

"VIRTEXT & VIRDATA:  
ADVENTURES IN VERTICAL INTERVAL SIGNALING"

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There are many videotex tests, trials, experiments, and demonstrations in the U.S. But, to the best of our knowledge, there is only one commercial operation based on teletext technology in the U.S. This enterprise is based on practical, produceable, cost effective hardware. The results have been encouraging. Several important new features have been introduced.

Additionally, a brief discussion of the teletext activities in Chicago will be included.

#### INTRODUCTION

Text-on-Video activities in the United States are accelerating. This is a many-faceted situation and this paper will concentrate on only a few aspects. The aspects chosen for emphasis are those with which I have closest association. Specifically, I will cover the satellite applications, and some features of the Chicago venture.

It is amusing to note that we see a pattern emerging which allows us to gauge the progress of a new technology. The first people to make money on a new technology are the short-course organizers. Closely following these are the multi-client study people. Conferences and newsletters pop up next. Once the important issues are defined, the lawyers enter to determine the nature of the rights to the technology. Of course, the lawyers make as much money as all the preceding phases. Finally, the hardware and software producers become involved. Their problem, of course, is the classical chicken and egg problem. Hardware sales are hampered by lack of software; software producers are less than enthusiastic in the face of a paucity of hardware. In the case of videotex, one opportunity exists for an amelioration of the chicken and egg problem because the chicken and the egg can be relatively inexpensive. Videotex technology is currently in these last two stages.

#### VIRTEXT

The first commercial, non-experimental application of teletext in the United States is the Cabletext system by Southern Satellite Systems. This fills a current market need. U.S. cable television systems presently have what are called "Character Generator Channels." Information suppliers

provide data signals over telephone lines to cable signal origination points. These signals are converted into synthetic video for modulation onto otherwise blank television channels. The viewer sees scrolling lines of text. The usual information providers are Reuters, United Press International, Associated Press, Dow Jones, and others. This is a current well established practice in the U.S. cable industry. Another well established practice is the use of "super stations." A super station is a formerly local television station which is picked up and distributed nationwide via satellite to Television Receive Only (TVRO) earth stations. The first super station was Channel 17, WTBS-TV of Atlanta, Georgia. Ted Turner was the spark plug behind this concept and Southern Satellite Systems, Inc. (SSS) made the technology work. Now WTBS is received by almost three thousand TVRO stations for use by cable systems. WGN-TV Channel 9, Chicago, is another super station; it is distributed by United Video Inc. to about one thousand cable systems.

SSS conceived of the concept of using teletext to distribute the data via the super station's Vertical Blanking Interval (VBI) to its subscribers. This allows the cable systems to avoid leased telephone line charges. In addition to this benefit, the SSS system facilitates the entry of new, smaller information providers. The equipment used to provide the SSS CableText service is based on British defined format teletext technology in general and the Mullard integrated circuits in particular. An early adaptation of this technology to North American television standards was accomplished. The result is a workable, efficient, and cost effective system. However, it is not precisely the British proposal for teletext in North America. It is a precursor of that standard. It is important to realize that VIRTEXT and VIRDATA seek to build on a technology which has an economic embodiment available, i.e., integrated circuits. However, VIRTEXT and VIRDATA must be incompatible with what might someday be a consumer service because the specific application of VIRTEXT and VIRDATA requires restriction of access to subscribers. Full compatibility would permit theft of service. Specifically, VIRTEXT differs in that the page format is twenty rows of forty characters instead of twenty-four rows, none of the enhancements are formally included, and the method of "gearing" is a preliminary approach.

## GEARING

The hallmark of the defined format teletext system is the one-to-one relationship between time in the television signal, location in the page memory, and spacial position on the television screen. By simply knowing where an information bit appears in time in the VBI, its location in memory, and its position on the television screen are unambiguously determined.

This procedure has two very important consequences. First, it is a very rugged signaling scheme because it carefully contains the results of any transmission errors. Errors are simply not allowed to propagate. The decoder takes advantage of the most stable part of a television signal, the horizontal synchronization pulse. The second very important consequence is that the decoder is made less expensive by not requiring the processing of the signal prior to loading it into memory. A microcomputer is not needed for decoding the teletext signal; there is nothing worthwhile for it to do. The data comes pre-addressed, carrying with it its memory location. Thus it goes directly into memory. There it is stored for access by the raster-generating circuits. In essence, the processing of the data has been pre-accomplished once, at the signal origination point. This task is not wastefully repeated in each decoder.

Gearing is the procedure which allows the preservation of a one-to-one relationship between time in the television signal (as measured relative to the horizontal synchronization pulse) and the spacial location of characters on the television screen. Because the British television channel bandwidth is significantly larger than the North American channel bandwidth, a higher signaling bit rate can be supported. Thus, all forty characters which are displayed in one row of the teletext page are transmitted in only one horizontal television line. The North American bandwidth being smaller will not allow this. The gearing procedure provides an ordered method of partitioning the characters between the television lines. SSS employs a 30/10 ratio with 5.5 megabit/second data rate. Thus, the first thirty characters of the first teletext row are transmitted, then the first thirty characters of the second row, then the first thirty characters of the third row. Following this is the three sets of ten characters which are needed to fill in the first three rows. This procedure is repeated until the page is filled. This takes place so quickly that the viewer does not notice the details. The page quickly wipes on to the screen.

The VIRTEXT method of accomplishing gearing is an effective method using special control characters which are Hamming protected. The official proposal for teletext in North America uses an improved method of gearing which is somewhat more rugged and efficient in terms of hardware realization. The two methods work well but are not compatible.

## DATA RATE

The data signaling rate of the VIRTEXT unit can be changed by replacing a few components. Among the various possible rates are 4 Mbits/second yielding a 20/20 gearing ratio and a 5.7272 Mbits/sec rate yielding a 32/8 gearing ratio.

The Mullard teletext chip set for the U.K. is employed. Only the timing chip has been modified for 525 scan lines. External chips are added to accomplish gearing.

## TWENTY-FOUR ROWS

A twenty row display is exceptionally convenient and suitable for the VIRTEXT application. However, we are advocates of a twenty-four row display for the actual videotex services. We have built several different versions of twenty-four row display and have found twenty-four rows to be very practical and economical, both with decoders built into receivers and with set-top adapters. These techniques have been demonstrated to the Electronic Industries Association (EIA) Teletext Committee. We believe there is no question that twenty-four rows are technically achievable, economically practical and eminently readable when used with character rounding and intelligently designed character fonts.

## PAGE SELECTION

The user of the VIRTEXT equipment has several methods of page selection to choose from. This is because the page selection mechanism is interfaced with a four bit microcomputer. The usual wired or wireless remote control key pad is available as well as a set of thumb wheel switches mounted on the panel of the unit. Additionally, the unit can be hard wired to receive only a small number of pages or the microcomputer can be programmed to work its way thru a group of pages. The nonsubscriber can be precluded from accessing pages.

## ORIGINATION EQUIPMENT

A small business computer product, the Zenith Data Systems Model ZDS-89, has been programmed to create teletext pages and to organize them into magazines. This unit plus a small rack-mounted box of electronics is all that is required to generate teletext signals. Software packages are available for VIRTEXT as well as the proposed British standard. In fact, this small scale signal source can originate Antiope, Telidon, or any other signal format. The unit is small scale, capable of forty-eight page magazines, and holding seventy pages on a floppy disk. Two computers could be used to double this capacity immediately. Other methods of increasing capacity are under development.

## VIRDATA

Because the coding structure and the Mullard chip set has so much inherent flexibility, we have been able to add several exciting extensions to VIRTEXT. And yet, we have hardly begun to exercise its full flexibility.

The VIRDATA system allows for transparent data transmission simultaneously with transmission of teletext. The data can be computer programs, teletypewriter signals, or other teletext formats such as Antiope and Telidon. The header row contains control signals which can be assigned to direct a microcomputer to handle the data sent in the rest of the line. This data can then be formatted for an RS-232 plug on the back panel of the unit.

If one line in the vertical interval is permanently assigned to this function a baud rate of 13,200 can be supported. More lines can support higher data rates. Conversely, if lower baud rates are all that is required the VBI line can be time division multiplexed to simultaneously provide teletext. It is important to note that this powerful adaptation is by no means the most efficient transparent data transmission mode. It's just one method that is particularly convenient for implementation with the integrated circuits as they currently exist. Since it fulfills the requirements of its application with plenty of margin, there is no need to search for the optimum. The "unhook mode" of British teletext is more efficient and does not require a microcomputer. However, as previously mentioned, this application seeks to build on but not be compatible with what might someday be a consumer product.

An important application of VIRDATA is in situations where an elaborate set of type fonts is desired. Here VIRDATA's RS-232 output drives a commercially available character generator to yield the type face of choice.

#### OTHER EXTENSIONS

A second type of RS-232 output is available. Called page-dump, it allows hard copy printout of what appears on the teletext screen. Of course the result is in monochrome. A detailed record of pages received is possible.

Multipage storage versions allow many pages to be received at a convenient time for subsequent display. Time codes associated with the pages permit them to be called forth and retired at assigned times.

An important feature assigns each decoder its own private address. Thus, electronic mail can be delivered only to the intended decoders. Global messages can, of course, be sent to all decoders.

The teletext page number is just an annoyance to viewers on a cable or master antenna system who do not have a remote control. Thus, an enhanced version suppresses the header row. Borders of selectable color replace the black frame of the original series of decoders.

The fundamental flexibility of digital systems makes it possible to assign control code sequences which can be used to cause relay closures. Thus, a remote control mechanism is established.

#### TRUE TELETEXT POSSIBLE

Since the SSS teletext signal is carried in the VBI of Channel 17, WTBS, and since no cable system is known to blank out that signal, VIRTEXT and VIRDATA decoders can be carried into the cable system for true teletext performance. That is, the user can be given personal control of which pages appear on his screen rather than having to wait for the page of interest to roll by. This has been tried in several cases with quite encouraging results. Both set top adapters and decoders built into receivers are possible from components already available. Only the details of assembly and interface are required. It is anticipated that this will take place later this year.

#### THE CHICAGO ACTIVITY

While VIRTEXT and VIRDATA are specifically intended not to be compatible with a broadcast teletext standard, the WFLD-TV, Channel 32 activity is the first complete realization of level one of the British proposal for teletext standards. The WFLD activity comes under a newly formed subsidiary called Field Electronic Publishing (FEP). FEP information comes from the Chicago Sun-Times newspaper via telephone computer link. A unique feature of the FEP activity is the permission to charge advertisers and to lease receivers. The only way to determine willingness to pay is to provide an opportunity to pay. Anything less is mere hypothesis. A second unique feature is that FEP is entirely funded by Field Enterprises. There are no government (foreign or domestic) funds and no foundation grants. This makes for a more rigorous test of the economic viability of the enterprise.

Again, the four Mullard integrated circuits are the kernel of the decoder. But this time the integrated circuits which surround the four implement the official proposal. Twenty-four rows, 5.7272 megabit/second data rate, and the new method of gearing are employed.

Approximately, one hundred and fifty color receivers will be involved. These will be twenty-five inch receivers with the decoder entirely built in. The picture tube's red, green, and blue electron guns will be directly driven (RGB drive) for the sharpest possible images with the most saturated colors. The television's wireless remote control key pad will also control the teletext functions. Since the key pad is interfaced via a microcomputer, several interesting consumer convenience features will be tested. The receiver includes a special linear phase surface wave intermediate frequency amplifier, synchronous detector, and special matching filter for data.

Later, a set-top, antenna terminal decoder is planned. Also, a cable-head end version which will allow character generator-like pages to be placed on blank cable channels will be introduced. This is similar to our VIRTEXT product, except that compatibility is desired and use of the signal is

encouraged since the signal is advertiser-supported.

It is intended that after-hours transmission will soon go to full field. Only data will be transmitted permitting four to six hundred pages per second capacity.

As the venture proceeds, levels two thru five of the British proposal will be implemented. Parallel attributes by the more efficient ghost row technique and smoothened mosaics are just some of the enhancements of level two. Level three includes Dynamically Redefineable Character Sets (DRCS) which permit cost effective, high resolution graphics. Level four features alphageometric graphics which can be Telidon compatible and level five boasts alphaphotographic level quality. The unhook mode for transparent data transmission will also be implemented.

WGN-TV Channel 9, the Chicago Tribune-owned VHF station in Chicago, has experimental transmission of teletext using the VIRTEXT equipment. This equipment was chosen for its immediate availability. It is convertible to the official standard proposal. Level one conversion is available now.

#### CONCLUSION

A very practical and broad system of features have been described which are possible because of the flexibility and extensibility inherent in the defined format teletext system. The Mullard integrated circuit set's implementation of this system is particularly convenient for realizing these potentials. The limits of the system have not yet been found.