so that, for example, a Captioning for The Hearing Impaired decoder and a Cable Descrambler can be used.

What Are The Advantages of MultiPort?

The principal advantage of MultiPort is that is allows the descrambler to be connected **after** the TV's or VCR's tuner and remote control circuitry. **Scrambling becomes transparent.** The consumer regains all the functionality of his hardware. It is just as if the TV and/or VCR were connected to a video source which had no scrambling. In particular, the VCR's tuner is once again under the control of the VCR's timer so different channels can be easily recorded at different times.

The MultiPort descrambler avoids duplication of the TV's or VCR's tuner, remote control, and channel indicator. In addition it doesn't require a "remodulator" to condition the signal so it is acceptable to the TV or VCR. Not only do these missing items save money, they reduce the "bruising" the signal undergoes as it is unnecessarily processed in the conventional set-top descrambler. A further advantage of MultiPort is that the descrambler goes in back of the TV or VCR and thus is out of sight. This means its cabinet can be simpler with less attention and expense devoted to esthetics. The device is called a "set-back descrambler" rather than a "set-top". All of these factors will result in lower costs and significantly higher reliability. The latter advantage comes from two factors: 1) there are fewer components to fail, and 2) the amount of heat and power consumption is significantly reduced. Heat is the main killer of electronic components.

Isn't It Obsolete, What about Compression?

Some have said that the time for MultiPort has past. The world has changed and we now have GHz cable, Near Video On Demand, NVOD,

and Digital Video Compression. Their claim is that MultiPort cannot accommodate these new needs.

This not true. These arguments are a red herring based on misunderstanding.

According to Paul Kagen, there are currently about twenty million U.S. TV households which have addressable, analog descramblers. That means that **twenty million homes could benefit from the availability of MultiPort on their next purchase of a TV receiver or VCR.** This is a number which grows every year. When scrambling is installed in a cable system, it remains in place for ten to twenty years. This is because the capital investment and the commitment to training, inventory, etc. is huge. Almost certainly, any technological advances which occur in the next several years will not change this. Currently, the only electronic signal protection technology being purchased in volume for use in cable is analog based scrambling which can benefit from MultiPort. This will remain the case for a long time.

What about Digital Video Compression, DVC? This is a promising technology. At present no products exist to be purchased. The most optimistic scenarios promise hardware in three years. Initially, DVC products will be very expensive. The rate of penetration will be slow. It will most probably be a decade or more before the number of DVC units in use exceed the number of analog descramblers which would benefit from MultiPort. The mere promise of DVC is not a reason to shy away from a MultiPort implementation which will help millions of subscribers for more than a decade.

What about HDTV? This technology also is a few years away from implementation. Because of the high cost of HDTV receivers, it is likely that penetration of HDTV receivers and VCR's will take years. It is probable that HDTV penetration will lag the penetration of DVC units.

The EIA has a long history of compatible upgrades of standards. A standard is said to be "backwards compatible" if it retains compatibility with older units when it is upgraded to accommodate new technology. EIA/ANSI 563 should be implemented as soon as possible. Simultaneously, the Joint Engineering Committee should

begin work on defining backwards compatible advanced versions. These will probably be called EIA/ANSI 563 A, B, C, etc. just as other standards have suffix versions (such as the computer peripheral EIA standard: RS 232 C). This approach allows consumers to benefit from standards while providing for future upgrades.

Why Not Interdiction?

Some have said that MultiPort should not be implemented because Interdiction should be encouraged instead. This too is a specious argument which would deprive subscribers of an early solution to interface problems while promising a tentative future benefit. In fact, MultiPort does nothing to prevent Interdiction when, and if, it ever becomes practical. (Those who are interested in a Consumer Electronics friendly environment can't help but be enthusiastic about Interdiction, but a dose of reality is also important! Analog scrambling will be with us for a long time. Interdiction may or may not make an impact in that time. Both should be encouraged where they make sense.)

Interdiction is the process of protecting signals by jamming them with interfering signals when the subscriber has not paid. The hardware is usually located outside in the cable plant. The advantage is that the paid-for signals enter the home free of scrambling and can be simultaneously used on all TV receiver and VCR's.

There are several problems with Interdiction.

Most interdiction approaches result in the cable signals being "in the clear", that is unscrambled on much of the cable plant. In the section below, it is explained that there is a technical need to scramble even broadcast channels in some situations. Interdiction is not compatible with that need.

Interdiction is a technology which has yet to become practical. Only a few products have been offered for sale. None have achieved success. This is an expensive approach which adds more electronics and power consumption to the cable plant. This can only impact reliability and maintenance expenses in a negative way.

A cable system which is analog scrambled in

a manner that is compatible with MultiPort will not likely change out to an Interdiction approach until the investment in scrambling hardware is depreciated. Any other approach is simply wasteful and will raise subscriber costs.

Technical Need to Scramble Broadcast Channels

In cable systems in large cities with Multiple Dwelling Units the cable system is often installed from roof to roof. This is the only practical method of installation in these situations. Unfortunately, people climb to the roof and tap into the cable to steal the signals. There are technical problems caused by this which overshadow the loss of revenue to the cable system and the loss of franchise fees the city government expects. When these illegal installations are done, they nearly always are done in a manner which:

a) damages the cable, causing expensive repairs and occasional signal outages

b) allows signal leakage which is a hazard to aircraft navigation and communications, the emergency communications of police, fire, ambulance, etc., and commercial uses of radio. The FCC has rules about the maximum allowable leakage. When unauthorized installations are made, these rules are almost impossible to meet.

c) allows interfering signals to enter the cable and disturb the reception of legitimate subscribers, distorting their paid-for pictures

The only way to discourage these illegal and dangerous installations is to ensure that those who make these installations derive no benefit. All signals which would be attractive to the illegal installer must be scrambled on all parts of the cable plant. This includes basic and local broadcast signals as well. This precludes the use of such technologies as interdiction. Unless this is done, hazardous conditions will be caused by those acting illegally and paying-customers will suffer degraded service.

Why Hasn't MultiPort Been Adopted by Now?

To be successful, MultiPort requires the co-operation of Consumer Electronics manufacturers, cable operators, and cable descrambler manufacturers. MultiPort has suffered from a lack of patience. A few years ago a number of TV manufacturers, RCA in the largest volumes, produced receivers with MultiPort plugs. A number of box manufactures, Zenith most notably, produced MultiPort descramblers. Several cable companies stocked and supplied MultiPort decoders to those who requested them. Only Bang & Olufsen produced VCR's with MultiPort.

At that time the numbers were just too small and the patience too thin. The participants lost heart and gave up. The severity of the Consumer Electronics Interface with cable was not as well appreciated as it is now. At this point, each of the participants need assurance that the other two will do their share. This might best be accomplished with a requirement to implement that gives comfort that progress will be made.

The party with the least enthusiasm for MultiPort has been the supplier of descramblers. Several of these suppliers see MultiPort as a lower cost version of what they already sell and are reluctant to give up the incremental revenues. It is our conviction that there are several attractive alternatives for descrambler manufacturers: 1) the lower cost and increased consumer friendliness will stimulate a lagging market which has suffered from subscriber back lash over the inconvenience of it all, 2) subscribers will want one MultiPort device for the TV receiver and another for the VCR, and 3) cable operators will be able to spend more for the program protection circuitry since they no longer will have to purchase tuners, remote controls, channel read-outs and remodulators.

Those who are worried about business disruptions should take comfort in the fact that the sales of TV's and VCR's takes place at a steady and deliberate pace. The requirement to provide MultiPort will not change any business overnight. It will, however, provide an option for the consumer who wishes a cable-friendly installation and is in the market for a new TV or VCR. That is something that is simply unavailable now!

The Spoilers

It is important to recognize that a MultiPort equipped TV or VCR which suffers from the other deficiencies described in the section on the definition of "Cable Ready" will still require a set-top converter. The benefits of MultiPort will be lost if the TV receiver or VCR fails the other requirements for being truly "Cable Ready".

Industry Support

The CableLabs Board of Directors during its December 12, 1991 meeting endorsed the need for a Definition of "Cable Ready" in any Consumer legislation. Support for MultiPort was included in this definition in the case of scrambled cable systems. The NCTA Board supported MultiPort during its January 13, 1992 meeting.

DIGITAL PROGRAM GUIDE

The Digital Program Guide, DPG, is a concept which would provide a carefully specified data stream down most cable systems. This information could be used to greatly simplify the use of cable. The data stream would provide data about cable programs and their schedules as well as a few details about their content.

In-home hardware would use On Screen Displays, OSD's, to present the information to the subscriber in a convenient format. The subscriber would be in a better position to take maximum advantage of what cable has to offer. This would increase the value of the cable subscription and the satisfaction of the subscriber.

More advanced versions of the DPG would use techniques to control the VCR directly. A subscriber would not have to program his VCR in the conventional, confusing way. It would be significantly simplified.

Still more advanced versions would use memory and microcomputer power to advise the subscriber about program which may be of interest. Viewing would be enhanced.

Free or Pay?

A fundamental question is whether the DPG should be "free" to all subscribers or a separate

pay service. Since nothing is really "free", the question boils down to whether its costs are lumped into the basic cable bill or are a separately charged item.

The arguments for a separate charge are based on the fact that this would be a truly useful and valuable service. It would greatly enhance the utility of cable. Some would argue that on that basis it should bring revenue. Still another argument in favor of a fee for this service is that those who don't want it won't pay to subsidize its use by those who do use it. Yet a third argument is that other services can be added to it to create a new "information age" business. The investments made by some cable operators in guide services further clouds the issue.

Estimates on the price of a guide service range from $12 per month to $2 to $4. The high end has been proposed by entrepreneurs outside the cable industry with little first hand knowledge of cable economics.

The arguments for a "free" service are based on the benefits of universal usage and the desire to avoid the hassles of a pay service. If the DPG improves subscriber satisfaction as much as anticipated, it may be in everyone's best interests for it to be included in the basic service. Not only will it help subscribers understand the services they have signed for, but is will help them understand what they are missing. As such it may be a powerful promotional tool.

There is good reason to wish to avoid the hassles of a pay service when the expected fee is just a couple of dollars a month. Making the DPG a pay service requires:

    a) addressability

    b) encryption or scrambling

    c) billion, and

    d) a continual fight against piracy.

Those functions may be too expensive for a $2 to $4 per month service. Put another way, these functions would eat up most of the margins of such a service.

Perhaps the strongest argument for a "free" service is that it would encourage the Consumer Electronics industry's participation. This would save the cable industry from yet another capital investment for in-home hardware while yielding significant advantages.

DPG in TV's and VCR's

The best place for the DPG is in the VCR. The second best place is in the TV. Next on the list is a subscriber owned stand alone box. The least desirable location is in the cable set-top box. Here it adds capital costs, heat build up, and reduces reliability.

If the DPG is in the VCR, it is best situated to make VCR operation easy. The subscriber moves the cursor next to the program he wishes to record and presses a "record" button. The VCR has all the information it needs to implement the command. Unlike external devices (such as the VCR Plus described above), a built-in DPG has access to information about the current status of all internal controls. For example, many VCR's have a manually operated switch which determines whether an input from the video terminals will be recorded or an output from the VCR's tuner. A built-in device will have access to this information. An external device has no way of knowing.

A built-in DPG knows if a tape is present. If the VCR records time codes on the tape, the DPG can even know if enough tape remains to accommodate the desired recording.

It is possible to put a "stick on" magnetic stripe on the tape cassette. Loading the cassette into the VCR moves it past a simple, inexpensive magnetic head which reads the magnetic stripe. Ejecting the tape again moves it past the head allowing more information to be added to the magnetic stripe. The information on the magnetic stripe comes from the DPG. An index of what is on the tape and its location is provided. This can be displayed with an OSD. This kind of functionality will not be possible in an external unit.

It is not likely that the Consumer Electronics industry will pursue a built-in DPG if its signal is not (almost) universally available.

Advanced DPG Features

One of the exciting possibilities of the DPG concept is to allow the creativity of cable vendors and Consumer Electronics manufacturers to enhance the utility of the DPG. They can decide how the guide should look on the screen and how its information should be accessed. Different brands will implement different "looks" and "feels" to the operation of the guide. Features can be added in higher priced models. At the bottom of the line might be a one-day guide while the top models may do a month.

Since the DPG contains some content information, a "Mood Guide" may be implemented. The subscriber can indicate the kind of programming he is "in the mood" for and the advanced DPG would inform him of his options. A still more advance version could keep tract of what has been watched and "learn" the viewer's preferences. Based on this analysis, the DPG could advise the subscriber of what is likely to be appealing. This could be done separately for each family member.

Urgency

There are a number of entities working on proprietary versions of a DPG. If these issues are not settled soon, the opportunity for an industry wide universal DPG will be lost. We will be faced with a multitude of incompatible approaches with little hope of having a DPG built into Consumer Electronics products.

VCR DESCRAMBLER

A number of cable descrambler vendors are working on versions of their products with two descramblers and two tuners. The motivation is to eliminate the constraint which prevents the simultaneous taping of one scrambled channel while viewing another scrambled channel.

As an alternative use of such a device, the PIP feature can be used with two different scrambled channels.

The advantages of this device is that is can simplify VCR usage. It may be slightly cheaper than two set-top descramblers. It solves the remote control problem in that two boxes with the same remote control codes is avoided.

The main operational disadvantage appears to be an inventory problem. A secondary disadvantage involves generating sufficient industry support to encourage manufacturers to design and produce such a unit in a cost effective manner. An industry position expressed in purchase orders is needed.

IN-LINE DESCRAMBLER

The in-line descrambler occurs in at least two forms. The first removes a scrambled channel from the cable, descrambles it, and then reinserts it back into its original spot. The subscriber enjoys the same kind of benefits as in the case of negative traps. The major difference is that this is an addressable approach. The re-insertion of the signal is difficult to accomplish without harming adjacent channels.

The second in-line descrambler approach places the descrambled channel in another part of the spectrum. A major advantage of this method is that it is easier to accommodate multiple channels. Only one channel is placed on the in-home cable system, but it can be chosen from several scrambled channels. This approach accommodates IPPV. Selection can be made either with a remote control whose signals are relayed to the in-line descrambler or using Automatic Number Identification, ANI, and phone calls. Techniques like this have been proposed for the 1992 Summer Olympics.

NEW TECHNOLOGY, NEW URGENCY

There are a number of technical developments which make the issue of Consumer Electronics interface urgent.

Near Video On Demand

The initiation of Near Video On Demand, NVOD, in Queens New York along with other forms of multi-channel IPPV has increased the interest in addressable signal protection. If we are to avoid a subscriber back lash, we need to implement these services in a Consumer Electronic friendly way. Otherwise, the growth of these services will be impaired and the results disappointing.

Digital Video Compression

Perhaps the most exciting current topic in cable is Digital Video Compression, DVC. It promises hundreds of channels for a variety of applications. Implementing DVC in a Consumer Electronics friendly manner will be a significant challenge. Once again, the promise is of more set-top boxes to get in the way of the remote control and VCR timer. The cable industry would be well advised to search for solutions which avoid new subscriber hassles.

HDTV

Fortunately, HDTV is building on the Multi-Port experience. A couple of industry committees are working to minimize the problems NTSC has experienced in signal security.

CONCLUSION

The importance of the Consumer Electronics interface with cable is more important than ever. Old solutions need to be implemented. New solutions for new technologies need to be found and implemented in a backwards compatible manner. If cable services are to continue growing, this important aspect of subscriber satisfaction needs serious attention and commitment.

THE AUTHOR

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He has nine patents issued. He has presented over a hundred papers and published about fifty, two of which have received awards from the Institute of Electrical and Electronic Engineers.

He is currently chairman of the Technical Advisory Committee of CableLabs. He serves on the Executive Committee of the Montreux Television Symposium. Walt is a Fellow of the IEEE, a Fellow of the Society of Motion Picture and Television Engineers, and a Senior Member and member of the Board of Directors of the Society of Cable Television Engineers. Other memberships include Tau Beta Pi, Eta Kappa Nu, and Beta Gamma Sigma. He has served on several industry standard-setting committees. Current interests center on cable-competitive technology, the consumer electronics interface with cable, video compression, and High Definition Television.

Walt received the 1987 NCTA Vanguard Award for Science and Technology. Communication Engineering and Design magazine named him 1990 Man of the Year.

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