Bell Laboratories Cover Sheet for Technical Memorandum

Title- **A Character Generation Facility for the TI Video Display Processor**

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ABSTRACT

Chargen is an interactive facility for generating character sets for use on the Texas Instruments **TMS9918** Video Display Processor. This processor enables one to display video graphics in a character oriented fashion, along with an external video source. Along with the definition of simple characters more complicated objects called *sprites* can also be defined. A sprite can typically be thought of as a small graphics symbol in a video game, for example a rocket ship outline. This system also enables one to define the sprites. The chargen facility is a flexible tool for generating and manipulating these characters and sprites.

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Bell Laboratories

Subject: **A Character Generation Facility for the TI Video Display Processor**
Case- 39394 -- File- 39394

date: **December 8, 1980**

from: **S.P. Ressler**

TM: **80-1356-6**

MEMORANDUM FOR FILE

1. Introduction

The Texas Instruments **TMS9918** Video Display Processor provides a substantial computer graphic capability with relatively little development effort. The **VDP** chip enables the display of several types of graphics. This chip does essentially all of the video processing and combining of several internal graphic layers into a single composite video signal. Because of this, the software efforts become more concerned with higher level device driver routines rather than an overburdening effort of hardware development. The system described below enables one to interactively define the character oriented portion of the VDP's graphics.

2. Usage

Chargen is a screen editing system for defining characters in a highly interactive way. The user is presented with a grid and the commands necessary to interact with the system. One can read and write the results of a session into a file. Several status lines are also displayed to aid the user. The system is standalone and the user need only type chargen to start it running. Currently it only works on HP terminals.

The generation of these character sets falls into three categories. These categories are the three modes of the system. Text, Pattern and Sprite mode. Text and Pattern mode are identical in every way except that in text mode you are not allowed to mark the last two columns of the grid displayed. This is to conform to the text and pattern operating modes of the VDP. The VDP ignores the last two columns of information when it is in text mode giving you a usable resolution of 8 rows by 6 columns when in text mode. A full 8 rows by 8 columns is available when in pattern mode.

When in Sprite mode you may use the complete 16 by 16 grid which corresponds to a 16 by 16 sprite. The use of an 8 by 8 sprite which is allowed by the VDP chip has not been implemented at the current time. The sprites are represented as a block of 32 contiguous bytes. The first 16 are for the left half of the sprite and the second 16 are for the right half.

There are also a fair amount of other parameters that must be loaded into the VDP to actually get some images displayed. These are accomplished by using a set of function in the VDP library. See [1] for a detailed look at the VDP.

3. Commands

Following is a list of commands and their functions.

r Moves the cursor to the right.

l Moves the cursor left.

u Moves the cursor up.

d Moves the cursor down.

p Selects the previous pattern for usage.

n Selects the next pattern for usage.

c Prompts for a current pattern number and selects it for usage.

m Prompts for a mode selection which may be:

- T Selects Text mode 8 rows by 6 columns.
- P Selects Pattern mode 8 rows by 8 columns.
- S Selects Sprite mode 16 rows by 16 columns.

x Marks the current cursor location.

. Erases the current cursor location if marked.

s Saves the patterns into a file. If you were in Text or Pattern mode file saved is pgt.f (for pattern generator table). If you were in Sprite mode the file saved is sgt.f (for sprite generator table).

t Takes or loads a file. If you are in Text or Pattern mode the file pgt.f is loaded. If you are in Sprite mode the file sgt.f is loaded.

q Lets you exit or quit the system.

4. Storage

The numbers printed out to the right of the grid are the octal values of each row of the grid. The patterns are stored as character arrays with each row in text and pattern mode being a single byte. In sprite mode each row needs two bytes thus the two numbers for each row. If an **x** is present at the grid location then a 1 is placed in the corresponding bit of the corresponding byte. There is room for a maximum of 256 patterns in text or pattern mode, and 32 patterns in sprite mode.

The following image is an illustration of what the user sees when he first starts up the system.

```
                 VIDEO PROCESSOR  CHIP  CHARACTER  GENERATION FACILITY

                 Current pattern number:        0          Current mode: Pattern


row=0, column=0                              Commands
. . . . . . . .        0                             r-ight
. . . . . . . .        0                             l-eft
. . . . . . . .        0                             u-p
. . . . . . . .        0                             d-own
. . . . . . . .        0                             n-ext pattern
. . . . . . . .        0                             p-revious pattern
. . . . . . . .        0                             c-urrent pattern pick
. . . . . . . .        0                             m-ode select
                                                        T-ext
                                                        P-attern
                                                        S-prite
                                                     x-to mark the spot
                                                     .-to erase the mark
                                                     s-ave
                                                     t-ake, read a file
                                                     q-uit
```

The illustration below is of a screen with an existing pattern. (The letter B)

```
VIDEO PROCESSOR CHIP CHARACTER GENERATION FACILITY

Current pattern number: 66 Current mode: Pattern

row=0, column=0                    Commands
. x x x x . . .   170                 r-ight
. x . . . x . .   104                 l-eft
. x . . . x . .   104                 u-p
. x x x x . . .   170                 d-own
. x . . . x . .   104                 n-ext pattern
. x . . . x . .   104                 p-revious pattern
. x x x x . . .   170                 c-urrent pattern pick
. . . . . . . .   0                   m-ode select
                                        T-ext
                                        P-attern
                                        S-prite
                                      x-to mark the spot
                                      .-to erase the mark
                                      s-ave
                                      t-ake, read a file
                                      q-uit
```

The following is a screen illustration of an existing sprite pattern.

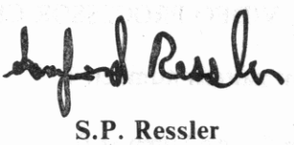
VIDEO PROCESSOR CHIP CHARACTER GENERATION FACILITY

Current pattern number: 1 Current mode: Sprite

```
row = 0, column = 0                    Commands
. . . . x x x x x x x . . . . .    17, 340    r-ight
. . . x . . . . . . . x . . . .    20, 20     l-eft
. . x . . . . . . . . . x . . .    40, 10     u-p
. x . . . . x x x . . . . x . .    103, 204   d-own
x . . . . . x . x . . . . . x .    202, 202   n-ext pattern
x . . . . . x . . . x . . . . x .  204, 102   p-revious pattern
x . . . . . x . . . x . . . . x .  204, 102   c-urrent pattern
x . . . . . x . . . x . . . . x .  204, 102   m-ode select
x . . . x . . . . . . x . . . x .  210, 42       T-ext
x . . x x x x x x x x x . . x .    237, 362      P-attern
x . . . . . x x x . . . . . x .    203, 202      S-prite
. x . . . . . . . . . . . . x . .  100, 4     x-to mark the spot
. . x . . . . . . . . . . x . . .  40, 10     .-to erase the mark
. . . x . . . . . . . . x . . . .  20, 20     s-ave
. . . . x x x x x x x . . . . .    17, 340    t-ake, read a file
. . . . . . . . . . . . . . . .    0, 0       q-uit
```

5. Conclusion

All of the previous screen illustrations were created using chargen. The grids were edited to produce the patterns and/or modify existing ones. A major goal of the system is to provide a highly interactive, simple and fairly userproof system for reasonably inexperienced computer users.



S.P. Ressler

MH-1356-SPR
Attached
References (1)

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[1] TMS 9918 Video Display Processor Preliminary Data Manual, March 1980