OFF-PREMISES ADDRESSABILITY, IDEAS TO APPLICATIONS

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ABSTRACT

The "Idea" of off-premises addressability was introduced to the cable TV industry several years ago. Since that time, several manufacturers have undertaken the task of translating those ideas into the reality of off-premises addressable systems. Each has taken a somewhat different approach to the problem and the resulting systems are now entering the "application" stages. Production of system hardware has begun and systems are ready for installation on a practical basis. This paper presents a viewpoint on why and how the off-premises addressable systems were developed. The characteristics of the Texscan "TRACS" addressable converter system are described with discussion of how off-premises systems may be applied in present and future cable TV systems.

INTRODUCTION

A new generation of off-premises systems is presently being introduced on a practical basis in the CATV industry. The idea of off-premises addressability is not really new; in fact, off-premises addressability has been available in the form of addressable taps for some time. The new systems now finding their way into the marketplace are the product of natural evolution and growth resulting from similar evolution and growth in the CATV industry. It is appropriate to examine some of the factors which influenced (and continue to influence) the development and application of these systems as well as reviewing some of the important features of the various systems themselves.

EVOLUTION OF THE REQUIREMENT

First, it is important to remember that the basic objective of a CATV system is to provide quality communications services and make a reasonable return on investment while doing so. Although this may be a little oversimplified, it is still fair to examine any anticipated change in a system against this criteria. That is, does it provide better service or better profitability or both?

The advent of premium pay services provided a means of increasing revenues by offering a product which the customer perceived as more valuable. However, this resulted in a problem of controlling access to these services and managing frequent changes in levels of service without incurring significant customer service costs. Addressable systems evolved to meet this need. But the addition of addressability to the subscriber's set top converter added significantly to the cost of the equipment installed in the subscribers residence where it was out of the operator's control and subject to loss or tampering. The idea of off-premises addressability arose as a potential solution to this problem, providing the advantages of addressable control while avoiding the increased risk of loss.

THE SYSTEM EFFECTS

The effects of this evolution in systems can be seen by examining a model in each of the configurations of non-addressable, addressable and off-premises addressable systems.

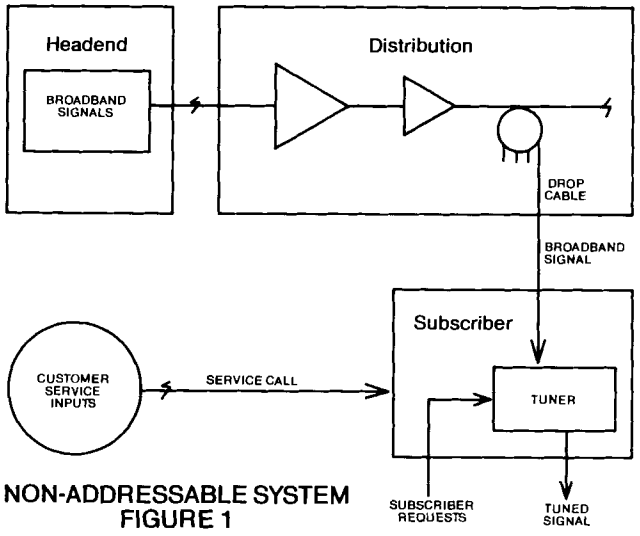
Non-Addressable Systems - In a non-addressable system, the headend provides the programming signals, the distribution system carries it to the subscriber's residence and the tuner (converter) allows the subscriber to select what he wants. The entire spectrum is available for his selection. Access control is exercised by external means (scrambling or traps) which may require comparatively minimual investment but larger operating expense due to continuing service requirements and theft of services and equipment. Figure One illustrates this configuration.

Addressable Systems - To implement addressability in this model it is necessary to add a control computer at the headend, a data communication path between the headend computer and the subscriber converters and add a control mechanism in the subscriber converter. Figure 2 illustrates this configuration. The changes in customer service level are entered into the headend control computer which interprets

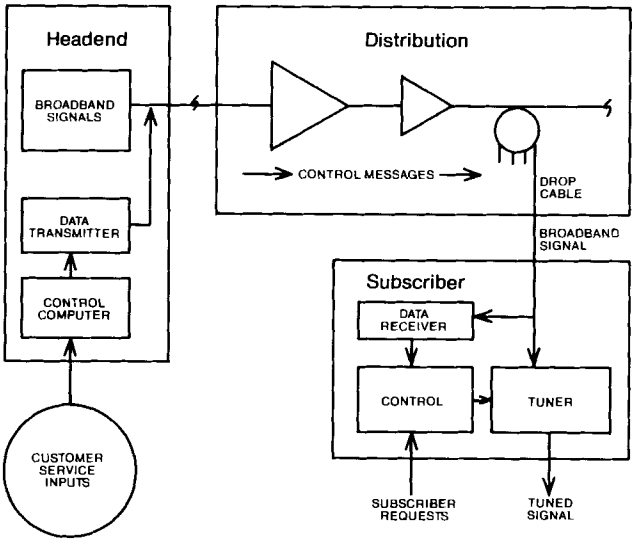
them into the specific messages necessary to update the converters and transmits through the data link in the cable to the set top converter where the control action is applied. More than likely this control action is applied in conjuction with some means of scrambling the controlled signals and what is actually being controlled by the headend computer messages is the descrambling device in the set top converter.

As noted previously, this system is still susceptible to theft of signals and the cost and complexity of the set top converter has increased. The valuable and vulnerable portion of the system is out of the operator's control in the subscriber's residence.

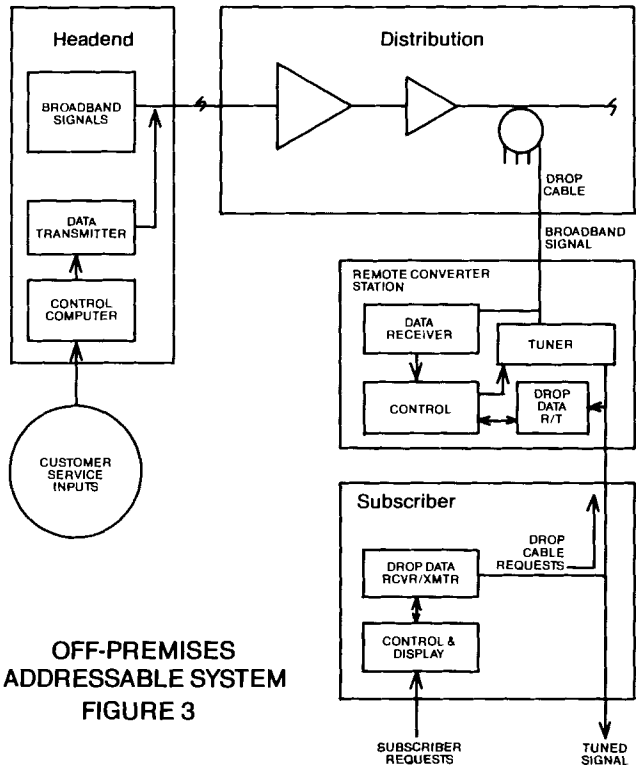
Off-Premises Addressability - To implement off-premises addressability in our model we must include the same elements necessary for the addressable system described above, but the location of the subscriber control element is changed. The headend computer and the customer service input are still in the headend. The data link is still required in the distribution system, but we have taken the set top converter functions and the associated control out of the subscriber's premises. In the place of the set top converter we add a control unit which allows the subscriber to request services. These requests for service are screened by the access control electronics and, if authorized, the service is tuned and provided to the subscriber. This configuration is shown in Figure 3.



NON-ADDRESSABLE SYSTEM
FIGURE 1



ADDRESSABLE SYSTEM
FIGURE 2



OFF-PREMISES
ADDRESSABLE SYSTEM
FIGURE 3

There are several advantages to this approach:

The broadband signal is not brought into the subscriber's premises so the subscriber no longer has access to any services except those permitted by the addressable system.

Scrambling of the premium signals is no longer necessary.

The control unit in the subscriber's premises can be made to be relatively inexpensive and even if stolen, cannot be used to steal signals.

The off-premises subscriber units may be grouped together to take advantage of sharing common resources such as the data communication receiver/transmitter and control microprocessor electronics.

Because the broadband spectrum is contained in the off-premises converter location, the level of ingress and egress of signals to and from the system may be reduced.

The primary disadvantage of this off-premises approach is that the environment where the control and tuning electronics is located is much more demanding than the set top environment. The off-premises units must be designed to operate and deliver services of acceptable quality over the full outdoor range of temperature, precipitation, vibration, electrical transients and RF level variation. Minimizing the size and power required by the off-premises equipment is important as is minimizing the cost of the in-residence components.

The in-residence set top control unit and the data link which allow it to communicate with the off-premises subscriber units are unique to the off-premises converter approach.

VARIATIONS IN APPROACH

The configuration of Figure 3 is characteristic of off-premises system which utilize the off-premises tuner approach. Some off-premises systems utilize slightly different approaches. The addressable tap and addressable trap systems, for instance, allow the tuner mechanism to remain in the home while the addressable control is exercised to allow or block access to certain pre-determined segments of bandwidth. Addressable jammers also operate on this principle except a jamming mechanism is turned on or off to obscure portions of bandwidth for a particular subscriber.

A variation of the off-premises tuner approach utilizes fiber optic methods rather than coaxial cable drops to carry the output of the tuner to the subscriber's premises.

IMPORTANCE OF "SYSTEM" EVALUATION

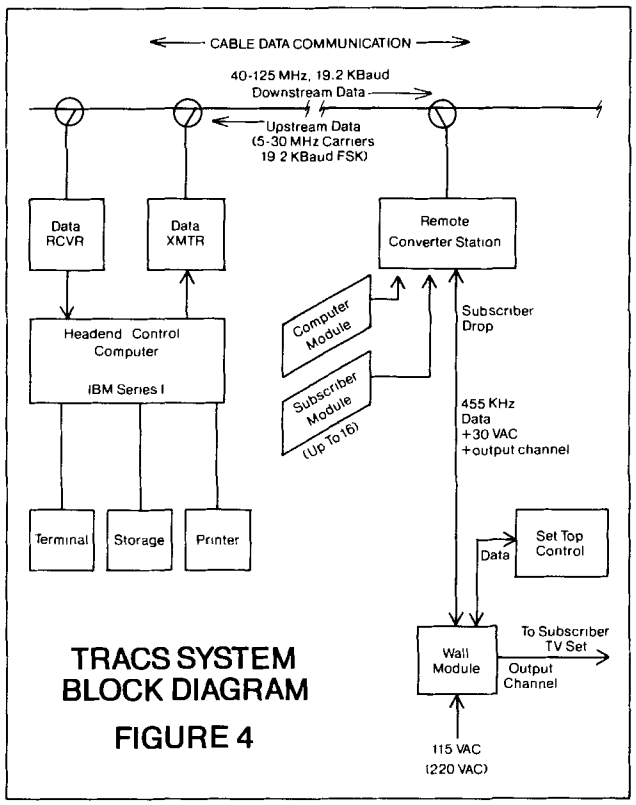
Previous papers have emphasized the importance of looking at the features of the complete system when evaluating an addressable system rather than taking a "Black Box" approach. This is true of off-premises addressable systems as well. The prospective buyer should throughly evaluate the available systems in light of his particular needs. A sampling of the applicable questions includes: Does the system provide operating software which will provide billing and business functions as well as control functions? Can the system easily be converted to two-way interactive operation? How versatile are the control features of the system? Does it depend on predefined tiers or can complete channel control be exercised? Will the system support pay-per-view? Will it support special event authorizations? Can security services be included? Can the command structure of the control system be expanded to provide more functions as services and systems grow? All these questions and many more should be carefully considered when considering a system for a particular application. Don't forget the basic rule: Quality service and reasonable profit.

OPERATION OF A REMOTE ADDRESSABLE CONVERTER SYSTEM

The Block Diagram of Figure 4 illustrates the configuration of a typical off-premises addressable converter system utilizing the Texscan Remote Addressable Converter System (TRACS). The headend control computer subsystem supports customer service funtions, billing, accounts receivable and general business functions as well as control and maintenance functions.

The remote converter stations are located throughout the distribution network to provide service to subscribers. Two types of remote converter station housings are available; a rack-mount unit designed primarily for indoor multi-dwelling applications and an cast aluminum housing designed for outdoor strand, pole or pedestal installations.

A computer module is located in each remote converter station to provide the control and communication functions. Each computer module can control up to 16 subscriber modules. The headend computer communicates with remote converter station computer modules via a one-way or two-way data link. (Conversion to two way is easily done by adding the appropriate RF modules.)



TRACS SYSTEM BLOCK DIAGRAM
FIGURE 4

Each subscriber module in the remote converter station includes a tuner assembly, a control microprocessor and the drop data communication unit. It is connected to the set top control in the subscriber's residence by the drop cable. Drop cable length may be quite long since it is no longer required to carry the entire broadband spectrum.

The drop cable terminates in the residence at the wall module. This module is a plug-in style transformer which provides an interconnection point for the various signals as well as providing power for the set top control. Optionally, it also provides power up the drop for the subscriber module. (115VAC line power, 60VAC cable power are optional powering methods for the indoor remote converter station; the computer module is cable powered in the outdoor remote converter station.)

The set top control is a small keyboard-display unit designed to be installed in the vicinity of the TV set. Favorite channel memory, special function data entry and parental control functions are provided. An infra-red remote transmitter is available. The subscriber enters his request for a channel in the set top control unit. This request is communicated back to the remote converter station and screened against the authorizations for that subscriber. If he is authorized for that channel, the tuner on his subscriber module is tuned to the requested channel. If he is not authorized for that channel, the tuner is tuned to a barker channel instead. This barker channel may provide a charcter generator display which informs the subscriber how he can sign up for the wonderful things carried on the service he has tried to access.

Two-way interactive capability is included in the TRACS system allowing up to three digits to be entered in a special function mode at the set top. The data is communicated back to the headend computer where it can be interpreted. This function can be used for opinion polling, games, pay-per-view impulse buying, etc. Also included in the system is the capability to add home security services.

Special event authorizations may be pre-authorized and strobed into effectivity by system wide command. All channels are authorized or not authorized by individual channels. Tiering is accomplished by software in the headend computer and may be retained in non-volatile memory on the computer modules so there is no loss of authorizations during power outages. If the headend computer system is not on-line for some reason, the remote converter stations and subscriber portions of the system will continue to function with the last authorization status.

A system-wide and individual force tune feature is included to support emergency alert and "Narrow-Cast" services. In two-way systems, status query commands are included to allow for collection of viewing status information (rating service). Individual privacy is protected in the software of the headend computer. The maintenance service features allow the operator to gather information on the operational status of the system down to the subscriber level to assist in troubleshooting and maintaining the system.

The data communication formats have been designed to be flexible and many additional commands are available for later expansion of the system.

Up to 120 channels on two cables can be accomodated with A/B cable switching automatically performed. The specific tuning frequencies and channel ID's can be pre-programmed so that any combination of STD/HRC/IRC, A/B cable and offset can be provided. The FM band is provided on all subscriber modules if desired.

SUMMARY

Off-premises addressable systems can offer some very real advantages for the system operator. They are not totally without associated disadvantages, however, and we may reasonably expect that there will be some "Growth Pains" associated with them as this progression from idea to application continues. While this limited paper cannot be a complete coverage of the subject of off-premises addressability, it is hoped that the background presented here will provide some assistance to anyone considering the possibility of applying off-premises addressability in their systems.