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## INDIA'S LARGEST MAGAZINE EXCLUSIVELY FOR SATELLITE & CABLE TV

### ADDRESSABLE CABLE TV SYSTEMS :
*An affordable Pay-TV solution*
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This series of articles will explain the workings and implementation of an addressable cable TV system. Over the course of a three part series, the benefits of implementation will be examined, and within this realm, the market position and options for a turnkey solution will be defined (Part I). The writing approach is deliberately angled towards the goal of every cable TV operator; Increased revenue.

Part II of the series will continue the vein with a breakdown of the main addressable system components. We will look in depth at just how control software, encoding equipment and addressable set-top boxes perform in a modern Pay TV operation.

Finally, part III will analyze advanced options and economic realities associated with the systems, concluding with advantages and disadvantages in order to present the technology in an objective light.
The existence of an addressable cable TV system is nothing new. With the first addressables being installed in the late 1970's, the technology can now boast a 25-year history. What is new, particularly over the past few years, is the emergence of addressable systems that are affordable to all cable operators. Previously, only the largest operations could justify the outlay and risks involved, but, as a result of manufacturing competition in the 1990's, system prices have now fallen dramatically. Decoders, the heart of an addressable system, can be bought today for under US$100, and the cost of supporting head-end equipment has also tumbled down.
But this is not the only good news for cable operators. As prices have fallen, operators have demanded more for their money; Features that were luxuries only a few years ago are now considered standard, and a whole new selection of advanced features have filled the void.

There has never been a better time to invest in the future, with low prices and high attractions easing the marketing strains of the past. Cable operators implementing new systems have been able to wield unprecedented control at the same time as offering their subscribers set-top boxes they actually want to use. Gone are the days of persuading people to put an ugly box on top of their TV. The attractive new generation of set-tops are packed with so many features, users are only too happy to take them in.
Market Positions
The latest figures show an estimated 60,000 cable operators throughout India. The number includes all operations from the smaller country services to the spiralling city networks, but ultimately all have the same goal; Each wants to collect additional revenues for Pay channels.

And it's this issue that leads us to a topic of much debate; How to charge for the service?
Traditionally, channels broadcast have been charged for collectively, using a fixed monthly payment of around 75 to 200 Rupees. But with such a method, beyond the fixed monthly charge, the cable operator cannot collect or justify additional charges… due to lack of individual billing.

The finance of a cable system has become more complex recently. With the introduction of so called 'premium' satellite channels, such as ZEE CINEMA and STAR MOVIES the cable operator is forced to pay heavy subscription charges to remain up-to-date and competitive with his rivals. It is up to the cable operator to then reclaim the money spent; by increasing revenue generated from cable TV subscription.

It is not fair that all subscribers have to pay for PAY channels, whether they watch them or not. This is so because the cable operator does not have the means of billing a subscriber on an individual basis.
The future can only get more complicated; more channels, most of which will be premium-satellite, "Pay TV" style, will increase the financial pressure.

Fig3: Addressable Cable TV application
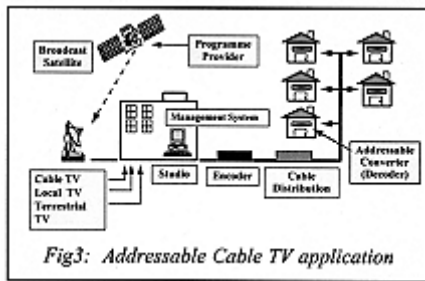
So what's the way out of this payment spiral? How can operators increase subscription revenue to counter the constant premium channel demands?
The answer lies with payment structures, brought about with the introduction of scrambled channels.

If operators can SCRAMBLE channels such as ZEE CINEMA and STAR MOVIES, to really control channel transmission, then a charging structure can follow. And it's a charging structure that can then apply to all future Pay TV channels, such as ESPN, HBO and others.

But what, exactly, is 'Scrambling'? It's certainly a fashionable terminology, but sometimes it is misunderstood. It's the electronic process by which Video and Audio reception of a channel is made unintelligible except to those who posses special equipment that can put together, or 'Descramble' the scrambled signals. We will look in detail at just what this means in Part II of the series, but for now let us continue with the payment of channels using the 'charging structure' discussed.

Until now there were no affordable systems available that would allow cable operators the control to charge subscribers on an individual basis. It's this idea of treating each user as a separate entity that moves cable TV on from old-style 'blanket' charges, to a new dynamic approach. When the users are individually served, both the justification and the means exist for a money generating, charging structures.
The last few years have seen advancements in exactly this area. With the establishment of low-cost Addressable Cable TV Systems, the scrambling of premium channels is made possible. And with the ability to scramble, comes this ability to target services and thus increase revenue.

Addressable Cable TV Systems allow the cable operator to scramble any channel. That is to say, the TV signal received at a subscriber home is authorized or not, completely at the control of the cable operator.
A fundamental concept of addressibility is the almost unlimited choices available. It is a programming tiered system, which means there are clear levels of control. All channels do not necessarily need to be scrambled.
In the simplest form, no scrambling is performed at all. This is known as a 'Basic' tier. Existing local TV broadcasts are likely to fall into this level.

The next tier, where the scrambling of each channel is controlled, is known as 'Premium'. This is perhaps most likely to develop within the Indian market, with channels such as ZEE Cinema.
Finally, the highest tier, that of 'Pay-Per-View' can allow operators to scramble, not just channels, but individual programmes. When broadcasts can be controlled within slots of time in this way, subscribers can pay only for what they view. Though perhaps not obvious, this method has proven in world-wide markets to be the highest revenue earner.

The levels of control don't stop there. In addition to those described above, user levels and programme levels are extensively supported. Good addressable systems allow as many as 32 user levels and 16 program levels. This means social and cultural sensitivities can be accommodated with full programming options. Government restrictions, religious, political, racial, adult and violent programming; can all be graded in such a way that correlates the suitability of the user with the transmission.



Figure 2: Traditional Cable TV application (Non-addressable)
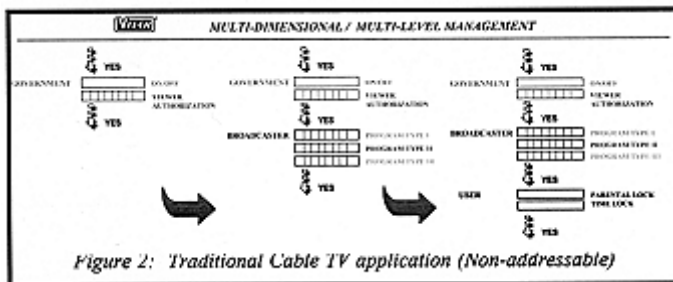
Typically the highest conceptual level is Government. This is represented in Figure 1. Reading left to right a simple principle applies; an function overrides viewing control, and assuming the setting in ON, an authorization level can then be defined. The principle holds for Broadcaster control and finally even User control. Broadcasters handle their control by defining the programming into categories (outlined with government ratings), then each user has the control of their set-top using 'Parental Control' settings. It all means that layers of protection are set out to protect incorrect viewing reaching the wrong viewers.
Children are an obvious example; The government outlines a film classification for the first level of control, then the broadcaster defines programming times and levels in order to conform to government guidelines for level two. Finally, the Parent may still not approve of the films' suitability so they lock the set-top with a security code. This is the third control level.

All this is supported with Addressable cable TV systems.
In fact, the controlling principle is exactly that causing a technological gold-rush in the USA. Addressable systems designed in recent years include software implementation of the "V-Chip", the new government-backed chip that must appear in each TV-set in America. Programming control is here to stay; at all levels, so the best Pay TV systems will be those that provide for future constraints. It will simply be unacceptable to broadcast, say, violent programmes to the wrong cross-

section of viewers. So systems are needed to turn this headache into an advantage.

The advantage comes with the 'addressibility' concept. 'Addressibility' is the control of the cable subscriber base, such that every user is uniquely identifiable. The idea is very similar to the address of a persons home. Each set-top in an addressable system has a unique address. A number programmed inside the unit that identifies it from all other set-tops in the system. When each set-top is uniquely identifiable it becomes simple for the head-end, given the right equipment, to turn on and off the scrambling of each chosen channel or programme.

For example, if user 344 has not subscribed to STAR movies channel, at the click of a button user 344 can be de-authorized from watching STAR movies. And if they now call up to subscribe…. another click will enable clear reception. The idea is all based around the internal number of each addressable set-top; The set-top 'address'. A good way to think about an addressable cable system is to think about directing programmes and channels exactly to those users suitable. For example, a big cricket fan is surely going to want a premium sports channel, and so such viewers can be directly 'targeted'. Addressibility lets the scrambled channels find the right viewers by 'targeted viewing' from the head-end. It must be the aim of each cable operator to please every Sports, Movie, News, Cartoon or General Interest fan, in order to gain maximum revenue!

### IMPLEMENTATION
We will describe in detail the component operations of an Addressable system in part two of this article series. But as a brief insight, we can look now at a system level description, and how it compares with traditional cable TV broadcast practices. First let us look at a set-top converter style cable network. The existing set-up of a CATV system, where all channels are broadcast without scrambling, is likely to resemble Figure 2.
Looking at the diagram from left to right, we have the TV broadcast studio with various AV sources from satellite or other input feeds. After some signal manipulation, the TV channels are distributed to the subscriber's homes. The 'cable distribution' box indicates the modulating, combining, amplification and attenuation processes involved.



Fig3: Addressable Cable TV application
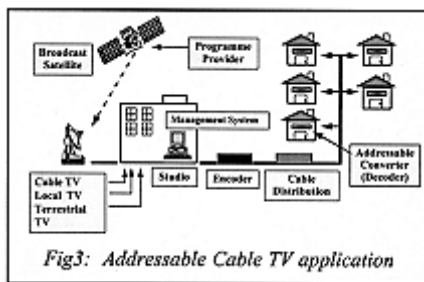
Finally, in the subscriber home, the signal is received using a set-top converter, and passed to the television.
With this diagram in mind, we can easily examine the options available to the cable operator for 'Pay TV'.
But first we should consider a simple definition, "How to describe Pay TV programming?"
It is the transmission of channels to subscribers with some form of scrambling. Or put another way, it is the decision to allow one or more channels to be descrambled and thus viewed.

### Pay TV options
Pay TV methods have been established over the last 15 years or so and can be broadly viewed as two options:
1) Traps
2) Addressable Converters
Both these options supply levels of 'secure' programming. Broadly speaking, traps offer low security and addressable converters offer medium to high security. The exact level depends entirely on the scrambling technique used in both cases.

The Pay TV options can be broken down further of course. For example, you can use, or may already be using, negative or positive traps. Similarly, the domain of addressable converters is by no means one option. Currently available addressable converters provide a range of configurations, including one-way operation or return-path, pay-per-view or fully interactive, digital or analog… the list goes on. The focus of this article is the most likely next step for a market such as India. In India, millions of TV's require channel expanders (set-top converters) because these TV's do not have the ability to receive all channels. Also, such TV's don't have remote controls for channel/volume changes, or even turning off the power of the TV. The Indian Pay TV option is either to use the old set-top converter set-up and then have the additional cost of operating traps, or kill two birds with one stone by using addressable decoders* , which offer the features of converters, traps and some more besides.
Strictly speaking, for most households in India, two options exist for Pay TV; Addressable Decoders against traps (with set-top converters necessary).

The decision between these options, for anyone setting up a cable TV system from scratch, is quite simple. Addressable converters by far out-weigh traps in almost every respect. The following disadvantages of traps give rise to this conclusion;

- Traps have a low security level.
  The piracy of trap-based systems is well documented; though this is a cheaper option, the security level is not high.
- Traps have very little versatility.
  Having decided upon a set-up, changing that set-up is costly, troublesome and time consuming.
- Trap operation often relies on physically hiding the device at the user-end; this almost always means burying.

Again, this practice is out-dated and troublesome.
It is important to consider the direct comparison between set-top converters with traps and addressable decoders.

Good quality set-top converters in India, with remote and volume control, are selling in the range of 3,000 to 5,000 Rupees. These converters are a considerable investment by a subscriber and they will not be replaced for a long time once the consumer has purchased. These converters must then be added to the cost of traps; one trap for every Pay TV channel.

For slightly more money, a cable operator can sell a much higher quality addressable decoder, which will do all the functions of a normal set-top converter and offers the cable operator a future option to start scrambled channels; whenever he is ready. There is no need for the cable operator to sell set-top converters when they can sell an addressable decoder. With knowledge of trap disadvantages and a knowledge of how hidden costs distort the balance, it is easy to see why new operators almost always implement addressable decoder systems. A different scenario however, is where an operator already running a trap based system, switches to an addressable converter system. The decision is not so obvious; the financial outlay may deter common-sense instinct.

Ultimately, it comes down to how long the operator intends to be in the cable TV business. Trap operation is a short-term solution suitable for operators who do not plan to stay in the business in the long term.
The addressable system An approach for long-term thinkers who plan to stay in the Pay TV business for a considerable time is an addressable decoder system. All the arguments against traps are solved with the adoption of an addressable system.

Figure 3 outlines an addressable cable TV application. In this diagram it does not look too different from a normal (Non-addressable) cable TV network. You can forget the digging in the ground and hiding hardware; the user-end is now fully incorporated within the addressable set-top converter. The difference to the user is that now they have many more features and instead of talking about a converter they will talk about a decoder.
The difference at the head-end is more obvious.

An Encoder will be needed in your equipment rack at the studio and this will most often be linked to a computer that handles the timing and operation of the Encoder. The main Encoder function is to scramble the AV signals received. Basically, the AV signals are generated in the usual form (either as a satellite signal or local source), then encoded, distributed, and finally decoded. Finally, one more new function must be served at the head-end when using addressable systems; the management of the subscriber authorization.
In Figure 3 this is represented by the term "Management System".

With these three components; Management system, Encoding set-up and Decoders, all the necessary ingredients are present for addressable system operation. There are no hidden agendas because the function in itself is a simple one. Encode-transmit-decode, with the management system ensuring the correct signals go to the correct viewers.

Part II of this series of articles will look in some depth at these three addressable system components;
- Management System
- Encoding set-up
- Decoders

With details on the subscriber information storage and how that correlates to the authorisation of different user classes. Then how that information is transmitted and what an operator can expect in terms of scrambling schemes. Also the critical discussion of decoder operation and features, and how they will enable the subscribers to enjoy the benefits of modern Pay TV broadcasting.

* An 'addressable decoder' is the same as an 'addressable converter', an 'addressable set-top' or an 'addressable descrambler'. All four terms are commonly used and interchangeable. Throughout this text the most common term, 'addressable decoder', will be used where possible.