

MINC Newsletter

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FEBRUARY - MARCH 1979

First MINC Customer in North America

The University of Pennsylvania is an old friend of Digital Equipment Corporation. In the past, the University has purchased a full range of DEC systems, and this year they are the proud owner of the first MINC-11.

The Electro-Optics and Microwave-Optics Laboratory of the Moore School of Electrical Engineering, University of Pennsylvania, made the purchase. According to a statement from Dr. Nabil H. Farhat, Professor of Electrical Engineering and Science at the Moore School, MINC will be used primarily as an aid in data acquisition, storage, processing, display, and control in an auto-

mated radar cross-section and antenna range measurement facility located in their microwave anechoic chamber.

This facility includes broad-band microwave sources and coherent receivers as well as a microwave network analyzer covering the 0.1 to 18 GHz range. The facility currently is used in the study of a new radar or sonar imaging principle capable of furnishing three dimensional object information. The principle utilizes frequency or wave-vector diversity to access the 3-D Fourier space of a nondispersive scattering object and hybrid (digital/optical) processing for the 3-D image reconstruction.

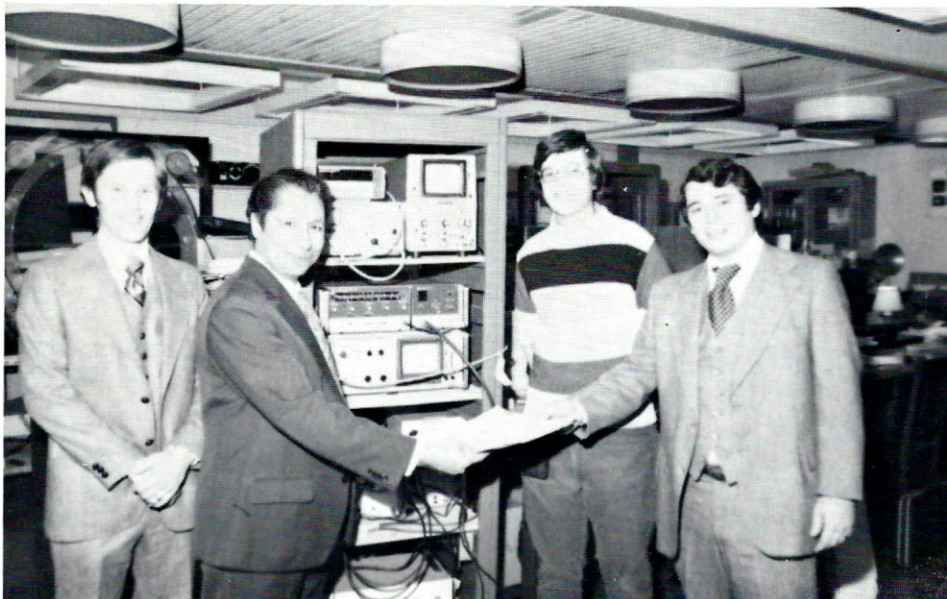
A specific task using this process would be the recreation of a three-dimensional image of a satellite. Radio waves are used to reach the satellite and collect the information.

MINC has made it possible for Dr. Farhat to do research that would have been impossible if the measurements had to be taken manually. MINC's IEEE-488 standard interface bus is used in instrument control and positioning of scattering test objects in the anechoic chamber. The relatively large amounts of data acquired by frequency sweeping are stored in MINC's 1 megabyte (1X10⁶ bytes) double-density dual floppy diskettes.

Because of its mobility, MINC will also be used in a variety of classroom demonstrations and in several other research projects involving holography and optical data processing.

Dr. Farhat claims that "The uses of MINC in the classroom are only limited by our imagination." At the present time, one of his classroom demonstrations exhibits the trajectory of electrons from an electron gun. By changing the parameters,

(Cont'd on page 2)



University of Pennsylvania places first MINC order. (Left to right: Ken Taylor, LDP Sales Unit Mgr., Dr. Nabil H. Farhat, Charles Werner, student, Rob Crossland, LDP Sales Rep.)

Items and Issues

Features

First MINC Customer in North America	1
Introducing The North American MINC Support Specialists	4
MINC Customers Invited to Join DECUS	2
MINC-11 Customer Support Strategy	3

Departments

Bits and Bytes	8
Editor's Corner	2
Programming Pointers	6
Questions and Answers	5
The Trading Post	9

Editor's Corner



With the publication of the first *MINC Newsletter*, Digital Equipment Corporation takes another step forward in its effort to support our customers. The Newsletter is published bimonthly to provide information about the MINC system to MINC customers.

Through our feature stories and columns, we hope to give you information that will enhance your applications. We encourage you to let us know what you're doing with your MINC, and also to submit programs that would be useful to other MINC customers. If you find a solution to a problem that can affect other MINC users, please let us know about it. "The Trading Post" is a column designed for the exchange of customer information.

Answers to questions frequently received at our Product Services Center in North America or through the Telephone Advisory Centres in Europe will be published in the *MINC Newsletter*. Since our MINC support specialists may refer you to the "Questions and Answers" column or to the "Bits and Bytes" column in which we advise you about MINC system problems and solutions, we recommend that you keep your *MINC Newsletter* with your MINC manual set.

We welcome your comments and hope you'll let us know which columns in the *Newsletter* you find the most valuable.

MINC Newsletter

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The MINC Newsletter is available to all MINC-11 customers.

MINC Customers Invited to Join DECUS

As a customer of Digital Equipment Corporation, you are eligible for membership in DECUS (Digital Equipment Computer Users Society), a "user-directed, not-for-profit organization, supported in part by Digital Equipment Corporation." DECUS is an international organization with more than 37,000 members.

A DECUS membership offers you the opportunity to join a SIG (Special Interest Group), which offers a means of exchanging specialized information and has no geographical limitations, or a LUG (Local User Group), which is geographically

based, and may have specific areas of interest. As a SIG member, you will receive all the literature generated by members of your group through a SIG newsletter. You will also have an opportunity to meet with people who use systems similar to yours at the symposia occurring throughout the year for each DECUS chapter.

As a member of DECUS you'll receive DECUSCOPE free of charge. DECUSCOPE, a newsletter published quarterly, will keep you informed about upcoming symposia and act as a forum in which to express your needs, interests, and opinions. DECUS members may also order any of the 2600 programs available from the DECUS library.

DECUS membership applications are accepted at the following offices:

DECUS Australia
P.O. Box 491
Crows Nest, New South Wales
2054
Australia
Telephone (61)-(2)-4392566

DECUS Europe
C.P. 510
12, avenue des Morgines
CH-1213 Petit-Lancy 1,
Telephone (022)-93-33-11

DECUS Canada
P.O. Box 11500
Ottawa, Ontario K2H8K8
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Telephone (613) 592-5111

DECUS U.S. and All Others
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1 Iron Way
Marlboro, Massachusetts 01752
Telephone (617) 481-9511
Ext. 4131

First MINC Customer in North America

(Cont'd from page 1)

Dr. Farhat is able to show how electrons change paths.

Dr. Farhat spent a year looking for a computer that would fill his needs. He did not have the time needed to configure a system that would meet those needs. Dr. Farhat was looking for a system that would provide an automated measurement system, give him control over data acquisition and computation, and be used in classroom demonstrations. MINC proved capable in all three areas.

MINC-11 Customer Support Strategy

Like our product, the customer support strategy for MINC is a new concept at Digital Equipment Corporation. It is a unique support strategy for DEC customers in that it offers centralized telephone service for total customer support.

MINC Support Specialists have been set up in telephone centers in selected locations around the world and are available to answer all questions customers have about their MINC systems.

MINC in North America

The Product Services Center (PSC) is available to all MINC-11 warranty and contract customers in North America for telephone consultation on any problems or questions they have about their MINC systems. Dialing the toll free number listed on page 5 of this newsletter puts you in contact with one of the MINC Support Specialists.

The staff at the Product Services Center is ready to answer all MINC system questions from 9 A.M. to 6



Jack Ragsdale, Petar Sredojevic, Robin Rapport and Andy Willinger, MINC Support Specialist in North America, investigate solutions for MINC questions.

P.M., EST, weekdays. Technical assistance for hardware problems is available 24 hours a day, 7 days a week, to extended contract customers.

MINC in Europe

Three Telephone Advisory Centres (TACs) have been set up in Europe to answer customer questions about their MINC systems.

Karl Heinz Mueller, who speaks both English and German, is our MINC Support Specialist in Munich. The Munich TAC accepts calls from customers in Germany, Austria and Swiss Germany.

Calls from customers in the United Kingdom and Ireland are answered by Peter Court, whose office is in Reading, England.

Johan Brusche, who speaks fluent French, Dutch, and English, addresses questions from customers in Holland, Belgium, France, and Swiss Romande.

Customers in Sweden, Norway, Denmark, Finland, Italy, and Spain are advised to call their local branch offices or authorized Digital representatives about their MINC systems. If more information is needed, customers will be directed to contact the appropriate TAC by their Digital representative.

European Telephone Advisory Centres are available to answer MINC-11 system questions from 8 A.M. to 5 P.M. on normal work days.

On-site service is available according to the terms and conditions of your agreement through your local Field Service Office.

MINC in Other Areas

Digital is considering the feasibility of telephone support centers elsewhere in the world. In the meantime, customers are advised to contact their local office or authorized Digital representative for information. An article on MINC support in locations outside of North America and Europe will be included in a future issue of the *MINC Newsletter*.



Don Ahnberg, Betty Markakis and Steve Miller discuss MINC related questions at the PSC.

Introducing The North American MINC Support Specialists

When North American customers telephone the Product Services Center, their questions will be answered by one of our MINC support specialists. For this reason we'd like to introduce you to three of the people you may be talking with about your MINC system.

Andy Willinger and Robin Rapport will answer your software questions and Petar Sredojevic can assist you with hardware questions or problems.

Andy Willinger comes to the Product Services Center from Harvard Medical School, where he was a postdoctoral research fellow in the Department of Neuropathology. As a research fellow, Andy's latest project at Harvard involved the study of somatic cell genetics. The project goal was to try to understand how genetic expression is controlled in mammalian cells. His experiments included the growing of pure mouse cell lines and fusing together and isolating heterokaryons, the binucleate hybrids.



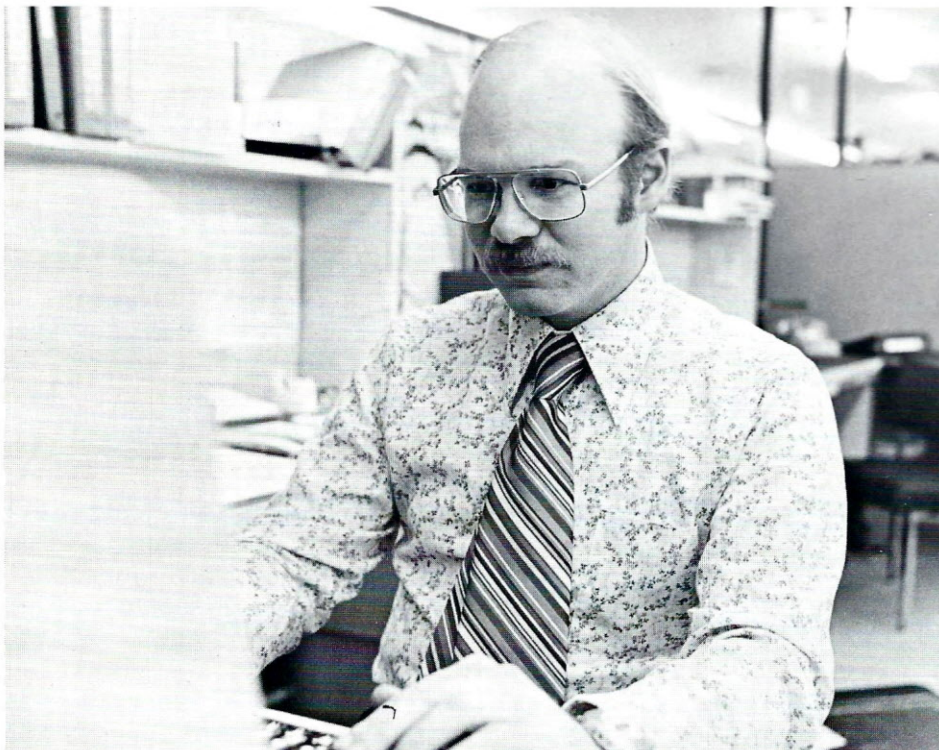
Robin Rapport

Prior to Harvard, Andy worked in a variety of laboratory settings while earning his Ph.D. in Biology at Temple University. During much of his time at Temple he was involved in studying the mechanism of protein

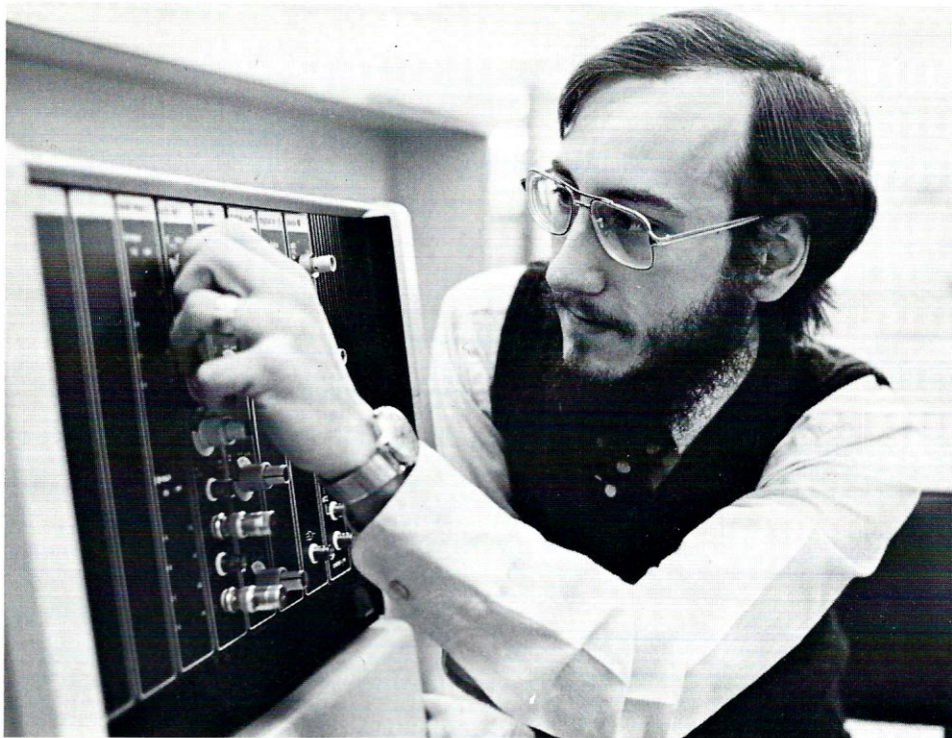
secretion in bacteria. The study's long-range goal was to find a way to stop secretion of protein in bacteria in order to eliminate the problems caused by bacterial toxins. He is acquainted with much of the equipment in a biology laboratory, having worked in neurophysiology, embryology, and biochemistry.

Not only is Andy comfortable in the laboratory setting but he also has acquired a great deal of knowledge about computers. He knows several high level languages, including BASIC, and has enjoyed working with computers since he was an undergraduate at the State University of New York at Binghamton. Andy feels that the link between his interests in biology and computers lies in the analytical procedure needed for both computer science and the biological sciences.

Robin Rapport, MINC software specialist, is something of a laboratory guru. Robin majored in Neurophysiology at Columbia University. After graduation, he decided to move away "from the big city life." He located a quiet position as Laboratory Director of a tannery, where he was



Andy Willinger



Petar Sredojevic

responsible for the development of new tests and procedures to be used in the art of tanning.

Robin's interest in electronics, which had been a hobby for many years, became a full-time involvement when he went to work for an electronics company. Wearing many hats in his new position, Robin was involved in the designing, testing, and debugging of hybrid microwave circuits.

It was in the Navy that Robin learned his first programming language, FORTRAN. He later enhanced his programming skills while working as a Sales Manager for a power company.

Robin's enthusiasm for acquiring computer knowledge arises from his belief that "Computers are the epitome of technology."

Petar Sredojevic, one of the MINC hardware specialists, comes to Product Services Center from Digital's Cleveland office. Petar recently worked with a customer who manufactured computerized axial tomography systems (CAT scan), which were controlled by a PDP-11/34. Petar's responsibility

was to install and maintain the PDP-11/34s, incorporated in the CAT systems, before their shipment to medical facilities.

The CAT scan, a diagnostic tool, takes a series of cross-sectional X-ray "slices" of a human body and displays them on a monitor for diagnostic viewing. The hope is that the CAT scan will help eliminate unnecessary exploratory surgery.

Before joining Digital, Petar worked as a field service representative for a Dallas company. He was based on-site at the Cleveland Trust Bank, where he was responsible for keeping the transaction control systems operational.

Petar first became interested in computers while working for Gould, Inc., Ocean Systems Division. He repaired the automatic test equipment for the Mark 48 torpedo used by the Navy. (Gould used a PDP-11 system to collect data from the test equipment.) Petar saw the industry trend toward computer data acquisition and analysis, and decided he wanted to become part of this new "computer world."

MINC-11 SUPPORT CENTERS

For answers to your MINC questions or help with MINC system problems, customers are reminded to call the following numbers:

In the Continental U.S., except Massachusetts, call

1-800-225-9366

In Massachusetts, call

1-800-762-9700

In Hawaii, Alaska and Canada, call collect

617-493-9473

In Europe, Telephone Advisory Centres are located in the following cities:

Munich, Germany

Brussels, Belgium

Reading, England

Customers in other parts of the world will be advised about calling instructions by their authorized Digital representative or local Digital office.

Questions and Answers

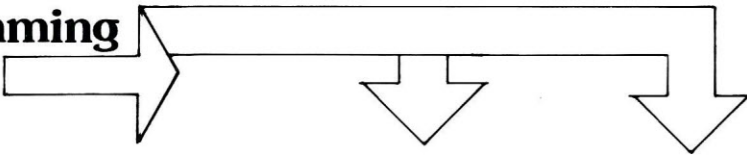
Telephone service centers have been set up around the world to answer questions about your MINC system, and the *MINC Newsletter* will publish those questions that are asked most frequently. Listed below are some questions that were answered by the Product Services Center in North America.

Q. How many channels can be displayed at once using AIN in Display Mode?

A. AIN can display more than one channel at a time on the MINC terminal. The maximum number that can be displayed is determined by two factors, the number of channels and the sample rate for the channels. The AIN command's first priority is to collect data, and as time allows, it will display the data as a graph. AIN can display around 300 points a second.

(Cont'd on page 7)

Programming Pointers



The following programming hints were provided by Digital people associated with the MINC-11 project. You are encouraged to submit programming tips that you feel may be helpful to other MINC users.

When Your BASIC Program Is Too Large

Some BASIC errors occur because there is not enough available memory. BASIC users can sometimes correct their problems by reducing the size of the BASIC program. Here are some ways to create more space:

- Eliminate or reduce such items as REMARK statements, long printed messages, and optional keywords such as LET.
- Make maximum use of multiple statement lines.
- Make use of program loops, subroutines, and user-defined functions.
- Split up large programs into several smaller programs by use of the CHAIN or OVERLAY statements.
- Reduce the size of arrays in memory to the size required (DIM statement).
- Use virtual array files for arrays that are too large to fit into memory.
- Reduce the number of simultaneously open files by opening a file just before you need it and closing it immediately after the last use.
- After you delete program lines, store the program with the SAVE command and restore it with the OLD command to further optimize program memory requirements.

String Arguments

Some MINC routines such as HTEXT or VTEXT use a text string argument. This argument may be a string variable, string literal or string

expression. The following statement contains an example of a string expression:

```
HTEXT ("Bold",5,30,"TIME="+CLK$)
```

For more information about Assignment Statements, see Book 2, page 38.

Complex Arithmetic with MINC BASIC

While the statement "PRINT 2+3" in MINC BASIC returns the value 5, the complex operation $2+3J + 3+2J$ is not defined as a valid operation.

Two programs are presented here for operations on complex numbers. The first program, COMPL1.BAS, will accept any two complex numbers and an operation symbol.

Note: Since the real number field is a subset of the complex number field, operations on the number 3 will return the same result as operations on the complex number $3+0J$. These two methods of writing 3 will work equally well; however, +J has no more meaning to these programs than does the + sign. If J is used it must be specified with a numeral (for example, 1J). In the program COMPL1.BAS the operation $(3+4J)*(3-4J)$ should return 25.

```
10 REM ****OPERATIONS WITH COMPLEX NUMBERS IN BASIC****
20 PRINT 'TWO COMPLEX NUMBERS AND AN OPERATION SYMBOL'
30 PRINT 'ARE INPUT IN THE FOLLOWING SPECIFIC ORDER:'
40 PRINT
50 PRINT      A+BJ,R,C+DJ
60 PRINT
70 PRINT 'WHERE THE LETTERS:A,B,C,D REPRESENT ANY REAL'
80 PRINT 'NUMBERS (+ OR -), THE LETTER "R" REPRESENTS'
90 PRINT 'ONE OF THE STANDARD BASIC OPERATION SYMBOLS:'
100 PRINT '+,-,/,*. THE OPERATIONS ARE PERFORMED AS IN'
110 PRINT 'STANDARD NOTATION, LEFT TO RIGHT (A-B<> B-A),'
120 PRINT 'AND THE J'S AND THE COMMAS MUST BE INCLUDED.'"
130 PRINT 'INPUT DATA AND OPERATOR' \ INPUT Q$(1),B$,Q$(2)
140 REM Define string locators; if number is in form
150 REM a+bJ,FNP will return the position of the
160 REM sign between the real and imaginary parts,
170 REM FNI will return the position of the J.
180 P$='+' \ N$='-' \ J$='J'
190 DEF FNP(A$)=POS(A$,P$,2)+POS(A$,N$,2)
200 DEF FNI(A$)=POS(A$,J$,2)
```

The user should type:

```
RUN COMPL1
```

The PRINT message explains the format for entry, then requests:

```
INPUT DATA AND OPERATOR
?
```

The user should type:

```
3+4J,*,3-4J
```

MINC responds:

```
25+0J
```

The second program, COMPL2.BAS, when run, comes back with the MINC BASIC 'READY' message. As long as COMPL2.BAS is loaded in the workspace, complex arithmetic may be performed in the immediate calculator mode. For example, the statement PRINT FNM\$(3,4,3,-4) will return: 25,0J

Note: The input of COMPL2.BAS is not a string, but the coefficients of the two complex numbers. To conserve workspace, the answer printed in COMPL2 was an array of two numbers as opposed to the string output in COMPL1.

The operations designated by the user-defined function statements FNA\$, FNS\$, FNM\$, and FND\$ (for addition, subtraction, multiplication and division) are performed on the first number pair by the second number pair.

```

210 FOR I=1 TO 2
220 R(I)=0 \ J(I)=0
230 REM R(..I) and J(..I), the real and imaginary
240 REM parts of the input expression, are
250 REM determined by string operations, and
260 REM are operated upon as real numbers.
270 R(I)=VAL(SEG$(Q$(I),1,LEN(Q$(I))-LEN(SEG$(Q$(I),FNP(Q$(I)),FNI(Q$(I))))))
280 J(I)=VAL(SEG$(Q$(I),FNP(Q$(I)),FNI(Q$(I))-1))
290 NEXT I
300 Z$='+-*/'
310 ON POS(Z$,B$,1)+1 GOSUB 130,370,400,430,470
320 U$=' ' \ IF J(3)>=0 THEN U$='+'
330 PRINT STR$(R(3))+U$+STR$(J(3))+','
340 PRINT 'INPUT ANOTHER OPERATION (Y/N)'; \ INPUT K$
350 IF K$='Y' THEN 130
360 GO TO 510
370 REM ***ADDITION***
380 R(3)=R(1)+R(2) \ J(3)=J(1)+J(2)
390 RETURN
400 REM ***SUBTRACTION***
410 R(3)=R(1)-R(2) \ J(3)=J(1)-J(2)
420 RETURN
430 REM ***MULTIPLICATION**
440 R(3)=R(1)*R(2)-J(1)*J(2)
450 J(3)=R(1)*J(2)+R(2)*J(1)
460 RETURN
470 REM ***DIVISION***
480 R(3)=(R(1)*R(2)+J(1)*J(2))/(R(2)^2+J(2)^2)
490 J(3)=(R(2)*J(1)-J(2)*R(1))/(R(2)^2+J(2)^2)
500 RETURN
510 END

```

```

10 REM ***IMMEDIATE MODE OPERATION***
20 REM Complex operations can be done in the
30 REM immediate mode with user-defined functions.
40 REM If the numeric components of the complex
50 REM are used as the input, instead of the string
60 REM representing the complex, these operations
70 REM follows:
80 REM PRINT FNM$(3,4,3,-4)
90 REM will print the result of the
100 REM complex multiplication of
110 REM (3+4j)*(3-4j). . .
120 REM MINC prints the real and imaginary
130 REM components as 25,0j.
140 REM ***ADDITION***
150 DEF FNA(A1,A2)=A1+A2
160 DEF FNA$(A1,B1,A2,B2)=STR$(FNA(A1,A2))+','+STR$(FNA(B1,B2))+','
170 REM ***SUBTRACTION***
180 DEF FNT(A1,A2)=A1-A2
190 DEF FNT$(A1,B1,A2,B2)=STR$(FNT(A1,A2))+','+STR$(FNT(B1,B2))+','
200 REM ***MULTIPLICATION***
210 DEF FNM$(A1,B1,A2,B2)=STR$(A1*A2-B1*B2)+','+STR$(A1*B2+A2*B1)+','
220 REM ***DIVISION***
230 DEF FNG(A2,B2)=A2^2+B2^2
240 DEF FNE$(A1,B1,A2,B2)=STR$((A1*A2+B1*B2)/FNG(A2,B2))
250 DEF FNF$(A1,B1,A2,B2)=STR$((A2*B1-B2*A1)/FNG(A2,B2))
260 DEF FND$(A1,B1,A2,B2)=FNE$(A1,B1,A2,B2)+','+FNF$(A1,B1,A2,B2)+','
270 END

```

Questions and Answers

(Cont'd from page 5)

This means you could collect data on a single channel at 300 samples per second, and it would be graphed at the same time, or you could collect data on two channels at 150 samples per second, or four channels at 75 samples per second. The display continues even if you sample too fast. If you sample at 600 Hz, you still get a display, but not all of your points will be displayed, thus leaving "holes" in the graph.

If you're displaying more than one channel at a time, depending upon the nature of the signals generated, it may be difficult to distinguish the points for each channel.

Q. What's the fastest way AIN can collect data and what is the rate?

A. The fastest analog data is collected in FAST mode using integer variables. The analog signal is sampled and converted to an integer at a single channel rate up to 8000 samples per second. A sample format of the statement to acquire 1000 points is

AIN ("FAST", A% (), 1000,1/8000, C)

where C is the channel to be sampled.

Q. What is the price of the MINC manual set if purchased separately?

A. The price is \$75 for the complete manual set, and it can be ordered through your MINC salesperson. The model number for the complete MINC manual set is QJV31-GZ.

"Bits and Bytes" is published to notify you of certain system restrictions and document corrections. We have listed the relevant pages in your manuals so that you may make a note of the suggested changes.

BOOK 2: MINC PROGRAMMING FUNDAMENTALS (AA-D799A-TC)

INTEGER ARITHMETIC:

Hidden Overflow (See Book 2, pages 114, 115)

Integer operations in BASIC can cause errors whose origin can only be determined if the reader knows how integers are treated by the machine. For example, the statement:

```
IF 500%> -32700% THEN ...
```

causes the error message:

```
?MINC-W-Value of integer expression not in range -32768 to 32768
```

This message occurs because the expression is evaluated by subtracting -32700 from 500—thus producing an integer out of range (33200).

BOOK 3: MINC PROGRAMMING REFERENCE (AA-D800A-TC)

EDIT: Spurious Character Appears (See Book 3, pages 74 to 76)

If after using EDIT you receive a syntax error while trying to run the program you edited, list your program. If part of your program disappears, a spurious nonprinting character may have been inserted via the editor. Go back into EDIT, delete the line that appears to have a problem, and also delete the line that follows. Type in the two lines that you've just deleted, store your program, and rerun it.

If the problem occurred in the first line of your program, none of the program will appear after giving the LIST command. If this happens, type EDIT, delete lines 1 and 2, re-

type these lines, store the program, and rerun it. (A full description of Keypad Editing can be found in Book 2, Ch. 15.)

BOOK 4: MINC GRAPHIC PROGRAMMING (AA-D574A-TC)

POINT "U" Option: Argument Description (See Book 4, pages 156 to 159)

The POINT "U" (Units) Option enables the system to assign units to points on the X axis as these points move along the axis in the strip chart mode. This option must be used in conjunction with the MOVE option. It cannot be used by itself. An example statement is:

```
POINT ("MOVE, UNITS", X,Y)
```

POINT "U" is referred to in the argument table on page 123, but the above information is missing from the argument descriptions that follow the table.

BOOK 5: MINC IEEE BUS PROGRAMMING (AA-D801A-TC)

SET_TERMINATORS: Message Termination (See Book 5, pages 8, 76)

When you start MINC, the RECEIVE and TRANSFER routines default to message terminators of carriage return and line-feed. The SET_TERMINATORS routine may be used to change terminators; however, they will remain changed until you either set them again or restart your MINC. This means that when you run a new IEEE program you may be using the terminators from a previous program. Therefore, you should always SET_TERMINATORS in every program that uses RECEIVE and TRANSFER routines.

A6SAVE.BAS: Demonstration Program (See Book 6, page 62)
The sample program A6SAVE.BAS on the demonstration diskette needs corrections to lines 2020 and 2040. Use the following procedure to implement these changes:

Insert the Demo diskette, power up, enter time and date and type in the following entries:

```
OLD A6SAVE  
SUB 2020 /(I)/(J+19)  
SUB 2040 /J=J+B/IF R0=100 THEN J=J+200  
REPLACE
```

Change the program lines 2020 and 2040 in the manual to match the edited program.

FFT: Wrong Error Message (See Book 6, page 148)

If, when using the FFT routine, you specify an invalid number of points in your argument statement, you will receive the error message:

```
?by ^C at line 20
```

Although an error has occurred, the message should read:

```
?MINC-F-Number of points must be a power of 2
```

HELP FILE ERROR:
TIME_HIST (See Book 6, page 203)

The TIME_HIST routine on the HELP file is erroneously labeled TEST_HIST. You can correct the label by editing the file HELP.TXT with the MINC editor.

TIME_HIST: Manual Correction (See Book 6, page 203)

The second example listed under TIME_HIST needs the following corrections to lines one and two:

```
TIME_HIST('DISPLAY',H%(),1,1E4,2,2^8)
```

Collect a sweep of 10,000 points (1E4points) with the clock running at 10,000 Hz.

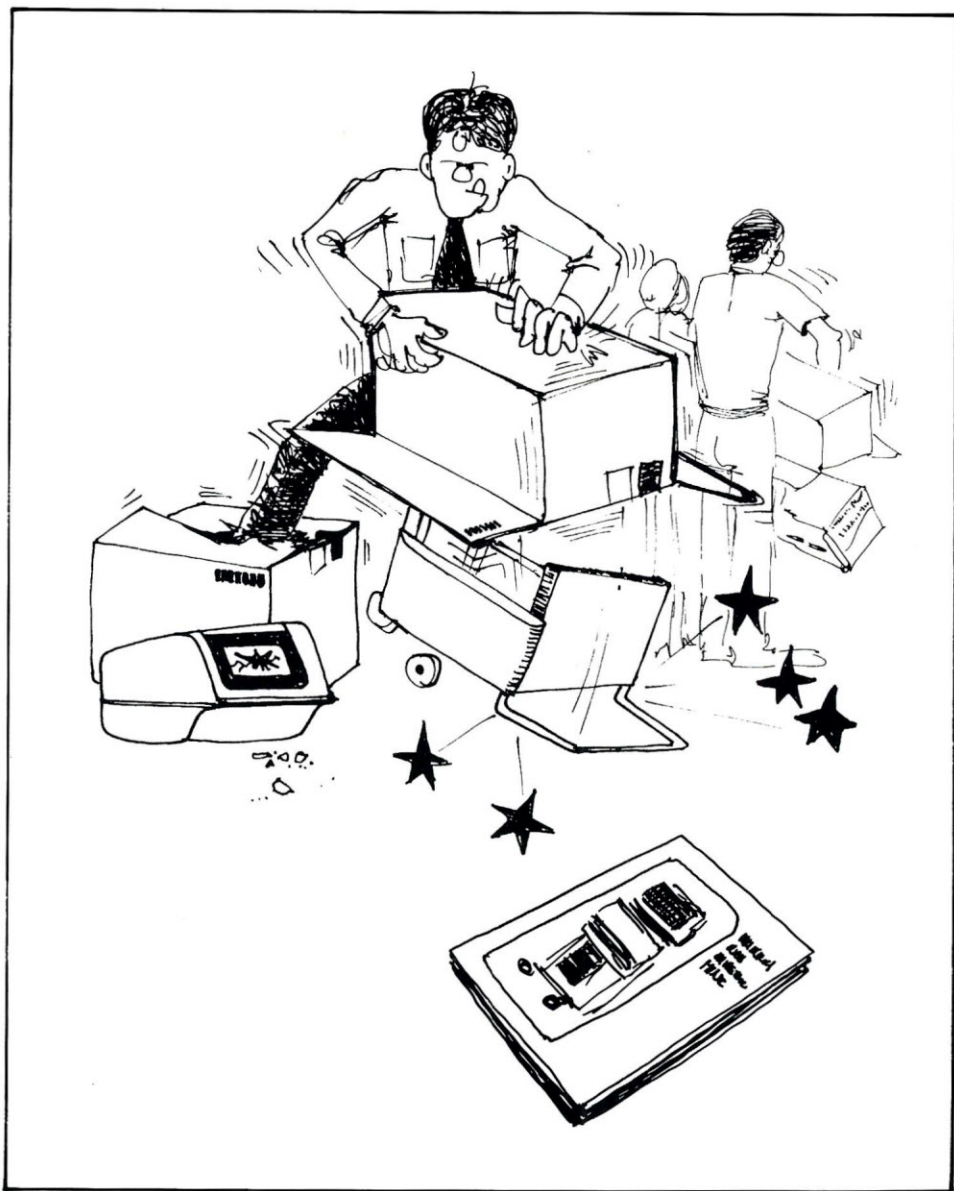
**BOOK 7: WORKING WITH
MINC DEVICES
(AA-D572A-TC)**

**ERRATIC ANALOG INPUT:
Sampling Warning (See Book 7,
page 140)**

The sampling rate limits the bandwidth of input signals that can be measured correctly. The Nyquist Sampling Theorem states: If a signal contains no frequency components higher than f_c , then the original signal can be completely recovered without distortion if it is sampled at a rate greater than $2 * f_c$ samples per second. Note that many complex waveforms, such as square waves, contain components well above their fundamental frequencies.

Slew rate defines the time rate at which an analog device such as the A/D converter can change its internal state in response to a changing input level. The A/D's slew rate will limit its response to certain kinds of input signals, particularly square waves generated by TTL and similar logic devices that have extremely fast rise/fall times. The maximum slew rate of the signal applied as input to the MINC A/D is 3 volts/microsecond. If the MINC preamp is being used to amplify this signal, you should remember to divide this value by the gain being applied to the input signal. For example, if the preamp is applying a gain of 100 to the signal, the maximum rate at which the input signal can change is 3 volts/microsecond divided by 100, or .03/volts/microsecond.

If such a signal were used simultaneously as input to the A/D converter and as an input to a conversion-controlling Schmitt trigger (Conversion made in External mode), the conversion could be triggered and made before the A/D converter had begun to respond to the selected edge of the square wave. The result would be erroneous data.



38 nanoseconds--that's all it took to unpack my MINC.

The Tradin' Post



Through the "Trading Post" we'd like to give our readers a chance to swap ideas, applications, and suggestions. We encourage you to send in questions about applications you want to do in your laboratory, but are having problems with; perhaps one of our readers will have some help or a solution.

We would also like to make you aware that the solutions, suggestions and applications printed in this column will not be edited, so Digital cannot assume responsibility for errors that may appear. We ask that you submit your data in printed form—either typewritten or teletyped.

The following "helpful hint" was submitted by Daniel Smith of the Eye Research Institute in Boston, to the 12-bit SIG newsletter. We have reprinted it with his permission.

"VELstraps. The cabling in our laboratory is constantly changing, and we did not want to 1) trip, 2) install a raised floor, or 3) have to get into the walls or ceilings to make a change. Our lab does have a dropped ceiling; so what we have done is to buy Velcro straps, wrap them around the ceiling supports, and run our cables under the ceiling, held by the VELstraps. Cables are easily inserted or removed, do not need to be threaded or pulled, are out of the way, and (believe it or not) are held very securely. It's a very nice system if you have our kind of dropped ceiling. Velcro Corporation, 681 Fifth Avenue, New York, N.Y. 10022; 212-751-2144. Ask for their 'comprehensive product guide' and the price list for 'Nylon Velstrap Fasteners.' They're made to order in almost any size, and color, and are fairly cheap (around 35¢ for a 3/4" by 14" strap), but there is a minimum order problem and I don't know of any retailers."

Velcro can also be purchased at most fabric stores or mountaineering shops.

Digital Volt Meter

Following is a program written by a DEC Software Specialist. The program is an example of the kind of application description and program which MINC users may want to trade with one another.

This is a simple program that serves two purposes:

1. It allows you to monitor an analog channel by:
 - A) taking a sequence of data (with display - at approx 25 Hz) and determining the maximum, minimum and average voltage,
 - or
 - B) providing a continuous display of data from a particu-

lar channel (at approx 7 Hz) as both a graphical representation and as a numeric value (in volts).

2. It illustrates the AIN routine in single sample mode and in continuous mode. (Item A above is in single sample, while item B is in continuous mode.)

When the program is run, the display is cleared, and the title of the program is placed in the upper right hand corner. At this point a question is posed: CONTINUOUS OR SERIES [C/S]? . The proper responses are the letters 'C' or 'S'. If a carriage return is typed, the system will return to BASIC's 'READY' state.

If series mode is chosen, the user is asked to indicate which channel the data will be read from and the number of points to be sampled before termination and the display of results. When the program has run its course, it returns to the beginning of the series sampling routine with the "CHANNEL" question. A return can be made to the initial display by typing a carriage return.

If the user opts for continuous mode, he is asked for the analog channel, and the program begins displaying both the graph and the voltage values. The program can be terminated by typing two CTRL/Cs. The program then returns to the initial display.

```

10 REM Begin by clearing screen, creating array, and displaying titles.
20 DISPLAY_CLEAR
30 DIM V1(4)
40 REM First title will have double-width characters.
50 MOVE_CURSOR(1,1) \ WIDE_LINE("WIDE",1)
60 PRINT "DIGITAL VOLT METER"
70 MOVE_CURSOR(20,1)
80 REM Question mark from INPUT statement appears right after PRINT text
90 PRINT "CONTINUOUS OR SERIES [C/S]"; \ INPUT A$
100 REM Now that questions are answered, clear screen again.
110 DISPLAY_CLEAR
120 REM Interpret answers to question. STOP if only a <RET> was typed.
130 REM If any character other than <RET>, S, or C is typed, repeat question.
140 IF A$="S" THEN 210
150 IF A$="C" THEN 640
160 IF A$=" " THEN STOP
170 GO TO 70
180 REM *****
190 REM Begin series sampling—question answered with S
200 REM *****
210 MOVE_CURSOR(20,1)
220 PRINT "CHANNEL (>=0) " ; \ INPUT C$
230 REM If the CHANNEL question was answered with a lone <RET>, return to
240 REM initial display.
250 IF C$=" " THEN 20
260 REM Otherwise, convert the character in C$ to the equivalent integer.
270 C=VAL(C$)
280 REM If a negative number was entered, repeat the CHANNEL question.
290 IF C<0 THEN 210
300 MOVE_CURSOR(21,1)
310 PRINT "NUMBER OF POINTS TO BE AVERAGED"; \ INPUT N
320 IF N<=0 THEN 300
330 REM V is the voltage of the acquired signal.
340 AIN("DISPLAY",V,,C)
350 REM S will be the sum of voltages, L the minimum, and H the maximum.
360 REM At this point, set all these variables equal to V.
370 S=V \ L=V \ H=V

```



```

380 REM If only one point was requested, you're done.
390 IF N=1 THEN 510
400 REM Otherwise, collect the remaining points, one at a time.
410 FOR I=2 TO N
420 AIN("DISPLAY",V,,C)
430 REM As each new voltage is acquired, add it to the sum in S.
440 S=S+V
450 REM Then compare new voltage to the maximum and minimum. If the
460 REM voltage is a new maximum or minimum, update H or L, respectively.
470 IF V>H THEN H=V
480 IF L>V THEN L=V
490 NEXT I
500 REM All points have now been collected; compute average voltage.
510 A=S/N
520 REM PRINT statement rings bell, signaling end of series. The semicolon
530 REM prevents a carriage return from being printed.
540 PRINT CHR$(7);
550 REM The results will appear in wide characters.
560 WIDE_LINE("WIDE",24) \ WIDE_LINE("WIDE",23)
570 HTEXT("BOLD",23,1," VOLTS MAX MIN")
580 HTEXT("BOLD",24,1," "+STR$(A)+" "+" "+STR$(H)+" "+" "+STR$(L))
590 REM Done with the series; return to CHANNEL question.
600 GO TO 210
610 REM *****
620 REM Begin continuous sampling—question answered with C
630 REM *****
640 DISPLAY_CLEAR
650 MOVE_CURSOR(20,1) \ PRINT "CHANNEL (>=0)"; \ INPUT C$
660 IF C$="" THEN 20
670 C=VAL(C$) \ IF C<0 THEN 640
680 DISPLAY_CLEAR
690 REM Disable CTRL/C while AIN is in continuous mode.
700 Z=RCTRLC
710 REM AIN call sets up a continuous mode operation. Array V1 will contain
720 REM the two partitions for acquiring and storing voltages. Trigger
730 REM interval is .20 sec.
740 AIN("CONTINUOUS,DISPLAY",V1(),2,2,C)
750 REM Before collecting points, restrict scrolling area to rows 22-23.
760 REM Row 24 will be used for continuous voltmeter. The MOVE_CURSOR
770 REM statement causes subsequent PRINT statements to print out on row 24.
780 REM The displayed voltages will be in wide characters.
790 ROLL_AREA(22,23) \ MOVE_CURSOR(24,1) \ WIDE_LINE("WIDE",24)
800 REM Each time CONTINUE is executed, collect two points and branch to
810 REM service subroutine.
820 CONTINUE(V1(),I,930)
830 REM Last 2 statements in next line are executed ONLY when IF expr is true.
840 REM The line watches for a double CTRL/C, whereupon it terminates the
850 REM data collection, reenables normal CTRL/C operation, and returns to
860 REM initial display.
870 IF SYS(6)=1 THEN TERMINATE("IMMEDIATE",V1()) \ Z=RCTRLC \ GO TO 20
880 REM If CTRL/Cs weren't typed, keep watching for them.
890 GO TO 870
900 REM ++++++
910 REM Service subroutine—prints voltages acquired by CONTINUE statement.
920 REM ++++++
930 PRINT TAB(15); \ PRINT USING "##.###",V1(I)
940 CONTINUE(V1(),I,930)
950 RETURN
960 REM End of service subroutine
970 END

```


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