The Utilization and Application of Character Generators Panel

Plus Questions and Answers

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Mr. Butler:

Good morning ladies and gentlemen. It is my pleasure to serve as moderator for today's panel, "The Utilization and Application of Character Generators."

We have with us this morning a distinguished group of experts who specialize in the field of character generators. These are the gentlemen who make the units that we buy and use in our studios.

Let's just talk a minute about what a character generator is. We've all seen them and used them. Unlike a camera, or video tape machine, there are no measurements that we can rate character generators on, such as differential phase differential gain, signal-to-noise. These analog specifications are meaningless when you talk about a character generator since it is a digital device. The measure of how well a character generator performs is how did it look and how easy is it for you to make it look the way you want it to look.

Hopefully, at the end of this panel discussion, you will have a yardstick by which you can measure the performance of the equipment shown here at the NAB and in different sales presentations.

In order to get to the question and answer session as soon as possible, we've chosen the following format. I will call on each of our panel members to give an overview of what their product might offer you. After that, each gentleman will have five minutes to give his opinions. We will then be ready for questions. First, I'd like to call on Mr. D'Ascenzo.

Mr. D'Ascenzo:

Perhaps the first (or at least a very early) application of an electronic character generator in a broadcast television facility took place in late 1967, at Channel 2 in Dade County (Miami), Florida. Using what was then a prototype of the later-to-be-introduced A. B. Dick Model 990 Character Generator, Channel 2 succeeded in video taping eight, one-half hour segments of a complex in-service video training series in the surprisingly short time of two working days.

What was significant about this was the fact that over 1,200 "supers" were used in the eight shows. That's an average of 150 per show, or about 5 per minute. Imagine the problem of handling over 5 super cards per minute; simulating vertical and horizontal "reveals"; effecting transposition of words; and doing all this on

cue with a rather technical script. Many long hours had gone into artwork preparation, rehearsing, and taping prior to the arrival of the Model 990 — all to no avail.

The success achieved with this early prototype unit paved the way for the subsequent entry of the A.B. Dick Model 990 Character Generator into the broadcast television industry and the eventual evolution of what has become one of the more practical product developments of the '70s.

A number of exciting developments in character generator evolution have taken place in the 10-year span from 1967 to 1977. So many, in fact, that character generators are no longer thought of as simple titling machines — i.e., an easier, better way to create a television super — but as true graphics tools.

From the standard dot-matrix character of 1967, modern day machines have advanced to presentation of truly high-resolution alpha/numeric displays and multi-front capability.

Applications of video character generators in commercial and educational television stations are now widespread, and examples of usage are seen every day on local and network shows. In addition to general titling, they are used to produce show credits, store and present statistics (for example, a baseball player's batting average), display election returns, superimpose news flashes over regular shows, and for game show graphics, advertising messages, and a variety of other purposes.

At first, the application of a character generator was quite limited. Pure and simple name supers and perhaps credits. Early machines ran headlong into a problem, however, because of their rather poor character formation or resolution capability. The demand of the professionally-oriented TV industry forced manufacturers back to the bench in an effort to develop systems capable of emulating graphics-quality type. And once that was accomplished, the industry demanded more. Happy to see high-quality, electronically-generated characters, their demand grew to include multi-front capability in various sizes.

The circle, of course, never closes.

Some Background . . .

Tracing the technological history of titling systems begins when DTL was a rather new technology and core memory was still the only way to go.

An early titling machine (i.e., 1967-1970) was usually restricted to one keyboard input and one video output. Bulk external memory systems were rudimentary at best, with one or two tape-type and hard-disk devices at the forefront. Internal memory was a major shortcoming in the design of these early systems. Solid-state RAM (Random-Access Memory) technology was in its infancy, and expensive as well. Core memory and then-current static and dynamic shift registers were in common use.

During the ensuing years of 1971 through 1975, the major technological improvements in titling systems were naturally tied to integrated circuit improvements. The ready availability of solid-state RAM's. 16k-ROM's and various other sized ROM's and PROM's opened up new horizons to designers. Multiple entry, dual channel video output, larger in-machine data (page) storage capability all became realities. Even so, the actual system structure of equipment did not change drastically.

Along in the early '70s, the idea and then the realization of "software" oriented titling systems emerged in the form of an advanced electronic titling device and changed the thrust of all future design thinking and customer expectations. Even then, memory was still a major problem, since lower-cost IC-type memory devices were not yet readily available. While impressive in capability (at that time), the equipment was relatively expensive. While the video output capability was still limited to a single channel, multiple inputs are readily accommodated.

In 1976, industry began to realize the promise and power of the newly available microprocessors. These computer-in-a-chip devices have been hailed as the catalyst for a revolution in electronic equipment design at all levels, and a simple observation of what is happening in the area of video games and hand-held calculators in a sufficient example of the "revolution."

An Innovation . . .

Microprocessors have altered the basic structure of titling systems as well. This can best be illustrated by describing in some detail a new product development which has evolved from the Datavision Laboratory of 3M Company.

The 3M-Datavision Model D-8800 ECG Titling System in a modern television titling and graphics system designed around microprocessor technology. The initials "ECG" stand for *E*lectronic *C*reated *G*raphics and underline the forward thinking features incorporated in the System. The D-8800 utilizes a multiprocessor design based on microprocessor technology and powerful operating programs to allow broad *creative* freedom and systems control.

The System design is based on the concept of maximizing software control to produce a SIMPLE TO OPERATE yet flexible and complete television graphics system. Software control provides the inherent capability to update the System over the years without incurring extensive hardware modification, And, special application or customer requirements can be more easily accommodated by software changes in the internal operating program.

The System is supported with an available library of 30 font styles in various sizes. Additional fonts will be added on a continuing basis, and custom design font service is available. Up to four complete fonts may be stored within the D-8800 for intermixed display. Additional fonts are stored on floppy discs, and may be quickly and easily loaded into the System.

Character resolution is defined in 35 nanosecond increments to produce characters of excellent smoothness, a far cry from the earlier stair-step character structure popular only a few years ago. All fonts are carefully designed to provide the best possible "video look," and characters are of variable width (proportion-

ally spaced) to provide optimum aesthetic appearance on the TV screen.

The maximum character height is 256 TV scan lines. Minimum practical height is 16 scan lines, although smaller characters may be defined within the limitations of the system and, of course, readibility. Larger characters or logos can be displayed with special font design and multiple keystroke entry.

All graphics are composed at the Model D-8800 control console. The console features an **Inter-Active** panel display, a standard typewriter keyset, auxiliary keys for editing, message storage and retrieval, and system control purposes.

A variable number of characters may be entered on any given row. While the maximum possible number is 100, for normal display purposes the number of characters used per row usually would average about 20-32. The number of rows utilized per display is also variable up to a maximum of 16 rows. Again, character design and variety per display determines this limit.

Both messages and font information is stored on removable "floppy" diskettes. While the basic system is equipped with one disk drive, up to four may be easily accommodated. Typically, 20 or more full fonts (1,960 characters) may be stored on one deskette. The transfer of a new font from disk to the D-8800 occurs in less than 5.0 seconds.

Floppy disks are also utilized for message storage. In this case, each diskotte will handle up to 152,000 characters, or the equivalent of 6,000 25-character rows of title information. For composition ease, the 6,000-row capacity is formatted into 1,000 addressable pages, each page of variable size depending upon font style, size, and mixture. Messages are selected on a random basis via a numeric key pad on the control console, and playback occurs within one-half (0.5) second of selection. Each message may carry "preamble data" to define roll, crawl, mask, speed, position and direction.

One of the more outstanding features of the Model D-8800 is the display panel mounted above the control console. In conjunction with the operating program, the display panel provides operator support through a carefully designed "operator system" hand-shaking program.

The inter-active nature of the system helps anyone become a qualified operator in a minimum amount of time and removes the system from the status of "specialized" equipment to the "general use" category.

The Model D-8800 provides the usual dynamic features expected in a superior graphics/titling system:

- Vertical roll (6 rates)
- Horizontal crawl (10 rates)
- Character or word flash
- Character-by-character color encoding
- Roll, crawl, and pause
- Accurate centering

Additional standard features, however, include:

- Dual high resolution channels
- Vertical roll *up* and *down*
- Horizontal crawl *right* and *left*
- Programmable roll/crawl masking (8 positions)
- Dual channel mixing
- Animation mode

The model D-8800 is equipped with *two* high resolution video channels which may be used independently in a preview/program model: concurrently as separate program outputs, or *combined* as a single channel output.

When combined, the dual channel capability allows creation of unusual effects, such as roll down of information, followed by crawl right of different information. The two channels may also be used simultaneously as two different outputs, and one channel may be in a static or update mode while the other is in a dynamic roll or crawl mode.

Another creative feature, the Animation Model, allows preparation of unusual animated graphic effects through use of the high-speed playback capabilities of the disk storage system. Two animation rates (up to 5 or 10 pages/second), and a specially designed "line segment font", puts animation at the operator's fingertips.

Inside the D-8800 Dual Intel 8080 microprocessors operate in conjunction with special software programming to enable the multi-function capabilities of the System. Here, the microprocessor has made its mark and foretells the future of the industry.

Inherent in the design is a rather generous use of internal memory. At every stage of systems structure, memory is being utilized to buffer and store information and to provide the digital intelligence of character formation. An accounting of internal memory capacity would indicate the following statistics:

Function	Memory Bits
Font Memory (one)	128,000
Page Display	128,000
Working Memory (Display)	32,000
Program Memory (Display)	32,000
Program Memory (I/O)	32,000
Working Memory (I/O)	128,000
Total Internal Memory	480,000
Three Additional Fonts	384,000
Grand Total	864,000

This represents an impressive and powerful operating system which would otherwise be prohibitively expensive if it were not for the readily-available microcircuits of today.

But why use *dual* microprocessors? In the D-8800 System, the processing load is split between the two internal computers. One Intel 8080 is assigned to the disk operating system, keyboard control, and external data Input/Output functions, while the other takes care of roll and crawl dynamics, refresh of Channels 1 and 2, and editing functions.

Operating two 8080 devices allows a greater degree of design freedom and provides room for future system growth from a software point of view. Indeed, a system

like the D-8800 promises a longer useful life than previously conceived systems *because* of its software-oriented nature.

Goals Accomplished . . .

At the inception of the D-8800, four goals were uppermost in our minds. These goals were to design a system that:

1. Provided the user with a modern machine utilizing the most advanced micro-logic components.
2. Provided advanced system features at a competitive price.
3. Provided inherent long-life usefulness through internal "operating program" update rather than extensive hardware modification.
4. Provided in an easy to use system even though complex in concept.

These goals have been accomplished in the Model D-8800 ECG Titling System.

While the D-8800 and its competitive counterparts are ushering in a new era of Electronic Titling Systems, it's well to recognize that technology advancements and customer demands are never-ending.

A natural extension of titling systems extends into the general area of Video Art. Already, tentative systems have been shown, and we can expect this Video Art concept to mature over the next several years until animated, user-composed Video Art Systems are real, on-the-market machines ready for use.

Indeed, the TV studio artist of tomorrow will need to learn to lay aside his ruler and brushes and take up the joystick and light-pen as digital electronics designers learn how to develop systems to make the *TOTAL* graphics-for-television job do-able in a television format.

Mr. Butler:

Thank you very much, Frank. Our next panelist is Thomas Hindle of Thomson-CSF Laboratories.

Mr. Hindle:

Thank you Bob. I'll make it very short.

The utilization and application of high technology equipment in the television medium must be advanced in a manner that maintains the balance between the performance, operation and technical demands of the medium. Particular consideration must be given to the variety of personnel skills that are required to meet these demands.

Changes in programming, production and other viewer visible styles and techniques that govern the success of a broadcaster takes place in an evolutionary manner. This close relationship between "on air" programming and "in house" operation gives us direction in the development of equipment that will operate successfully in this environment.

The television medium consists of visual stimuli which are most effectively utilized when created, changed and refined in the same dimensions that an audience sees the final presentation.

Traditional methods to create graphics can not be used in this type of direct operation, since there are several intermediate levels of preparation before final presentation can be put to the viewer.

In order to reduce this time gap and number of operations between the original graphic and its presentation, it must be generated in a form that provides direct operator manipulation while in its final presentation form.

The introduction of Vidifont in 1969 applied high technology developments to electronically generate quality graphics that were, until that time, only achieved from "hard copy" artwork. With the characters in this format, a reduction of the number of intermediate steps between initial and final presentation of the graphic is realized.

The integration of these two facilities, electronic generation and manipulation of graphics, provides an effective closed loop system that ties together man, methodology and medium.

This inter-relationship of immediate operator feedback must be maintained as continuing technological developments brings about more sophisticated forms of graphic transformations.

Mr. Butler:

Thank you Tom. Now, Eugene Leonard of System Resources.

Mr. Leonard:

The emphasis on digital technology in television, and the realization that the character generator is a forerunner of complex digital capabilities to come makes this panel presentation singularly appropriate.

The character generator represents the most common form of digital image creation and manipulation presently used in the TV broadcast field. It is the prime generator of still frame graphic imaging in flat color, as distinguished from camera-generated full gray scale, full color moving images.

The television still frame graphic area needs less memory and manipulation capability than full gray scale and color television. Therefore, it is the first to offer economically-feasible capabilities in the form of character titling and graphics generators. These are presently confined to still frame, but they will soon become available in animated graphics and — we can be sure — will eventually be available in full gray scale and color.

In this connection, a new area of the television discipline can be expected to open in which we deal with manipulation of the contents of the frame by digital technique. This will provide a new dimension to the capabilities presently offered by the application of a digital technique to editing of frame sequences, picture quality enhancement and time-basis correction.

What are the capabilities which are so desirable that broadcasters will spend money and character generators and their more sophisticated sisters — the graphics generators?