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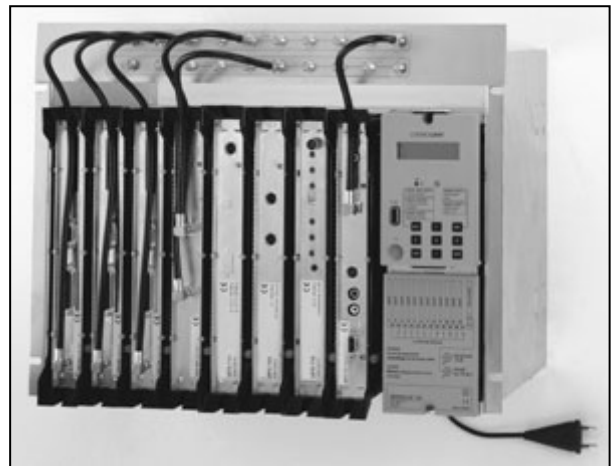
Small Networks - Go Digital with TRANSMODULATORS

Transmodulators Can Provide A Basic Low Cost Digital Headend To Be Set Up For Just Rs 1 Lakh Or Less ! However, this Cannot Provide Pay TV Services.

India is one of the world's largest cable TV markets besides providing entertainment to over 50 million cable TV homes, cable networks in India had the option to receive from a choice of over 500 television channels.

Indian Cable networks have been quick to absorb latest international technology. Large networks in the country already offer 860 MHz bandwidth, fibre optic backbone, cable modem service and recently digital CATV.

Setting up cable TV head end, offering pay services (CAS) is an expensive option. Professional CATV digital head end with CAS can easily cost over Rs. 4 crores. Clearly, these large amounts make it unviable for small cable networks to offer digital CATV to their subscribers.



Digital cable TV services rolled out currently in the metro cities were primarily designed and installed to provide pay TV. (CAS). With the Govt. having reneged on CAS, besides Chennai no cable network in the country offers CAS. The lack of CAS is not because cable networks cannot or do not want to provide it simple because the customers have rejected CAS.

Despite the CAS confusion, pay channels continue to proliferate. Indian skies already offer more than 150 channels specifically targeting Indian audiences. Clearly all these cannot be carried on analog networks even though the analog networks are upgraded to the fullest extent provided by technology i.e. 860 MHz. An 860 MHz analog CATV network can carry a maximum of 106 analog TV channels. In fact, due to ground realities such as Doordarshan's terrestrial transmission as well as pager interference and bandwidth required for cable modem services, an 860 MHz analog CATV channel cannot carry more than 100 channels.

Existing television bouquets such as those from Star, Sony and Zee continue to add channels. In addition new broadcasters continue to emerge in the Indian market. These broadcasters approach cable operators for carriage, using every tactic possible - ranging from request and payment of carriage fee to illegal threats of withdrawing bouquet if new channels are not carried.

DIGITAL OPTION

Digital cable TV provides an elegant solution to the bandwidth crunch. A single 8 MHz analog channel can be substituted by a group of 6 to 12 digital cable TV channels. Hence if just 10 analog channels are pulled out, they could provide bandwidth for over 100 digital channels instead.

UPGRADE: ANALOG OR DIGITAL ?

Most networks through out the country, even in the smaller towns and cities, are 550 MHz capable. The 550 MHz bandwidth can support maximum of only 69 analog channels.

The plethora of Indian channels including region specific channels available from Satellite push cable operators, even in the small towns and cities to increase the channel carrying capacity on their networks.

ANALOG UPGRADE

One option is the analog upgradation of existing networks. This is the most logical step. It requires replacing all amplifiers in the network from 550 MHz to the next level of either 750 MHz or 860 MHz. Besides upgrading and relocating the amplifiers, an attractive option is to upgrade the trunk to fibre. Fibre optic cable is now available at less than Rs. 10 per meter. Optical transmitters are available from just Rs. 25,000 upwards and Fibre optic node can be purchased for almost the same price as a cable TV RF amplifier.

Hence Fibre optics provides a high technology, low cost upgrade path.

DIGITAL UPGRADE

However, Digital compression also provides the ability to upgrade the existing plant (without upgrading any analog distribution hardware) to practically an unlimited capacity of digital channels.

Just for argument sake, if the 69 analog channel capacity of a 550 MHz CATV distribution network is fully deployed for digital channels, it will support over 700 digital channels! All these without any change in the distribution networks. Changes only need to be implements at the head end.

If The 69 Analog Channel Capacity Of A 550 MHz CATV Distribution Network Is Fully Deployed For Digital Channels, It Will Support Over 700 Digital Channels!

DIGITAL HEAD END

Digital head end is an extremely sophisticate and advanced system, that can cost over US \$ 1 million (or Rs. 4.5 crores).

InCableNet and Siti Cable in Ahmedabad have rolled out digital services on their existing 550 MHz analog distribution networks. Most interestingly, these digital head ends have been set up with a total outlay of probably less than Rs. 1 lakh, offering 40 to 50 digital free to air channels.

The Miracle product that enables this is the "Transmodulator". It must be clearly kept in mind that digital solution provided by the transmodulator, can currently support only free to air channels. It is not possible to currently use this scheme to provide digital pay TV channels from multiple bouquets to subscribers.

Siti cable in fact has the advantage of being part of Subhash Chandra's group of companies, which include Dish TV - India's only pay DTH service. The transmodulators can be used to receive DTH signals and distribute them digitally, on a cable TV network.

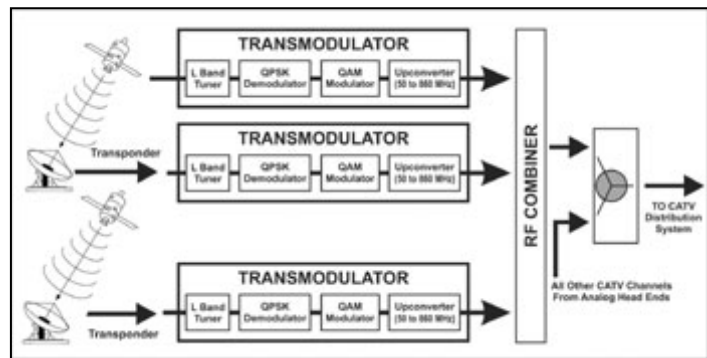


THE TRANSMODULATOR

Fig. 1 shows a simple block diagram for a Transmodulator based Digital Head End.

Satellite TV broadcast digital signals using QPSK modulation. On the other hand, digital cable TV signals utilise QAM modulation.

The Transmodulator simply converts or transfers the QPSK modulator signals to QAM modulator signals. The QAM signals are also down shifted in frequency to any frequency band from 48 MHz to 860 MHz. If required the Transmodulator output can be set to provide signals between 300 MHz to 450 MHz. Such signals can be easily carried on any 450 MHz networks or 550 MHz networks.



Allocating the digital channels (Transmodulator output) to any frequency above 300 MHz has the advantage that in the UHF (above 300 MHz) frequency band, each analog channel in the PAL-G system is 8 MHz wide, which is the standard for 1 unit of a digital data stream.

As indicated in Fig.1, the transmodulator directly receives the output from an LNB. It simply changes the modulation and down converts the frequency from all channels received from that LNB, irrespective of the actual no. of digital channels on the LNB.

If a transponder of particular polarity carries 10 digital channels, a single transmodulator will provide 10 digital channels at the Cable TV head end.

A Single Transmodulator Will Convert All TV Channels On A Satellite Transponder, To Digital Cable TV Channels.

Let us take the example of the INSAT 2E Satellite. This satellite, located at 83 degrees east carries a large no. of Doordarshan and private free to air channels.

The entire bouquet of Doordarshan channels is available on the satellite, free to air. These can be carried as digital cable TV channels using transmodulators.

Similarly, the INSAT 2E satellite carries a bouquet of ETV's regional language channels. The entire ETV bouquet can again be serviced using a single transmodulator.

WITH FTA DTH TOO !

Another interesting and efficient solution is to use receive the DIRECT + DTH bouquet from Doordarshan's Ku Band Transponders. These provide a large number of Doordarshan and Free to air private channels spread over just 4 Transponders. Effectively this will yield almost 35 Digital free-to-air channels against a modest outlay (approx. Rs 1 Lakh) of just 4 transmodulators.

"CHERRY PICK" TRANSPONDERS

In this manner, cable networks in India can pick satellite specific transponders that each carry the maximum number of free to air digital channels. These can then be down converted using a single transmodulator.

It may be prudent to restate that a simple transmodulator cannot remove or insert an encryption system, by itself. Hence a low cost transmodulator solution can only be deployed for free to air digital channels available on Satellite, to be converted to free cable channels.

While free cable channels do not provide any additional recurring revenues, they certainly ease the channels capacity crunch.

As an example, InCableNet in Ahmedabad has shifted out all Doordarshan channels from a channel of bouquet to its digital bouquet. Only the "Must Carry" Doordarshan channels continue as analog channels. This move alone, using low cost transmodulators frees up almost 14 analog channels.

Each of these analog channels vacated could fetch handsome carriage fee for the cable network.

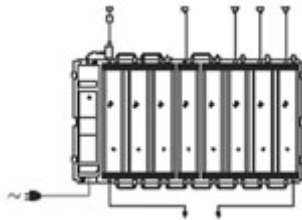
On the other hand, consumers are rewarded with digital cable television for a fairly reasonable (approx. Rs. 4,000) one time cost of a digital set top box. There is no recurring monthly additional fee for receiving the free to air digital channels.

ANY DIGITAL STB

Since the digital cable TV channels are not encrypted, they can, in principle, be received by any digital STB. Hence the customer can even purchase their own digital STB if available in the open market, configure and use it with their TV set.

Of course, configuring the digital STB will dissuade many who would prefer to purchase the product, backed by a warranty, supplied by the cable operator.

HEADEND CONFIGURATION



The head end configuration for the Transmodulators is very straight forward. The configuration is also shown in Fig. 1.

The IF input from each LNB is fed into the specific transmodulator.

Much like analog modulator, the output of multiple transmodulator is combined together and then finally mixed with the combined outputs from the analog modulators.

The output frequency of each transmodulator is set by the user as desired. As indicated earlier in the article, setting the digital output frequency between 300 MHz and 450 MHz is ideal for Indian cable TV networks. Using this frequency band, the networks do not need to upgrade their distribution plant. Also these frequencies are in the UHF band providing the required 8 MHz frequency spacing per analog channel compared to 7 MHz allocated for VHF frequencies i.e. frequencies below 300 MHz.

SIGNAL LEVELS

The transmodulators provide digital signals with QAM modulation. These signals need to be adjusted 10 dB below the analog signals, to avoid interference.

QAM MODULATION

The transmodulators also allow setting of the density of QAM modulation. QAM modulation is possible with 16 QAM upto 256 QAM. 256 QAM can squeeze many more digital channels in an 8 MHz analog bandwidth. However the more dense QAM modulation is easily affected by noise and poor transmission due to an imperfect distribution plant.

Keep in mind that the transmodulator can only provide channels it receives from a single transponder. In most cases, a single transponder really provides more than 6 channels. In such a situation, the QAM modulation can be set for QAM 64. This provides an ideal compromise on digital channel density and ease and robustness of transmission.

COST OF TRANS-MODULATORS

Simple transmodulators are quite inexpensive. Though currently transmodulators are not stocked by Indian CATV distributors (due to lack of demand) these can be provided against orders. A typical, "non-intelligent" free to air transmodulator will cost approximately Rs. 25,000 each. Keep in mind that this investment of Rs. 25,000 will yield typically, 6 to 10 digital channels !

Most sophisticated transmodulators are also available, which accept SMART cards for decrypting pay channels. The encryption supported will vary from manufacturer to manufacturer.

Usually the NDS system utilised by Star TV will not be supported by such SMART card based transmodulators, because NDS policy does not allow for it. Conax and Iredeto SMART cards are frequently supported. Of course, the relevant broadcaster's (e.g. Zee Turner, One Alliance, etc.) permission will have to be sought for using SMART card based transmodulators. The broadcaster will have to provide multiple SMART cards for the same channel, one for the analog decoder and another for the transmodulators.

Of course, keep in mind that SMART card based transmodulator will be very substantially more expensive than their free to air counterparts.

OTHER ISSUES

In a digital cable TV bouquet, the "SI" (System Interface) carries full details of the organisation of digital channels. The cable network can easily group channels by genre. As an example all general entertainment channels can be grouped together, all news channels could form a separate group etc. Any number of groups and clusters can be configured by the cable head end. New channels can be added to any group without disturbing the channel numbers of the other group.

The system interface therefore plays very crucial role in presenting the digital channel in a user friendly manner.

The low cost transmodulator does not provide the facility to add external system information from the cable head end. It will continue to carry the system information from the satellite bouquet itself. As a result, the digital head end based on low cost, free to air transmodulator may have more than one channel designated as Channel No. 1. In fact each channel No.1 from different satellite transponders will carry the same label on the cable network.

Ofcourse, these channels will not interfere with each other to produce distortion on the TV screen. They could however provide less user friendly presentation of digital channels on the Cable TV system, for the end user.

SUMMARY

Transmodulators provide practically a "Magic Bullet" for cable networks to incorporate digital channels at an extremely low cost. A Rs. 25,000 transmodulator can provide 10 digital channels yielding a cost of just Rs. 2,500 per digital channel !

Of course, consumers will need to purchase an extra digital set top box at their own expense (typically Rs. 4,000 each). However this solution provide tremendous benefits to the consumer who can , using the digital set top box view 50 or more additional cable TV channels on their TV set without recurring, additional monthly subscription fee.

For the cable network also, transmodulators provide a low cost solution to the bandwidth limitation on existing analog cable TV networks. The additional digital channels are provided on existing analog cable networks, even 450 MHz or 550 MHz analog cable TV networks, without the need to upgrade the existing distribution plant to 750 MHz or 860 MHz.

The only question remains Will consumers today, spend the marginal extra Rs. 4,000, as a one time expense, to receive additional free to air channels ? ■

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