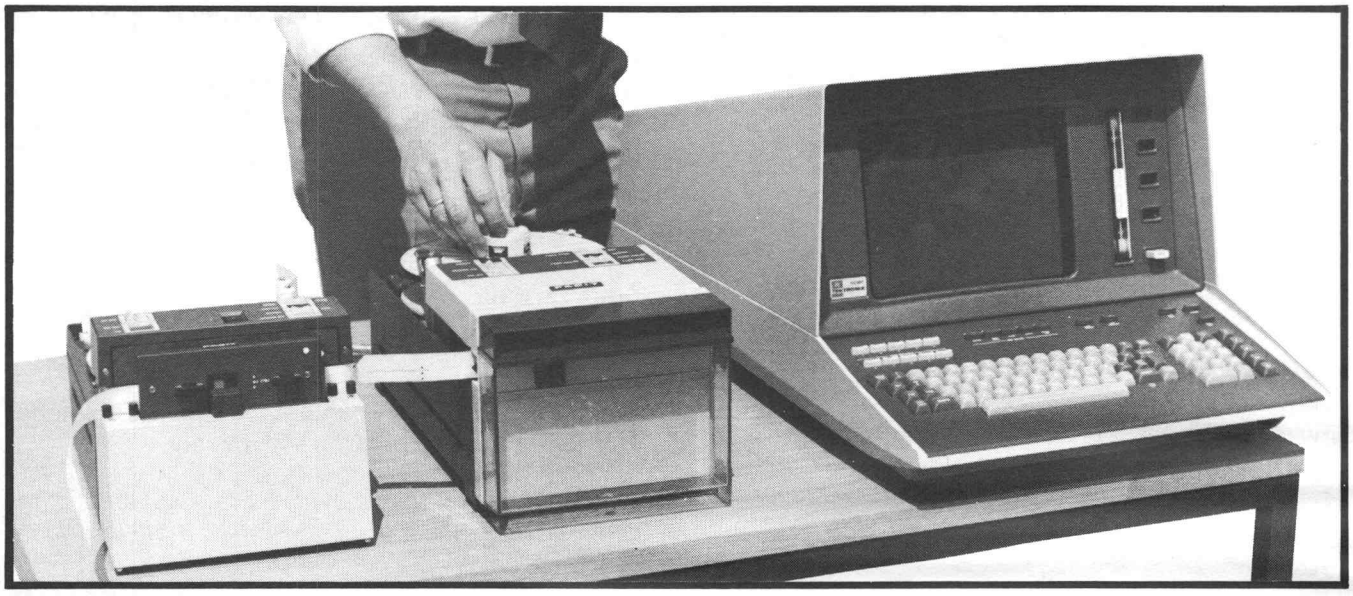
Tekniques

The 4051 Applications Library Newsletter Vol. 1 No. 7



4051 Interfaces with FACIT Paper Tape Punch and Reader

By Han Klinkspoor, Tektronix Datatek
Badhoevedorp, The Netherlands

Regardless of what you may hear about the decline of paper tape usage, the fact remains that paper tape is still widely used for data collection, machine control and as a stable, convenient storage medium. After talking with several 4051 users here in Europe, we realized there was a definite need for a convenient method of connecting paper tape handling equipment to the 4051.

As a result of this decision, FACIT Company of Sweden, in cooperation with Tektronix in Europe, developed a GPIB interface for their high speed paper tape equipment. This interface makes it possible to read and punch paper tapes with the 4051 via the 4051 GPIB port.

FACIT is currently offering the GPIB interface on two devices: the Model 4070 paper tape punch and the Model 4021 paper tape reader. The Model 4070 punches 8-bit paper tapes at up to 75 characters/second. The Model 4021 reads up to 300 characters/second in both directions. Since the 4021 reads 8-bit coded paper tape, it can read virtually any paper tape either via ASCII or Binary, or via low level RBYTE I/O commands.

4051-based systems using this equipment are successfully running in several application areas. The Dutch land registry office uses a 4051 and graphic tablet (4956 Option 33) to digitize and store maps from tablet to paper tape. This tape is processed by a minicomputer producing a paper tape that is fed into the 4051 again for making graphs. One of the reasons for using paper tape as a medium in this application is that several remote digitizing stations supply paper tapes for one existing paper tape-based central processing mini. Reliable, long term data storage was also a consideration.

Another interesting application of this 4051-paper tape combination is a 4051-based medical system used to do radioimmunoassay analysis. The decision in this case to purchase paper tape equipment for use with the 4051 was based on the fact that

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the existing equipment produces paper tape. The 4051 does the analysis and graphs results on the 4662 plotter with a previewing option for the screen.

A third system using this paper tape option is a typical previewing application. Here a 4051 Option 1 is used to download files from a Control Data Corporation Cyber mainframe that contains data to control numerical control machines. A preview is done on the 4051 screen and if this is found to be correct, a paper tape is produced to feed into the NC-tool. If editing is needed, interaction with the host is initiated to produce an updated file.

These applications show that sometimes it is necessary to have a paper tape "in-between". Having the FACIT equipment available allows you to fit the 4051 into environments where paper tape is one of the elements.

Operation of the FACIT devices is straightforward with the 4051 I/O commands: (punch at primary address 3; reader at 2)

Programs:

```
SAVE @3:
LIST @3:
OLD @2,16:
APPEND @2,16:1000
```

Secondary address 16 is selected to make a forward read; secondary address 17 initiates backward reading. This bidirectional ability of the FACIT Model 4021 is useful for tape verification.

Data I/O:

```
PRINT @3:A$
WRITE @3:A$
INPUT @2,16:A$
INPUT @2,17:A$
READ @2:A$
WBY@66: [255 to write EOF mark]
```

(A$ represents your alphanumeric data)

Alternate delimiters can be used in % mode. This sometimes is necessary, because blank tape is read as "@" (null character) and can cause syntax errors (OLD and APPEND) or fill up target string variables very quickly. Ignoring the null characters is advisable here.

```
PRINT @37,0:13,255,0
INPUT %2,16:A$
OLD %2,16:
```

Apart from programmed operation, "Off-line" TALK ONLY, LISTEN ONLY can be selected with switches on the reader and punch respectively. TEKniques

Editor's Note: These devices are available in the United States using IEEE-488 compatible interfaces specified below:

FACIT Model 4070 paper tape punch with 5137
FACIT Model 4021 (table top) or Model 4022 (rackmount) paper tape reader, either with 5138.

FACIT offices are located at:

66 Field Point Road, Greenwich, CT 06830
(203) 622-9150
1167 Chess Drive, Suite A, Foster City, CA 94404
(415) 574-8255
5415 Jandy Place, Los Angeles, CA 90066
(213) 390-8502

What It's All About

By Dr. P. C. Holman
Offices of Management Information & Institutional Research
University of Wisconsin—Stevens Point

By way of introduction, Dr. Holman contributed the program "Pie Chart for Hard Copy," Abstract #51/00-9514/0. In correspondence with Dr. Holman, he suggested that we not withhold any person's thinking under the guise of selectivity, whereupon we asked him to express his viewpoint to TEKniques.

From time-to-time the TEKniques group assembles to wax eloquent about progress and problems and things philosophical. Sometime during the last bash somebody began thinking, and the group wound up debating the place of ideas in the greater scheme of things. As usual, nobody agreed. Matter of fact as the evening wore on it seems there were fifteen or twenty different views, which is all the more unusual since there were only ten or eleven

TEKniques, the 4051 Applications Library Newsletter, is published by the Information Display Group of Tektronix, Inc., P.O. Box 500, Group 451, Beaverton, Oregon 97077. It is distributed to TEKTRONIX 4051 users and members of the 4051 Application Library.

Publisher — Ken Cramer
Managing Editor — Patricia Kelley

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people present. However, the group finally agreed that while the topic was essential to the philosophical bases upon which TEKniques rests, it was too heavy for the cocktail hour debaters platform. The group voted the usual cop out which is to call in one of the longhairs from the halls of academe and have him knock out a couple of definitive paragraphs. They immediately contacted me because I work cheap, I rarely get the corporation in too much trouble, and if somebody comes up with a topic that really intrigues me I work for nothing, which seems to bring no end of joy to the corporate treasurer. It turns out that "ideas" is an absolutely fascinating subject. Follow the thread of logic and see if you don't agree.

Ideas are insidious things that are rarely in the cataclysmic thunderclap category. Rather, ideas are more like the drip of water slowly creating new land forms. It seems to me that our compartmentalization of the development of mankind into stone age, iron age, industrial revolution, and now the second industrial revolution which is the age of the computer, is much too abrupt and does not reflect the way mankind really progresses. The correct basis for analyzing and assessing progress should be the analysis of the idea continuum. It's interesting that it is very difficult to find idea plateaus, or to find sharp divisions where one set of ideas was replaced by a new set. Ideas are more like money drawing interest. Nothing very dramatic ever happens but the sum keeps slowly increasing. The real task is to keep adding to the principal.

If one thinks about the most dynamic nations and groups of people one concludes that the amount, variety, and flow of ideas is the outstanding denominator. The nations and groups that have the highest quality of thought and life, that which we call culture and civilization, are those that have not only the best but also the most ideas. One can easily observe that the most advanced people also have the most diverse and greatest quantity of methods of communication. All of the magazines, television, radio, journals, newsletters, and so forth are not just entertainment. Rather they are purveyors and transmitters of ideas. As ideas are sufficiently developed and expanded they are put into categories and special category media, such as newsletters, are dispersed. That mankind is able to find ways to bring so many ideas to those who can benefit is an outstanding characteristic of the species. Nothing else man does or will ever do can match what the sharing of ideas does. Anybody who doubts the power and value of ideas need only contemplate what our world would be like if all ideas suddenly ceased. Ideas are imagination, and imagination is the sun that shines within man. The most advanced groups have always found ways to share ideas and, consequently, each person learns from others. This is what TEKniques is all about. Each of us has two obligations; to learn and to contribute. TEKniques is the vehicle that permits us to honor those obligations. TEKniques

The editor couldn't have said it better and will strive to minimize the use of the blue pencil on programs or articles. Let us hear from you.

* EDITOR'S NOTE

For the Novice

Many 4051 users are inexperienced programmers. If you fall into this category, you are probably painfully aware of how much time can be lost from the omission of some minor detail from an instruction manual or training session. To aid those of us who are not well versed in "standard programming practices," TEKniques is adding a new feature titled "BASIC BITS". Some of the program tips included here may seem excruciatingly obvious to experienced programmers, but we hope they will eliminate some hiccups for novice 4051 programmers. If you've discovered any "BASIC BITS", please send them in, no matter how simple or obvious they may seem.

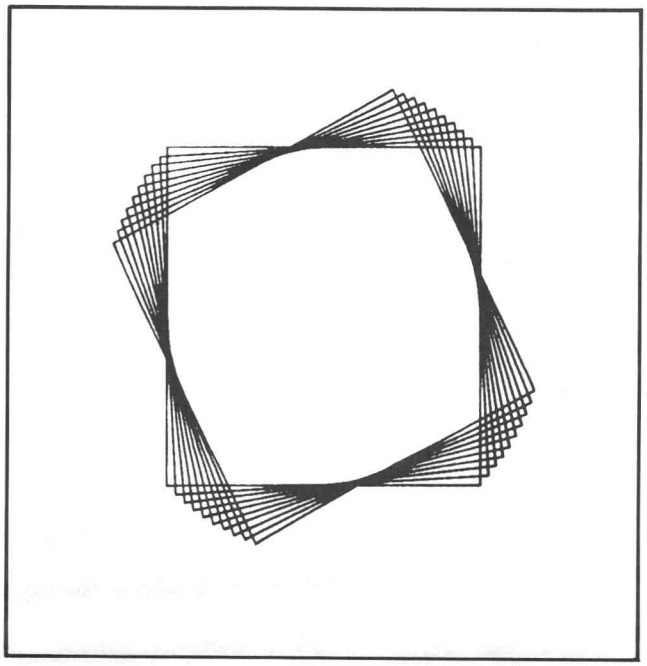
Program Catalog Available

The 4051 Applications Library catalog of abstracts was mailed out with the last issue of TEKniques. It describes programs in the Library contributed through May. If you did not receive one, write Tektronix, Inc.; Information Display Group; P.O. Box 500; Group 451; Beaverton, Oregon 97077.

Have You Filled Out Your 4051 Applications Library Membership Card?

In an effort to keep our mailing list current, we generally remove names from the TEKniques mailing list after four months if we don't receive a 4051 Applications Library Membership card. So if you haven't filled out a membership card yet, take a few moments and complete the card included in this issue of TEKniques. If you have a change of address, filling out a new membership card is a convenient way of informing us of the change. TEKniques

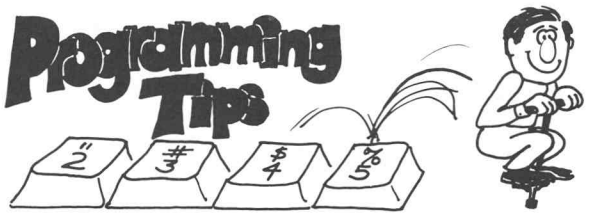
Camera, Action . . . CUT!



We goofed. Will Gallant's "Animation" article in TEKniques No. 6 referenced a sample program suggesting a general approach for creating graphic images to be filmed without the need to have an operator on hand. Unfortunately, the program was omitted, so here it is along with an illustration. We apologize.

```
100 INIT
110 SET DEGREES
120 DATA -25,0,50,0,-50,-25,50,0,-50,0
130 DIM X(5),Y(5)
140 READ X,Y
150 REM ROTATE A BOX THRU 10 REVOLUTIONS
160 FOR I=1 TO 10
170 FOR J=0 TO 360 STEP 3
180 ROTATE J
190 MOVE 65,50
200 RMOVE X(1),Y(1)
210 FOR K=2 TO 5
220 RDRAW X(K),Y(K)
230 NEXT K
240 COPY
250 REM ALLOW FOR SLOW SHUTTERS
260 FOR S=1 TO 100
270 NEXT S
280 REM ERASE THE SCREEN AND REORIGIN
290 FOR L=1 TO 8
300 PAGE
310 NEXT L
320 NEXT J
330 NEXT I
340 END
```

Note that after the COPY command in line 240, the screen is erased eight times. This erase loop is necessary because of the automatic origin shift in the 4051. It is recommended that this feature not be disabled. The total time to complete this erase loop is only 6 seconds, which doesn't add much to your pre-frame shooting time.



Using The POINTER Command in Interactive Programs

By Ken Cramer

When programming interactive applications on the 4051, it is sometimes desirable to input a character without it being echoed to the 4051 display, or to have the program respond to the typing of a single character, rather than a character followed by a carriage return.

You can use the POINTER command to accomplish both these operations as the following contrasting examples demonstrate:

Standard Method:

```
100 PRINT "Do you want instructions? (Y or N)"
110 INPUT A$
115 A$=SEG(A$,1,1)
120 IF(A$="Y") or (A$="y") THEN 200
130 IF(A$="N") or (A$="n") THEN 150
140 GO TO 100
150
```

Using POINTER:

```
100 PRINT "Do you want instructions? (Y or N)"
110 POINTER X,Y,Z$
120 IF Z$="Y" OR Z$="y" THEN 200
130 IF Z$="N" OR Z$="n" THEN 150
140 GO TO 100
150
```

In this particular use of the POINTER command, the returned X, Y values are of little consequence unless you have a 4952 Joystick.

The advantage in using the POINTER command is that it requires only one keystroke to respond to a question, and no response, which may disrupt the picture, is echoed to the screen. Keep in mind the absence of a blinking question mark as an input prompt and the unavailability of the keyboard editing keys to correct typing errors.

Renumbering Programs

By Will Gallant

Once you have written and debugged a program, it is often desirable to renumber the program so that the subroutines begin on hundreds or thousands. A typical technique for renumbering a program is to renumber and list, renumber and list, etc. This procedure can be simplified considerably using a GOTO ... IF ... statement.

The first step in this simplified renumbering procedure is to list the program and record the line numbers of the first statement of each subroutine. Next, add a GOTO statement in an unused space prior to statement 100. In this example, assume that subroutines start at lines 230, 380 and 610 and that you would like them to start at 1000, 2000 and 3000. The initial GOTO statement would then be:

```
1 GO TO X OF 230,380,610
```

Now call a RENumber operation followed by a command to redisplay the GOTO statement (press the RECALL LINE edit key to redisplay line 1).

```
REN 1000,10,230
1 [RECALL LINE]
1 GOTO X OF 1000,1150,1380
```

After each renumber operation, the line numbers in the GOTO statement are automatically updated. The new line numbers can then be used in the next renumber operation.

```
REN 2000,10,1150
1 [RECALL LINE]
1 GOTO X OF 1000,2000,2230
REN 3000,10,2230
1 [RECALL LINE]
1 GOTO X OF 1000,2000,3000
```

This procedure is very efficient since you only have to redisplay one line after each renumber operation rather than relist the whole program. Teknigues

Truncation Utility

By Judy Peterman

This program was originally offered as one of the early programs in the 4051 Applications Library. It is so short, however, that we decided to provide it to you as a program tip.

The program illustrates a one-line process that allows the user to truncate a number to a specified number of digits, not the number of digits to the right of the decimal point, but the total number of significant digits. It can be used to avoid round-off error or to prepare for a PRINT USING format.

```
100 INIT
110 PRINT "HOW MANY DIGITS OF ACCURACY";
120 PRINT " DO YOU WANT"
130 INPUT D
140 F0=0
150 PRINT " ENTER 0 ";
160 INPUT F8
170 IF F8=0 THEN 190
180 F0=INT(10↑(D+INT(-LGT(ABS(F8))))*F8+0.5)/10↑(D+INT(-LGT(ABS(F8))))
190 PRINT F8,F0
200 GO TO 150
```

4051 Applications Library Program Abstracts

Documentation and program listings of these programs may be ordered for $15.00 each. Programs will be put on tape for an additional $2.00 handling charge per program and a $26.00 charge for the tape cartridge. (The program material contained herein is supplied without warranty or representation of any kind. Tektronix, Inc. assumes no responsibility and shall have no liability, consequential or otherwise, of any kind arising from the use of this program material or any part thereof.)

Please use the Applications Library Order Form. Order forms are included in the Membership Packet and are available from your local Tektronix Sales Engineer. Teknigues

ABSTRACT NUMBER: 51/00-6102/0

Title: **Hewlett-Packard Interface Package**
Author: Peter O. McVay, Program Specialist
Norfolk Public Schools, Norfolk, VA
Memory Requirement: 16K
Peripherals: Option 1

This program consists of 13 files. File number 1 contains a menu of the 12 routines in the package. The menu also provides operation control for the routine. The entire interface package allows you to:

1. Log on and off the HP2000 series computers,
2. Interface in terminal mode,
3. Restore and store HP programs on the 4051 tape system,
4. Store and restore HP files using HP utility programs $FCOPY and $EDITOR,
5. Connect the Tektronix 4051 to any RS-232 EIA-compatible hardcopy terminal for listing or printing (terminal may be used as a line printer only).

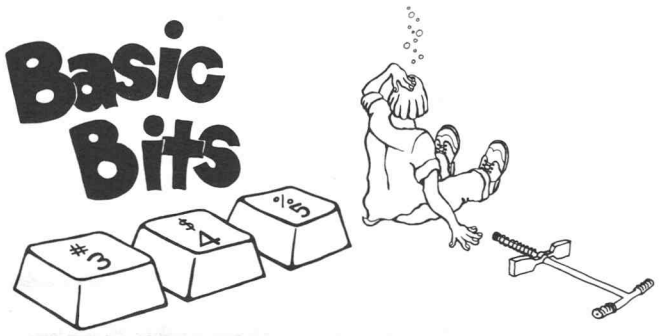
The system is internally documented, and maintains continuous control of the two computers. Pressing Overlay Key 5 (RETURN TO BASIC) returns control to the MENU.

ABSTRACT NUMBER: 51/00-8012/0

Title: **Leroy Character Generator**
Author: Mark Mehall
Memory Requirement: 16K
Peripherals: 4662 Plotter (Optional)

This set of routines draws alphanumeric characters and special symbols on a 4051 or 4662 in a style similar to the Leroy character set. The characters and symbols can be any size or angle, and may be positioned at any location on the screen or plotter surface. Since the routines do not interfere

with the user's window and viewport, they can be used with existing programs for annotation. Labels can be placed on axes, points can be indicated, and legends can be added to graphs. There are 128 possible symbols, including upper and lower-case letters, numbers, sixteen centered symbols, and special characters. The routines also offer sub-scripts and superscripts, underlining, italics, tab settings, backspace and carriage return functions.



MARKING AND RE-MARKING

A **new** tape? Stretch it out before MARking it. Insert it in the 4051 and type FIN 2 (any # except Ø or 1). The tape will be searched to the end and this message will appear on the viewport:

```
FIN2
MAG TAPE ERROR IN IMMEDIATE LINE - MESSAGE NUMBER 54
```

Press the REWIND button and the tape will be ready for use.

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Any files following the file on a tape that has been re-MARked will be lost. Example: You have 5 files saved on a tape. File #2 is too small for the revised program and you MARk it again enlarging it. As a result, files 3, 4 and 5 are lost and cannot be recovered.

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Herman Kan of Boeing suggests when you are developing a program to use the first file on a tape and mark it the full memory capability of your 4051. Using File #1 will save you the time of searching over other programs for the file on which you're working.

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M6800 Cross-Assembler/Editor

For use in M6800 microcomputer system development. Program is written in 4051 Tek BASIC and requires a 4051 with 32K of memory. Source statements written in Motorola Assembly language are converted to M6800 machine code. Program has nearly all the features of both Motorola's co-resident assembler and their cross-assemblers including automatic hex, octal and binary conversion. Program also automatically saves the entire assembly listing in the first available file on a data tape. Can be modified to run on machines with less than 32K memory. Includes loader and dissassembler. Buzz Hill, Eyedentify, Inc., P.O. Box 2006, Longview, Washington 98632, (206) 423-3281.

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