generated by the tuning oscillator, providing the same tuned oscillator, frequency as generated with the 80 MHz channel. Because of this, both a highband and a lowband modulator should never be simultaneously connected to the input of the sideband analyzer.

Another useful feature of the sideband analyzer is that, as previously stated, the device is actually made up of two sections: a video sweep portion and a spectrum analyzer portion. These can, if desired, be used independently. The quality video sweep signal produced may be used as any normal video sweep generator, by simply disregarding the spectrum analyzer portion of the sideband analyzer. The same thing applies to the spectrum analyzer portion of the device. In other words, you might feed a multiburst or some other test signal or, if desired, an actual video signal into the modulator under test and observe the sidebands generated with the spectrum analyzer without using the video sweep section. Therefore, the versatile device actually serves as three useful test devices: a sideband analyzer, a video sweep generator, and a spectrum analyzer, providing, in one small package, most of the tools required for maintenance of your head-end modulators.

This paper is based primarily on the sideband analyzer manufactured by DYNAIR Electronics, Inc. and is similar to the other devices now on the market.

CHAIRMAN TAYLOR: Thank you very much Mr. Bates. Do we have any questions on the sideband analyzer?

QUESTION: Is there a plan to build into the analyzer or equipment for checking the audio portion of a modulator?

MR. BATES: I didn't mean to imply in my talk or to be too specific in referring necessarily to the sideband analyzer that DYNAIR happens to be manufacturing. I was trying to keep this general and not get down to specifics on our particular unit. To answer your question: No, not at this time.

CHAIRMAN TAYLOR: Thank You. Our next speaker, Mr. Lyle Keys, President of TeleMation Incorporated, will speak to us on what we may consider a dirty word, the technical problems of non-duplication. Lyle Keys.

MR. LYLE O. KEYS (TELEMATION INC.): Thank You. Gentlemen, Mr. Chairman: My paper is entitled "Design Considerations for CATV Non-duplication Equipment". There are copies of this paper on the table at the rear of the room.

The subject of CATV non-duplication can be divided into four areas:

1) requirements for program deletion
2) choice of substitute programming
3) method of switching
4) method of switcher programming

Non-duplication arrangements are not necessarily limited to the rules set forth in the FCC's Second Report and Order. CATV operators are free to negotiate different agreements with protected stations. For example, channels programable at one minute intervals. Unfortunately this design would be impractical because of the physical size and expense of these 120,960 memory bits using any memory device that would meet the other design criteria. This type of programmer can be simplified through elimination of redundancy. The trick is in knowing how far to go with this simplification. One approach is to change from a pulse-based system requiring 10,080 events per week to an elapsed-time based system where the event time is programmed along with the switching functions. This greatly reduces the total number of switcher events required, but requires a means of time encoding and time coincidence sensing.

Another way of eliminating redundancy, applicable where functions are to be repeated on more than one day of the week, is to design the programmer to scan all events daily performing switching functions on days so programmed while omitting the function on other days.

A further decrease in programmer size could be achieved by changing to binary coding of all timing functions.

TeleMation's new programmer utilizes the first two of these techniques, but for ease of programming, timing intervals are the usual days, hours and minutes.

Invariably we find operators who insist that the do-it-yourself route is better and/or less expensive. I have no great quarrel with this approach but feel compelled to point out a few of the pitfalls involved.

I have a slide here showing a simple programming clock. This clock costs about $60. and is capable of controlling one channel over a 24-hour period. Eighty-four of these clocks would provide 12 channel, 7-day capability, if a means of commutating between the clocks could be devised, and if switching accuracy were improved by about two orders of magnitude.

The second slide shows a non-duplication switcher which used reed delays as memory elements. This was a one-channel switcher capable of switching on half hours only. The cost per memory bit of this approach is extremely high compared to other systems.

This third slide shows another programmer offering six channel capacity and one minute switching intervals. It can be purchased from the Edwards Company for $300. which makes it quite economical on a cost per bit basis. Unfortunately, it would require anywhere from three to seven of them to handle even the simplest CATV non-duplication switching schedule. The reason is that like many programmers designed for ringing school beels, it lacks the capability of being programmed for different times on different days. This is because day selection can only be accomplished in two hour intervals so that only one day's schedule can be accommodated. Other days, requiring a different schedule in this same two hour period, would require additional programmers.

The fourth slide shows a typical pinboard. This one is manufactured by AMP. The cost of this approach per cross point is relatively low but it doesn't lend itself to use in an elapsed time base system. Therefore, it would require the previously mentioned 120,960 crosspoints to meet the criteria we have previously established. This would take a board eight feet on the side, if the crosspoints were on quarter-inch centers.

The fifth slide shows a programmed switcher which we have been supplying for some time now. It is built around commercial programmers, manufactured by Simplex. I think a number of you people have built your own using this programmer. We have to use two programmers; one scanned daily, carrying repetitive week day programming, and the other scanned weekly, carrying those events that occur once weekly. This provides a maximum capacity of 480 events per week. The two main disadvantages of this programmer are the programming expense where each program bar costs $.32 and can be used only once, and in its limited six channel capacity.

The sixth slide shows our newest programmer. Here we have gone to our own proprietary design rather than trying to make do with other available devices. The unit meets all of the previously listed criteria and uses plugged holes in a perforated metal drum as memory bits.

The last slide, by way of contrast, shows the non-duplication switcher which we built about five years ago. We believe this to be the oldest non-duplication switcher in existence. It incorporates toggle switch memory and stepper switch commutation. It occupied about 30 inches of rack space, had one-sixteen hundredth the capacity of our latest designs, and cost the same amount.

In conclusion, let me suggest that you make a thorough evaluation of your present, and anticipated, switching requirements before deciding on what approach to use. It is also well to look at your physical plant in terms of non-duplication requirements. It may be necessary to completely revamp your head end in order to utilize available switching techniques. In any event, be sure to provide the switcher manufacturer with complete switcher specifications or describe in detail exactly how the switcher will be used and obtain from the manufacturer a guarantee that the equipment furnished will meet your requirements.

I'd like again to depart from the text. Among the problems we have had in the sale of non-duplication switchers, 90% of them occur after we have delivered the switcher and the man finds out that the switcher does not do what he wanted it to do. He buys a switcher that is capable of switching video and he wanted to switch RF, or vice versa, and then when he finally gets this result, perhaps he can't program it; because of the complexity of programming or one thing and another, it doesn't meet its program schedule. This is a subject that is extremely complex. You only have to sit down with about ten TV stations' program schedules and work out one non-duplication program to understand just how complicated it can get. I do urge you to study it very carefully, in order to make sure that you can adequately accommodate it. That's the conclusion of my paper and I thank you.

CHAIRMAN TAYLOR: Thank you, Mr. Keys, very much. Do we have any questions about the non-duplication?

QUESTION: Why is a one-minute interval used for switching instead of some other shorter interval to fit commercial lengths?

MR. KEYS: Let me answer that in two parts. First of all, it would be desirable to build as much resolution into a programming system as is possible. If you went to ten second intervals, this would require six more time event sensing circuits and the reason that we have not adopted that philosophy is that station break intervals are usually, but not necessarily, one minute duration. If you can program to accomodate one minute breaks, then it should not matter to you whether you carry the first commercial of that break or carry all three of them. In the event they have a triple spot break, where generally they will have two commercials and an ID announcement, which takes about two seconds, the total of which it would take about 60 seonds.

Secondly, the switching accuracy of these programmers is about 2/10 of a second plus or minus the instantaneous power line error. The power line error at any time throughout the day could be as much as three or four seconds, so trying to get resolution down to accommodate this ten second commercial would be quite a monumental task. Thank you.

CHAIRMAN TAYLOR: Are there any other questions? If there is no further business to come before this meeting, the meeting is adjourned. Thank you gentlemen.