Tektronix
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SPS PROGRAMMING

For Users of SPS Instruments and Software.   Volume 4, Number 1   Feb 1980

In This Issue . . .

V02 PROGRAMMING AID AVAILABLE

When early shipments of V02 software were made, the Programming Aid
was not available. It is now in print and is being sent to all customers
who have received TEK SPS BASIC V02. If you have V02 and have not received
a programming aid, you can call your local Tektronix Field Office or
representative and order part no. 070-2847-00 to get a copy.

This new programming aid serves as a good reference document for users
already familiar with TEK SPS BASIC. It describes the purpose and syntax
for all TEK SPS BASIC V02 commands (system software as well as package
commands), provides a listing of error codes, and contains other helpful
operating information in a handy 5.5 x 8.5 inch manual.

The SPS PROGRAMMING UPDATE is published periodically by the SPS (Signal
Processing Systems) Documentation Group of Tektronix, Inc. This newsletter
provides a listing of verified problems for current products, information
for correcting or bypassing verified problems, listing of documentation
corrections, notice of availability of corrected software and firmware,
helpful programming hints, and a description of new products.

The SPS PROGRAMMING UPDATE is provided free of charge to users of SPS
products. Subscriptions can be obtained by returning the subscription card
received with your product or by sending requests to the address below.
All subscriptions should be addressed to an individual contact at the
customer's site -- preferably the person maintaining the system.

Much of the material in this newsletter is developed from customer
comments or from SPS Performance Reports (SPRs) which are of a general
nature. As a result, we urge you as subscribers to send in any comments
or report all apparent errors in the software, the instruments, or the
manuals. Use the attached report form or send comments to the address
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or address to:

        SPS PROGRAMMING UPDATE
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        P.O. Box 500
        Beaverton, OR 97077

Outside the U.S.A., contact your local Tektronix representative.

TEK SPS BASIC V02 PROGRAMMING HINT

Fatal Errors, The GPIB, And The Low-Level Driver

It has come to our attention that, while TEK SPS BASIC recovers from fatal errors, the GPIB interface is not always so fortunate. It can be left in an unpredictable state, creating intermittent problems with subsequent GPIB communications (usually indicated by I-18 errors). To avoid this, execute the following two lines after fatal errors resulting from programs which use the low-level GPIB driver (GPI.SPS):

        *SIFLIN @X,"IFC"
        *SIFCOM @X,LA,SA,"SDC"

where: X is the interface number,
         LA is the listen address of the last instrument
         communicated with before the fatal error,
         SA is secondary address of the last instrument
         communicated with.

These instructions will clear both the interface and the instrument to permit normal GPIB communication.

If identifying the last instrument addressed is a problem or if the last GPIB communication involved several instruments, substitute the following for the second command:

        *SIFCOM @X,"DCL"

This will return all instruments on the bus to their initial state. However, this can have possible side effects. In a 7912AD configuration including programmable plug-ins, a DCL command will return both the mainframe and the plug-ins to power-up settings. If the timebase has been set for a very fast sweep speed and the intensity was not turned down before the DCL is sent, the return to power-up settings might cause a target burn on the digitizer.

Preventing Permanent Graticules

The GRAPH command normally displaces the graticule by a few points each time it is invoked. This prevents burning a pattern onto the terminal screen. However, if a SETGR VIEW statement precedes the GRAPH command, the graph will be in exactly the same place every time the following command sequence is invoked:

```
*SETGR VIEW
*GRAPH WA
```

This will eventually burn a permanent graticule into the screen.

To get around this problem, the viewport should be moved by a few points prior to each SETGR VIEW statement. In the following routine, JH and JV (horizontal and vertical displacement) are randomly set to some value between +5 and -5, and then added to the base viewport value. The program lines which accomplish this are lines 500 to 530. The remainder of the program provides an explanation and example of how the program can be used.

```
10 REM ***** FOR THOSE WHO USE VIEWPORT TO *****
20 REM ***** GRAPH AND DON'T WANT TO BURN  *****
30 REM ***** THEIR SCREEN                  *****
40 REM
50 REM
60 REM ***** INSTEAD OF VIEWPORT X,Y,Z,W   *****
70 REM ***** VIEWPORT X+JH,Y+JH,Z+JV,W+JV  *****
80 REM ***** WHERE JH - HORIZONTAL JITTER  *****
90 REM *****       JV - VERTICAL JITTER    *****
100 REM
110 REM ***** SET UP AN ARRAY              *****
120 DIM A(511)
130 A=1\INT A,A\A=A*SIN(44/7/512*A*5)
140 REM ***** INTITIALIZE VIEWPORT VARIABLES X,Y,Z,W   *****
```

```
160 X=300\Y=800\Z=150\W=650
165 VIEWPORT X,Y,Z,W
170 FOR I=1 TO 5
180 REM ***** ADJUST THE VIEWPORT *****
190 GOSUB 500
200 SETGR VIEW
210 GRAPH A
220 NEXT I
230 END
440 REM **** ROUTINE TO DISPLACE VIEWPORT ****
450 REM GET A HORIZONTAL JITTER FACTOR BETWEEN
460 REM -5 AND 5 SCREEN POINTS
470 REM GET A VERTICAL JITTER FACTOR BETWEEN
480 REM -5 AND 5 SCREEN POINTS
490 REM THEN ADD JITTER TO EXISTING VIEWPORT
495 REM
500 JH=ITP(11*RND(0)-5)
510 JV=ITP(11*RND(0)-5)
520 VIEWPORT X+JH,Y+JH,Z+JV,W+JV
530 RETURN
```

Hardcopy A shows several graphs overlapped when no jittering is performed. Used repeatedly, this will result in a permanent graticule on the screen. Hardcopy B shows the same graphs overlayed with jittering.
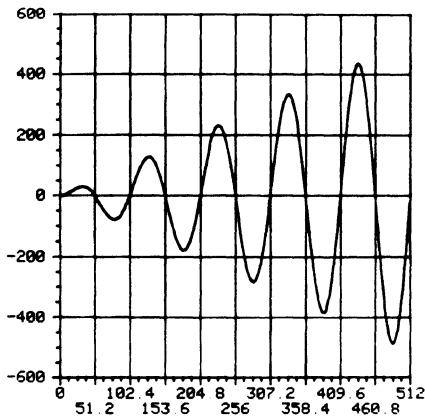
Hardcopy A
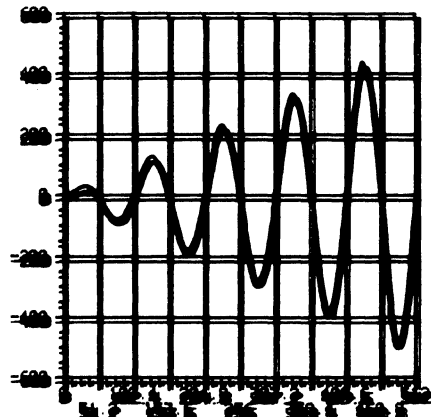
Hardcopy B

A Method To Get More Accurate Timing For WAIT and SIFTO

Due to the different types of memory available (including cache), the timing in the WAIT and SIFTO commands is not always as accurate as some applications demand. Here are some simple methods to calculate a calibration ratio specific to your system by using a stopwatch. The ratio can be used to adjust the WAIT and SIFTO commands for more accurate timing.

To calculate a ratio for the WAIT command, use the following program:

```
10 LOAD 'WAIT','PRINT'
20 PRINT 'WHEN YOU ARE READY, SIMULTANEOUSLY HIT A KEY'
30 PRINT 'AND TURN ON THE STOPWATCH'
40 PRINT 'WHEN THE TERMINAL BELL RINGS, TURN OFF THE STOPWATCH'
50 WAIT
60 WAIT 30000
70 PRINT '^G'
80 PRINT 'INPUT TIME FROM THE STOPWATCH'
90 INPUT T
100 PRINT 'THE WAIT-ADJUSTMENT RATIO= ';30/T
```

The timing portion of the program takes 20 to 40 seconds to complete; the exact time depends upon the computer type. Now, whenever you use the WAIT command with this system, multiply the time you want to wait by the WAIT Adjustment Ratio.

To calculate a ratio for the SIFTO command, use the following program. A GPIB instrument should be connected to the interface and turned on. Lines 20 and 80 should use the interface number your hardware is strapped for.

```
10 LOAD 'GPI','RASCII','SIFTO','PRINT','ONERR','WAIT'
20 SIFTO @0,30000
30 ONERR Z GOTO 100
40 PRINT 'WHEN YOU ARE READY, SIMULTANEOUSLY HIT A KEY'
50 PRINT 'AND TURN ON THE STOPWATCH'
60 PRINT 'WHEN THE TERMINAL BELL RINGS, TURN OFF THE STOPWATCH'
70 WAIT
80 RASCII A$ FROM @0
90 RETURN
```

```
100 PRINT '^G'
110 PRINT 'INPUT TIME FROM THE STOPWATCH'
120 INPUT T
130 PRINT 'THE SIFTO ADJUSTMENT RATIO= ';30/T
140 ONERR RETURN
```

The timing portion of the program takes 20 to 40 seconds to complete;
the exact time depends upon the computer type. Now, whenever you use the
SIFTO command, multiply the timeout value you want to specify by the SIFTO
Adjustment Ratio.

A convenient way to implement these adjustment ratios in a program
is to set a variable to the value of the calculated adjustment ratio. Then
each time the command is used in the program, specify the time-out value
by multiplying the desired time-out period by that variable. If the program
is run on another computer, only the single line defining the variable
needs to be changed

PROGRAMMING REPORTS FOR TEK SPS BASIC V02 SOFTWARE

Programming reports 1 through 12 for TEK SPS BASIC V02 Software are
included in this issue. If you are a current owner of this software, you
may want to attach these reports to your manual or place them in a separate
notebook for easy access.

NOTICE

Please use multicopy forms if available.

No.

SPS PERFORMANCE REPORT

(Instruction on back of yellow copy.)

Date:

(A)

PRODUCT NAME: **OPTIONS:**
SERIAL NUMBER: **VERSION:**

(B) Company Name:	(C) REASON FOR REPORT	PRIORITY
Name of User:	☐ Performance	☐ Low
Address:	☐ Documentation	☐ Standard
	☐ Suggestion	☐ High
	Is performance reproducible?	
Phone: Ext:	☐ Yes ☐ No ☐ Intermittent	

(D) SYSTEM CONFIGURATION (include serial numbers)

Acquisition Units (include plug-ins):

Controller (include memory size and type):

Storage Devices:

Display Devices:

Software (versions/releases):

(E) DESCRIPTION (attach listings or hard copies if available):

ORIGINATOR: Retain yellow copy—Send others to SPS DOCUMENTATION GROUP

(F) FOR TEKTRONIX USE ONLY   **REPLY**

COMMENTS: DATE:

                                        REPORT #:

SIGNED

SPS DOCUMENTATION GROUP: Retain green copy—Return white copy to originator—Send pink copy to SPS Marketing

SPS PROGRAMMING UPDATE
RESPONSE FORM

|_| Address correction only (show new address below).

|_| I am receiving duplicate copies of the SPS Programming
Update. Please drop all except one.

|_| Add the following additional names to the SPS Programming
Update mail list (please show complete address).

|_| Drop my name from the SPS Programming Update mail list.

Additional Addresses/Changes:

Name _____

Company _____

Building _____ Mail Station _____

Address _____

City _____ State _____ Zip _____

. . . .

Name _____

Company _____

Building _____ Mail Station _____

Address _____

City _____ State _____ Zip _____

. . . .

Name _____

Company _____

Building _____ Mail Station _____

Address _____

City _____ State _____ Zip _____

. . . .

Comments: _____
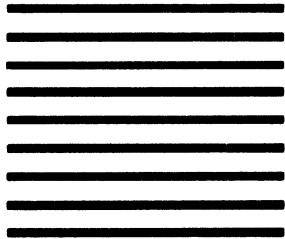
_____

_____

PROGRAMMING REPORTS

for

TEK SPS BASIC SOFTWARE

V02

January 15, 1980

TEK SPS BASIC V02 PROGRAMMING REPORTS

Index by Type

Latest report included: 12   Date: 15-JAN-80

Command/Statement/Driver/ Function Affected	Report Number(s)	Fixed in Version/ Release/Patch
ATAN2 Command	5	
BOOT Command	7	
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COPY Command	2	
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COS Function	4	
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DISPLAY Command	11	
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REPLACE Command	1	
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TEK SPS BASIC V02 PROGRAMMING REPORTS

Index by Number

Latest report included: 12   Date: 15-JAN-80

Report Number	Fixed in Version/ Release/Patch	Description
1		0-2 error when using REPLACE may cancel disk files.
2		INTO feature of COPY command with too small block specification creates incorrect file without issuing an error.
3		Requesting patch area with SYSBLD command causes fatal C-5 errors.
4		When function argument is outside range -2PI to +2PI, SIN and COS may return wrong value.
5		No error is issued by signal processing commands if zoned arrays given as arguments overlap.
6		Warning error issued if variable name starting with E immediately follows a line number when program is loaded by OVERLAY.
7		BOOT command cannot boot DX1:.
8		RESET command used when READing parts of arrays results in invalid data with subsequent READs.
9		A fatal H-0 error can occur after re-ATTACHing a DPO.

10   Minus sign in a string specifying an
            octal number does not cause the VARTST
            command to issue an error.

11   The first symbol is not printed when
            line plots are made using the DISPLAY
            Command.

12   SETDATE command does not allow leading
            zeroes or spaces in the date string.

TEK SPS BASIC V02 PROGRAMMING REPORT

NO: 1   **DATE:**   3-OCT-79

MODULE: TEK SPS BASIC Nonresident REPLACE   **VERSION:** V02-01
              Command   **SPR NO:**

DESCRIPTION:

If the REPLACE command causes an 0-2 error, the disk file being
replaced might be cancelled and replaced with an empty one-block file.

EXAMPLE:

```
*DIM A(3000)
READY
*REPLACE 'PROG.BAS'
FATAL 0-2
READY
*DELETE A
READY
*DIR 'PROG.BAS'
PROG.BAS        1
```

SUGGESTION:

If this happens, delete an array that uses at least 260 words of
storage or RELEASE any drivers or LOADed commands. Then try the REPLACE
again.

DISPOSITION:

To be fixed in the next release of the REPLACE command.

NO: 2   **DATE:**   3-OCT-79

MODULE: TEK SPS BASIC Nonresident COPY   **VERSION:** VØ2-Ø1,(VØ1-Ø1,
Command   VØ1-Ø2)

                                              SPR NO:

DESCRIPTION:

If the INTO feature of the COPY command is used and the number of
blocks stated is one block too small, no error is given although the new
file is incorrect.

EXAMPLE:

```
*DIR 'PROG.BAS'
PROG.BAS          5
READY
*COPY 'PROG.BAS' TO 'PROG.FOO' INTO 4
READY
*DIR 'PROG.FOO'
PROG.FOO          4
READY
*
```

Even though PROG.FOO is listed in the directory as consisting of 4
blocks, the new file is incorrect since it was one block smaller than the
original file PROG.BAS.

SUGGESTION:

If the INTO feature of the COPY command is going to be used, display
a DIRectory of the file first to obtain the size of the file.

DISPOSITION:

To be fixed in the next release of the COPY command.

TEK SPS BASIC VØ2 PROGRAMMING REPORT

NO: 3   **DATE:**   4-OCT-79

MODULE: TEK SPS BASIC Resident Monitor   **VERSION:** VØ2-Ø1
                                                                    SPR NO:

DESCRIPTION:

When a patch area is requested (by using the SYSBLD command), the monitor initialization program attempts to execute the following line of BASIC:

        OLD "PATCH.FIX"\RUN

The OLD command, however, does not allow any commands to follow it on the same line. The PATCH.FIX program is brought into memory, but a C-5 error is issued and the program is not executed.

EXAMPLE:

        TEK SPS BASIC VØ2-Ø1--COPYRIGHT 1979--TEKTRONIX, INC.
        FATAL C-5
        ALL RIGHTS RESERVED. SERIAL NO. XXXXX.
        YOU HAVE XXXXX WORDS OF FREE MEMORY

        READY
        *

SUGGESTION:

Since there are no patches to the TEK SPS BASIC VØ2 Resident Monitor at this time, it should not be necessary to request a patch area for correcting the monitor. If you have some other reason to use the patch area, you must RUN the program yourself. Type RUN following the appearance of the fatal C-5 error message and the READY prompt.

DISPOSITION:

To be fixed in the next release of TEK SPS BASIC Monitor.

NO: 4   **DATE:**   4-OCT-79

MODULE: TEK SPS BASIC Resident Monitor   **VERSION:** V02-01, (V01-01
             SIN and COS Functions   V01-02, V01-03)

                                                       SPR NO: 2725

DESCRIPTION:

When the function argument is outside the range -2 PI to +2 PI, the double-to-single precision conversion routine used by SIN and COS may inadvertently round an intermediate mantissa. This overflows its exponent, causing the function to advance by 1 quadrant. This can occur in approximately 1 of 2^{24} values entered outside the range of -2 PI to +2 PI. This problem occurs only in controllers with FIS/EIS.

This error was fixed incorrectly in V02-01.

EXAMPLE:

```
5  REM *** LINE 10 PRINTS CORRECTLY
10 PRINT COS(-5/4*6.283184)
15 REM *** LINE 20 COMPUTES INCORRECTLY
20 PRINT COS(-5/4*6.283185)
RUN
1.49803E-06
.0245412
```

SUGGESTION:

Test arguments to be sure they are in the range ±2 PI.

DISPOSITION:

No user patch available. To be fixed in next release of TEK SPS BASIC Monitor.

TEK SPS BASIC V02 PROGRAMMING REPORT

NO: 5

DATE: 4-OCT-79

MODULE: TEK SPS BASIC Nonresident
CORR, CONVL, INT, DIFF,
RFFT, RFFT1, ATAN2 Commands

VERSION: CORR: V02-01; (V01-01,02)
CONVL: V02-01; (V01-01,02)
INT: V02-01; (V01-01)
DIFF: V02-01; (V01-01)
RFFT: V02-01; (V01-01)
RFFT1: V02-01; (V01-01)
ATAN2: V02-01; (V01-01,02,03)

SPR NO:

DESCRIPTION:

No error is issued if zoned arrays given as arguments overlap. Since these commands store intermediate results in the various arrays, necessary values may be overwritten if zones overlap. Note that the autocorrelation capability in the CORR command is an exception since it is designed to work properly when the source arrays totally overlap.

EXAMPLE:

```
10 DIM A(100)
20 A=1
30 INT A(0:99),A(1:100)
```

Values in A do not increase in a linear fashion.

```
10 DIM A(511),B(256)
20  .
     .          (set up array A)
     .
50 RFFT A,B,A(0:256)
```

The resulting arrays, B and A(0:256), will contain inaccurate values.

SUGGESTION:

Transfer one array zone to a temporary array unless you are performing an autocorrelation with totally overlapping source arrays.

DISPOSITION:

Will be corrected in next release of these commands.

TEK SPS BASIC V02 PROGRAMMING REPORT

NO: 6   **DATE:**   4-OCT-79

MODULE: TEK SPS BASIC Nonresident OVERLAY   **VERSION:** V02-01,
        Command   (V01-01, V01-02)

                                                         SPR NO: 2752

DESCRIPTION:

If a program which was brought into memory by OVERLAY contains a
statement such as:

        10000 E9 = 0

where the line number is followed by a variable name composed of E followed
by a number, a warning error (E-4) may occur during the first computational
command following the OVERLAY command. The OVERLAY command uses an ASCII-
to-integer conversion routine which accepts E as a valid numeric character.
In the above example, the line number is decoded as 10000 E+09 which is
too great a value for an integer.

EXAMPLE:

If a file, PROG.BAS, has the statement:

        1000 E9=0

and the following program is executed:

        100 OVERLAY "PROG"
        110 X = 0

a warning error E-4 occurs at line 110. (NOTE: Warning error E-4 is set
during line 100 but is not checked until the end of line 110.)

SUGGESTION:

This error does not cause the program to run incorrectly. The warning
error should be ignored. To get rid of the warning error, specify the LET
keyword before the destination variable (e.g., LET E9=0).

DISPOSITION:

To be corrected in next release of the OVERLAY command. Correction
provided for the V01-02 OVERLAY command by user PATCH.010 in Vol. 2, No.
2 of the Software Maintenance Newsletter.

NO: 7   **DATE:**   8-OCT-79

MODULE: TEK SPS BASIC Nonresident BOOT   **VERSION:** V02-02
              Command   **SPR NO:**

DESCRIPTION:

It is not possible to boot DX1:.

EXAMPLE:

*BOOT DX1:

The machine will halt.

SUGGESTION:

Do not try to BOOT from Drive 1 on the floppy disk drive.

DISPOSITION:

To be fixed in the next release of the BOOT command.

TEK SPS BASIC V02 PROGRAMMING REPORT

NO: 8   **DATE:**   8-OCT-79

MODULE: TEK SPS BASIC Nonresident RESET   **VERSION:** V02-01, V01-01
Command   **SPR NO:**

DESCRIPTION:

If a RESET is done after part of an array has been read, subsequent
READs return invalid data.

EXAMPLE:

```
10 DIM A(10),B(3)
20 A=3
30 OPEN #1 AS 'TEST' FOR WRITE
40 WRITE #1,A
50 CLOSE #1
60 OPEN #1 AS 'TEST' FOR READ
70 READ #1,B
80 RESET #1
90 READ #1,A
```

After line 90 is executed, A will not contain 3's.

SUGGESTION:

When reading parts of arrays, use CLOSE followed by an OPEN instead
of RESET.

DISPOSITION:

To be fixed in the next release of the RESET command.

TEK SPS BASIC VØ2 PROGRAMMING REPORT

NO: 9   **DATE:**   12-OCT-79

MODULE: TEK SPS BASIC Nonresident DPO   **VERSION:** VØ2-Ø1
Driver   **SPR NO:**

DESCRIPTION:

A fatal H-Ø error can occur after re-ATTACHing a DPO. If a DPO was
ATTACHed, then DETACHed, and finally re-ATTACHed, the processing of an
interrupt from that DPO (e.g., a program call button is pressed) will
corrupt the software.

EXAMPLE:

```
10 ATTACH #1 AS DPO:
20 DETACH #1
30 ATTACH #1 AS DPO:
```

After executing the above statements, pressing call button 14 will
cause an H-Ø error indicating that the software is corrupted. (An H-Ø error
may not occur when other call buttons are pressed, but the software is
corrupted anyway.)

SUGGESTION:

If a DPO must be DETACHed and re-ATTACHed, the driver should be
RELEASEd and re-LOADed between the DETACH and the ATTACH.

DISPOSITION:

To be fixed in the next release of the DPO driver.

TEK SPS BASIC V02 PROGRAMMING REPORT

NO: 10   **DATE:**   18-OCT-79

MODULE: TEK SPS BASIC Nonresident VARTST   **VERSION:** V02-01
              Command   **SPR NO:**

DESCRIPTION:

The VARTST command does not give an error when a minus sign is used in the string specifying an octal number, even though the command was not designed to accept negative numbers as inputs.

EXAMPLE:

```
*VARTST X,'-7',Y
READY
*
```

SUGGESTION:

If you need to set the high-order bit, specify it along with the other bits to be set, as in VARCLR and VARSET.

DISPOSITION:

To be fixed in the next release of the VARTST command.

TEK SPS BASIC V02 PROGRAMMING REPORT

NO: 11   **DATE:**   3-DEC-79

MODULE: TEK SPS BASIC Non-resident   **VERSION:** V02-01, (V01-01)
             DISPLAY Command   **SPR NO:**

DESCRIPTION:

When using the DISPLAY command, the line plot with squares and the
line plot with triangles do not draw the square or triangle on the first
point of the graph.

EXAMPLE:

```
RUN
10 DIM A(31)
15 LIST
20 A=1\INT A,A
30 A=A*SIN(A*.19642)
40 VIEWPO 100,900,100,450
50 SETGR VIEW,NOPL,GRAT 2,3,2,3
60 GRAPH A,A/2
70 DISPLA 2,2,A,3,2,A/2
```
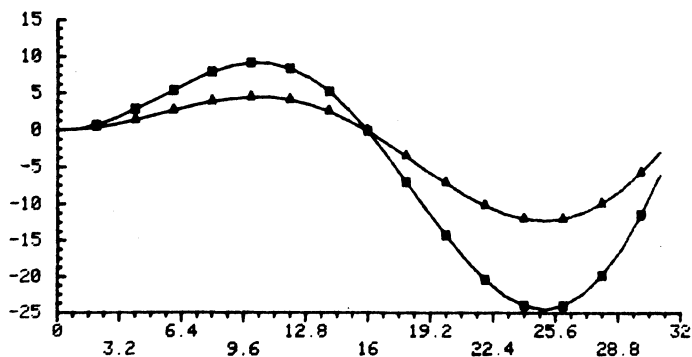
SUGGESTION:

If a symbol is required at the first point, MOVE to the position of
the first point (e.g., MOVE 0,A(0) for the array in the example) and then
DRAW the square or the triangle. For example:

```
MOVE 0,A(0)
RSMOVE -4,-4
RSDRAW 8,0,0,8,-8,0,0,-8
```

will draw a square at A(0) on the graph.

DISPOSITION:

To be fixed in the next release of the DISPLAY command.

TEK SPS BASIC V02 PROGRAMMING REPORT

NO: 12

DATE: 3-DEC-79

MODULE: TEK SPS BASIC SETDATE Command

VERSION: V02-01

SPR NO:

DESCRIPTION:

The SETDATE command does not allow leading zeroes or spaces in the
string argument. An S-22 error is returned.

EXAMPLE:

```
*SETDATE "03-OCT-79"
FATAL S-22
READY
*SETDATE " 3-OCT-79"
FATAL S-22
READY
*
```

SUGGESTION:

When SETDATE is used in a program, edit a leading zero or space out
of the date string by:

```
10 IF SEG(A$,1,1)<"1" THEN A$=SEG(A$,2,LEN(A$))
20 SETDATE A$
```

DISPOSITION:

To be fixed in next release of the SETDATE command.