ACCOMMODATION OF VCR'S AND STEREO TELEVISION IN THE DESIGN OF SUBSCRIBER DEVICES

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ABSTRACT

New devices and technologies in the home are creating new challenges for converter manufacturers. For example, one of the most popular applications of VCR's is time shifting of programs for later viewing. But subscribers wishing to use their VCRs' programmable features are finding their cable converter an obstacle. Another example: With the introduction of stereo television, NCTA-commissioned research has identified many technical problems associated with carriage of the broadcast stereo method on cable systems. Yet cable needs a practical stereo delivery method to keep its product competitive with broadcasters. An addressable converter system design approach is discussed by which these two consumer phenomena - the VCR and stereo TV - may be eliminated as problem areas for the cable operator.

CABLE AND THE VCR

As the penetration of VCR's into cable homes surges past the 35% penetration mark, the issue of compatibility and mutual friendliness between VCR and converter is moving into the forefront.

VCR owners look to cable's satellite-delivered basic and pay services as their prime source of program material for recording. To make such recording possible in the owner's absence, nearly all VCR's include a programmable 'timer' feature that allows the VCR to be pre-programmed to automatically tune to a specific channel at a later specific time. But most cable subscribers are finding that this convenience feature can't be used to pre-schedule recording of cable TV programs, because their cable service requires they have a converter/descrambler between their cable input and VCR/TV. Since the converter's actual output is always a fixed channel (typically channel 2 or 3), regardless of the channel actually selected by the subscriber, the VCR's capability to tune to a specific channel at a particular pre-programmed time is rendered useless. The VCR's built-in timer might still be of value, except for the fact that:

(1) the converter power must already be "on", and
(2) the desired channel must already have been manually selected by the subscriber using the converter's tuning controls.

A straightforward solution to this converter/VCR incompatibility is to build into the converter a programmable timer of its own. A fringe benefit of such an approach is even additional converter functionality: using that same timer, the converter can be programmed for other applications, such as wake-up, snooze, or show reminder timing.

The timer feature is highly desirous in the converter. But price pressures in the converter marketplace demand the feature be added for an incremental cost which is at most minimal, and preferably nothing at all. Furthermore, subscriber simplicity is essential if the feature is included: the subscriber should not be expected to keep TWO complete electronic clocks (one in his VCR, one in his converter) synchronized and set for the correct time to make possible unattended time-shift VCR operation. For both these reasons - cost and simplicity - a "timer" approach other than just another clock is required. Fortunately, the latest generation of addressable converters already has inherent attributes which make such an alternate approach feasible.

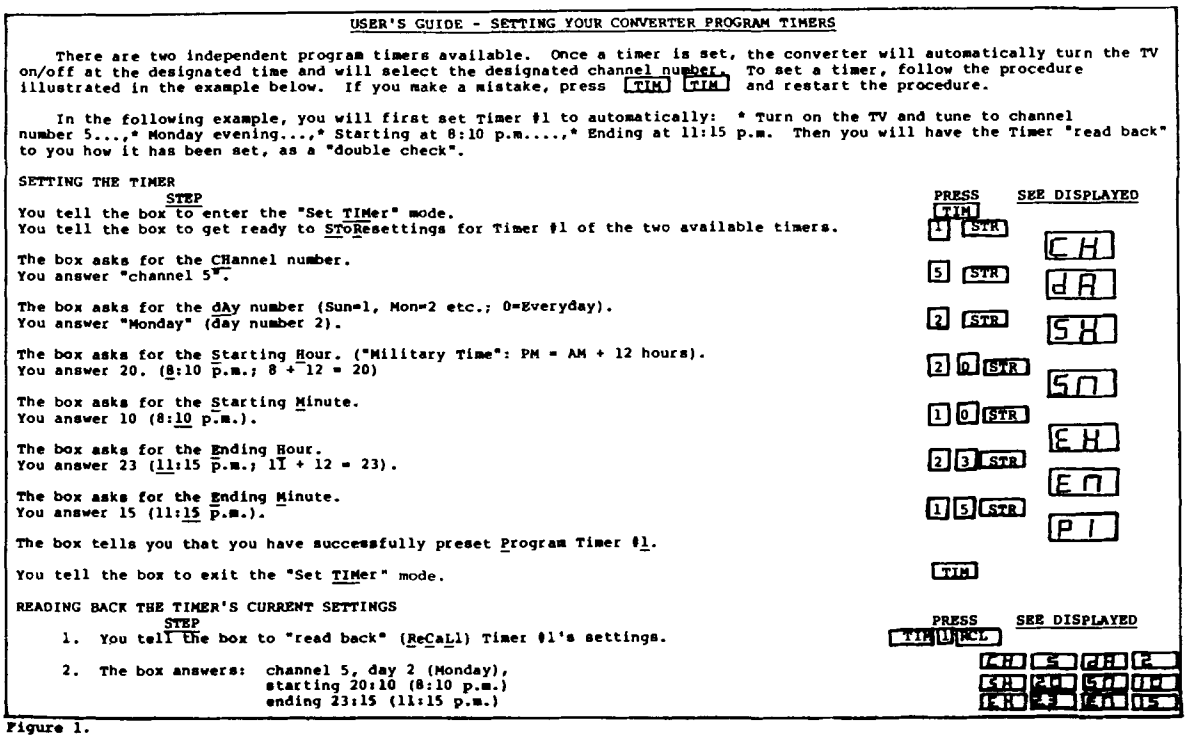
With addressability, the cable operator has a data communications conduit established between one central cable office control location and thousands of converters in subscriber homes. The latest generation, which includes the "downloading" feature, makes

possible easy operator setting and resetting of many system-related converter parameters (channel/frequency maps, channel format, etc.) by simple computer data entry from the operator's central vantage point. By application of this "downloading" capability to the converter's need for a VCR timer, it is possible to have one central computer clock at the operator's office keep track of the day, date and time, and simply keep all converters advised through "refresh" updates, "globally" broadcast to all converters. In data communication terms, the amount of information being distributed -day, date, time- is miniscule, so a refresh interval of every minute is not an obstacle. Thus no true "clock", per se, need be present in the converter...the operator's headend is really the one system master clock. Conventional RAM in the converter can receive and store the necessary refreshes. Even if the continuous flow of refresh updates should be interrupted by headend equipment failure, the same 10-year-life lithium battery backup in the converter used to backup other download functions can keep the converter aware of the last broadcast time refresh. A timing loop in the converter's firmware can then extrapolate actual day/date/time quite accurately for many minutes, even in the absence of additional updates from the operator headend.

The result is a quite simple and friendly VCR timer feature in the converter with almost no incremental cost.

One implementation with which the writer is familiar, the Pioneer BA-5000 series converters, offers two such programmable timers in the converter; i.e., at any time, two forthcoming unattended recording sessions can be in queue, as pre-programmed by the subscriber.

Through the use of prompting characters in the l.e.d. channel number display on these converters, a subscriber can easily program in cable channel number and start/stop day, hour and minute for each of the two "timers", as illustrated in Figure 1. The subscriber never need worry about his converter knowing the correct time...it always knows, thanks to one-way addressability with "downloading".



USER'S GUIDE - SETTING YOUR CONVERTER PROGRAM TIMERS

There are two independent program timers available. Once a timer is set, the converter will automatically turn the TV on/off at the designated time and will select the designated channel number. To set a timer, follow the procedure illustrated in the example below. If you make a mistake, press [TIM] [TIM] and restart the procedure.

In the following example, you will first set Timer #1 to automatically: * Turn on the TV and tune to channel number 5...,* Monday evening...,* Starting at 8:10 p.m....,* Ending at 11:15 p.m. Then you will have the Timer "read back" to you how it has been set, as a "double check".

SETTING THE TIMER

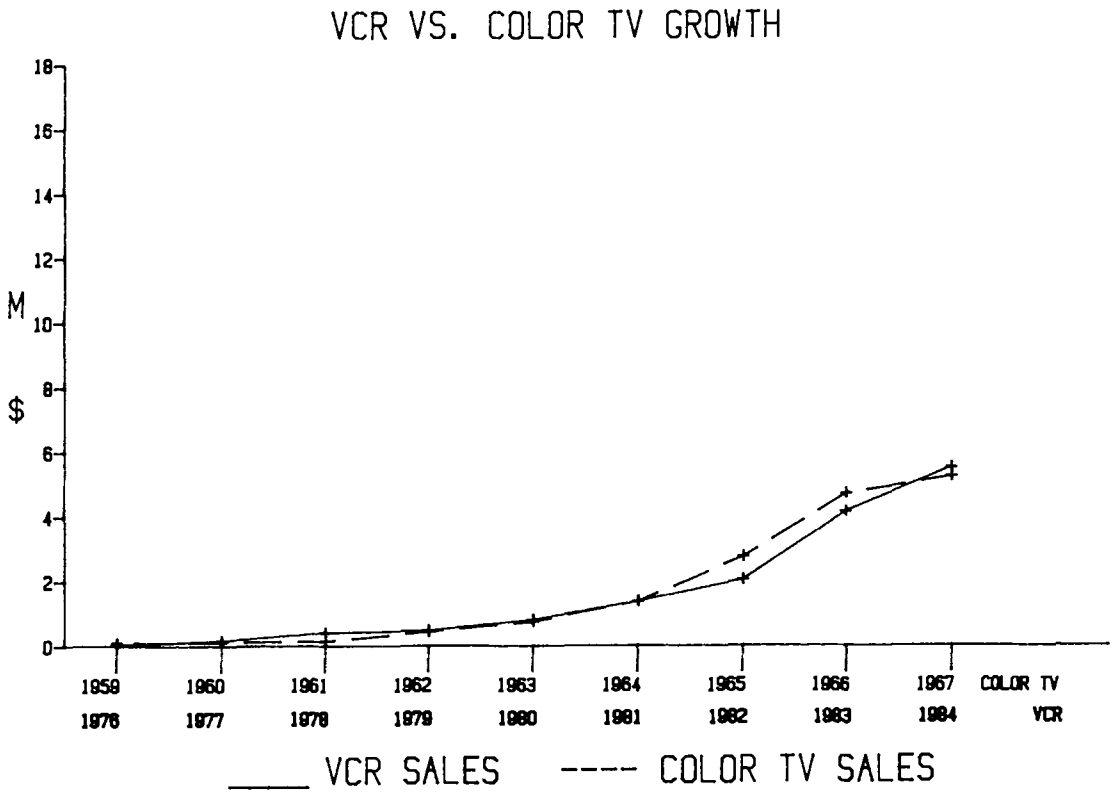
STEP	PRESS	SEE DISPLAYED
You tell the box to enter the "Set TIMer" mode.	[TIM]	
You tell the box to get ready to STOResettings for Timer #1 of the two available timers.	[1] [STR]	CH
The box asks for the CHannel number. You answer "channel 5".	[5] [STR]	dA
The box asks for the dAy number (Sun=1, Mon=2 etc.; 0=Everyday). You answer "Monday" (day number 2).	[2] [STR]	SH
The box asks for the Starting Hour. ("Military Time": PM = AM + 12 hours). You answer 20. (8:10 p.m.; 8 + 12 = 20)	[2] [0] [STR]	SM
The box asks for the Starting Minute. You answer 10 (8:10 p.m.).	[1] [0] [STR]	EH
The box asks for the Ending Hour. You answer 23 (11:15 p.m.; 11 + 12 = 23).	[2] [3] [STR]	EM
The box asks for the Ending Minute. You answer 15 (11:15 p.m.).	[1] [5] [STR]	P1
The box tells you that you have successfully preset Program Timer #1.		
You tell the box to exit the "Set TIMer" mode.	[TIM]	

READING BACK THE TIMER'S CURRENT SETTINGS

STEP	PRESS	SEE DISPLAYED
1. You tell the box to "read back" (ReCaLl) Timer #1's settings.	[TIM] [1] [RCL]	
2. The box answers: channel 5, day 2 (Monday), starting 20:10 (8:10 p.m.) ending 23:15 (11:15 p.m.)		CH 5 dA 2 SH 20 SM 10 EH 23 EM 15

Figure 1.

Figure 2.



CABLE AND STEREO TV

The VCR, although only recently raised to prominence among cable's biggest issues of concern, has actually been brewing a long time. In fact, Figure 2 shows how VCR sales in recent years have quite neatly replicated the growth color TV enjoyed back in the 60's. Indeed, the VCR has been around "in quantity" a full decade, yet only now is reaching the point of major concern to cable operators. This point is cogent to keep in mind as one contemplates the much more recent phenomenon of stereo television, and its impact on cable.

Last year action by the FCC positioned the "BTSC" delivery stereo audio delivery method as a broadcast industry de facto standard. However, shortly thereafter, an NCTA-commissioned engineering study revealed that accomodating the new broadcast stereo cable signals would cost operators over $700 million in system upgrading costs, despite the fact that it will likely be many years before a large quantity of stereo TV sets capable of receiving BTSC stereo TV signals are in subscriber homes.

On the positive side for operators, however, the stereo TV issue has also brought to light a significant business opportunity for which the cable industry now finds itself ideally positioned...an opportunity for cable - not broadcast TV - to become the established place the consumer turns to to get stereo television reception and quality TV sound in general.

The TV networks and their broadcast TV affiliates are still largely in their infancy with stereo experience. On the contrary, cable operators currently have direct and easy access to a multitude of stereophonic satellite-delivered services. A March, 1985, survey among program suppliers revealed that 12 were already beaming a stereo audio signal to cable headends, along with their channel's video content. These suppliers include noteworthy advertiser-supported services like MTV, VH-1, Nashville Network, USA Network, Cable News Network, and pay services such as Bravo, Disney, Home Theater Network, and The Movie Channel.

For several years, some cable systems

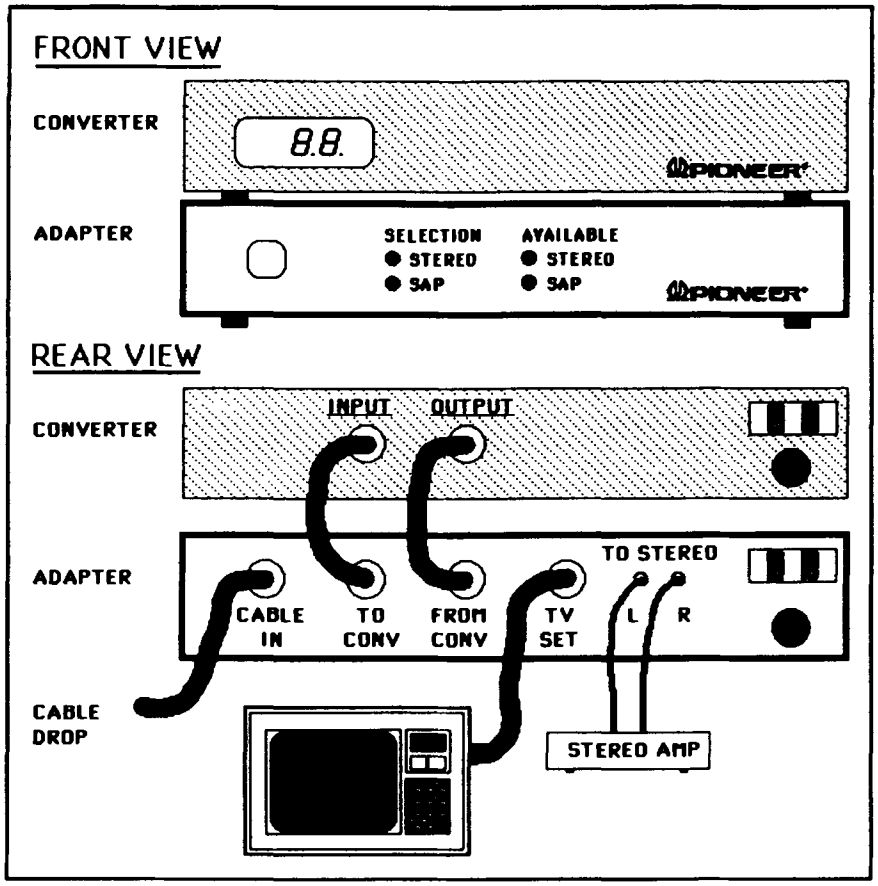


Figure 3. Stereo Adapter Installed Underneath a Converter.

have been offering their subscribers satellite-delivered TV channels with stereo sound by "simulcasting" the audio on additional FM stereo multiplex audio channels placed on the cable system. As a result, about 1.5 million 'FM outlet' subscribers (out of about 36 million total basic cable subscribers nationwide) can now enjoy the excellent sound quality of these FM stereo simulcasts with their TV viewing. But can they easily FIND the simulcast signal among all the other FM stations on the dial? And is it reasonable to expect them to institute another 'station search' every time they change TV channels? And what if a TV station they switch to is not even accompanied by an FM simulcast station on the cable at all? These shortcomings are a primary reason why FM simulcast TV stereo sound has not already gained a much broader acceptance among subscribers already offered the service. But the addition of a few pieces of headend equipment, and a subscriber-installable add-on near his converter, could easily eliminate these obstacles.

Let's call the in-home add-on "The Tracker". It is a device which can be added on to most existing models of converters. From the subscriber's standpoint, it is simply a 'Stereo Adapter' that allows him to connect his TV to his stereo system. Installation is so simple enough the subscriber can pick up a unit from his cable operator, take it home, and install it himself (Figure #3).

Electrically, it connects 'around' a subscriber's CATV converter, sampling rf on both the input and output sides of the converter (Figure 4). Standard audio cables then deliver left and right audio channels to the subscriber's stereo system.

At the cable headend, stereo channels - i.e., those channels for which the operator is also simulcasting an FM multiplex signal - are 'tagged' with a data signal by a relatively inexpensive additional piece of electronics. All other channels are processed as usual.

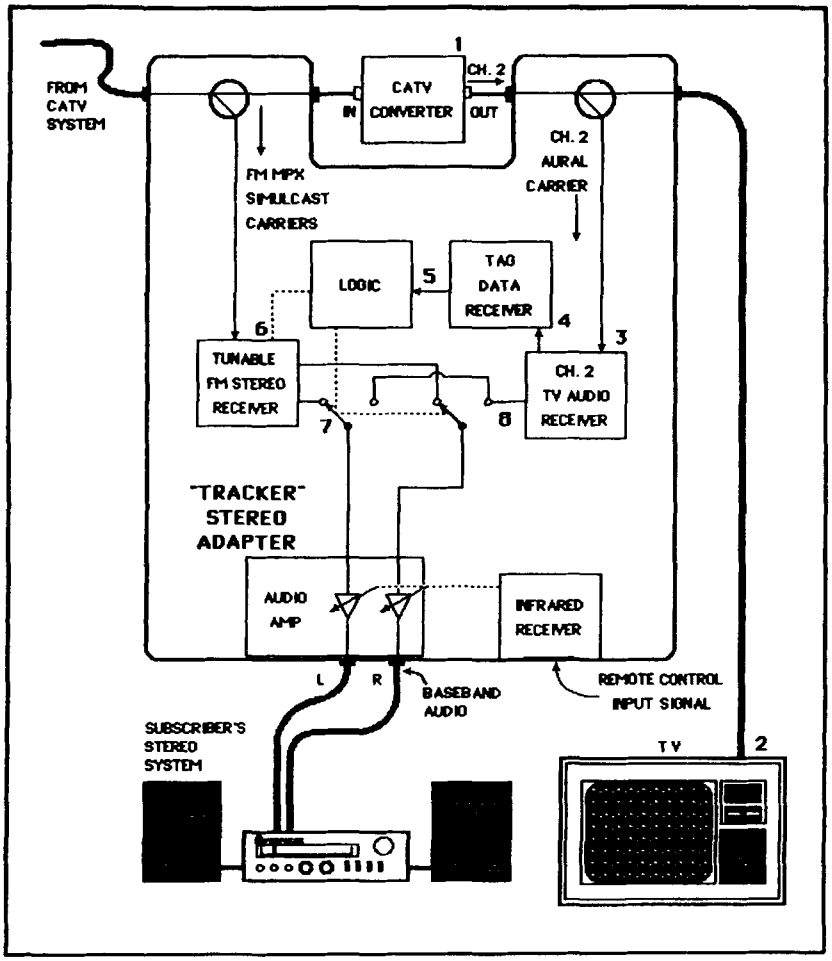


Figure 4. Stereo Adapter Functional Block Diagram.

No expensive BTSC processing equipment is involved anywhere. Troublesome BTSC signals are kept totally out of the cable system.

To understand how the Tracker works, refer to Figure #4. Suppose a subscriber selects for example, HBO. His converter outputs HBO on channel 2 (1), sending it on to the subscriber's TV for picture viewing (2). Meanwhile, a channel 2 audio receiver inside the Stereo Adapter also receives HBO's sound signal (3). This receiver in turn feeds a tag data receiver (4). HBO tag data is then passed on to a logic circuit (5). The logic circuit reads the tag data to determine at what frequency on the cable system the FM stereo multiplex simulcast for HBO can be found. It then tunes the FM multiplex receiver to the frequency where HBO stereo audio is being simulcast (6), and connects the FM stereo receiver output to the subscriber's stereo system (7).

Suppose instead a subscriber selects a TV station not broadcasting in stereo. In this case, the cable operator is not originating a stereo simulcast signal, nor generating any 'tag' data, for the channel. Again, the converter outputs the station on channel 2 (1), sending it on to the TV (2) and the channel 2 audio receiver inside the Stereo Adapter (3). This time, however, the Tag Data Receiver sees no tag at all (4). This tells the logic that no simulcast FM stereo channel exists for this station, so the logic circuit connects the channel 2 audio receiver output to the subscriber's stereo system (8).

Naturally, all the above takes place instantaneously, and transparent to the subscriber. All he knows is that, as he

switches channels, he receives superb sound quality through his stereo system on all channels, and on some he also receives true stereo. He has obtained 'stereo television' without buying a new TV set. And sound quality on ALL channels is probably better than if he had purchased a new stereo TV, too, since his stereo audio system is likely alot better sounding than any of the new stereo TV sets.

There's another fringe benefit to the Stereo Adapter, too. A subscriber can have remote control of TV volume using an optional handheld keypad. Even subscribers who previously couldn't get volume control, due to limitations inherent in their r.f. converter design, now have remote capability via the Tracker.

Cable, as a "closed circuit" medium, is not required to use the broadcast BTSC stereo TV sound delivery method. Cable is free to offer any alternative delivery method it wishes. "The Tracker" is one such alternative having many practical advantages:

* Threatening BTSC signals are kept completely out of the CATV system.

* The customer service 'nightmare' sure to result otherwise, is avoided.

* A major expense is avoided in converter, headend processor, and possibly plant upgrades to accomodate BTSC signals.

* Headend equipment to stereo-ize a cable system is cheaper with 'tracking'.

* Many operators already FM simulcast satellite-delivered stereo channels, so only an inexpensive tag generator is required in those cases to "stereo-ize" a channel.

* Expensive BTSC signal originating equipment is not required!

* A new revenue source is created for the cable operator: The subscriber instantly gets 10 or more stereo TV stations through his cable operator, plus superb sound quality on all channels, WITHOUT spending $1200 or more on a new stereo TV set.

* The Tracker is subscriber-installable, no truck roll is required to retrofit converters for BTSC.

* The actual service delivered... 'supersound' on ALL channels...has a high perceived value to subscribers, yet zero incremental direct cost to the operator (the stereo comes along free to the operator with the TV channel).

* The greatest portion of marketing expense to sell subscribers on the service, that of educating them on 'stereo TV', is 'free' to the operator...thanks to set manufacturers', networks', and local broadcast stations' large marketing budgets promoting "stereo TV" to the public.

CONCLUSION

The VCR Timer feature and add-on Stereo Adapter alternative to BTSC stereo TV are specific examples of a new generation of technical innovations now emerging from converter manufacturers. They are solutions to the very practical problems involved with the more global issue of cable TV "interfacing" within the home.

For the very "long haul" - beyond 10 years - the author commends the work of groups like the joint EIA/NCTA Engineering Committee for its ongoing efforts toward practical standards for compatibility and interfacing between consumer devices hooked to cable systems. Meanwhile, for at least the next 10 years, innovative solutions like the VCR Timer and Stereo Adapter will hopefully make coping with "interface" not only more palatable, but also more profitable, for the cable operator.

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