

Programming - Why and How?

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If you are like me then you probably find yourself with Grade 13 education of a few years ago somewhat baffled by the current level of technical papers. They seem to require a knowledge of calculus, statistics, electronics and geodesy. While not meaning to suggest that these subjects are unnecessary or that we are uneducated or slow, it does seem more realistic to admit our weaknesses and try to apply our own education and experience to the newer technologies.

One such technology may be found in the field of computers. Whereas most surveyors are now using computers of one sort or another, I think that they are a little mystified by it all.

It is my intention to show that with only common sense and your own background in survey mathematics you can easily learn enough about computer systems and languages to enable you to write all your own programs and thereby be less dependent on the firms that sell you the hardware in the first place.

We ourselves got into this approach quite by accident. Ever since the inception of the survey technician program in 1965, it was our wish to purchase a programmable type of calculator but, budgets being what they are, we never got beyond the wishing stage.

I am glad now that we never acquired such a machine because our school made the major decision to put in a complete time-sharing computer system. We are now extremely flexible and find ourselves in the position of having the latest improvements to the system always available.

Certainly, if we had purchased one of the simpler machines a few years ago, we would now be looking for a more improved model.

Time-sharing is based on the fact that the computer is capable of such fantastic speeds, and that it can handle the work load from several people at one time. The configuration of such a system finds a central data processor at some location which is connected by regular telephone wires to a series of remote terminals. These remote units are usually teletypewriters similar to those used in the telecommunications field and in fact

can be used for the same purpose.

However, other pieces of equipment can be used such as cathode ray tubes or plotters. Most of the 30 or so remote terminals at George Brown College are connected to the GE 400 computer (now Honeywell) by dialing the computer number on a regular telephone. When the proper signal is heard the hand set is placed on a cradle which translates the electronic signals into sound signals to be sent over the wires.

In the survey section we have decided to use hard-wired terminals instead because of their more refined signal and excellent Bell service. Our terminals are complete with tape punch and reader. This type of terminal can be rented for around \$115 per month and can be used as a regular telephone or for telecommunications.

In addition, time must be rented from a firm which owns the computers. I am uncertain as to this cost.

The actual method of calculation of a survey job as we recommend to our students is described below:

- (1) Prepare a field sketch and number all required points.
- (2) Write up a list of commands on ordinary paper that correspond to the program used. We use a program developed by us called "Survey."
- (3) Prepare a paper tape of this list on the terminal in the local mode. This operation is entirely free of cost and is the most time consuming part of the operation.
- (4) Proof read the tape.
- (5) Dial up the computer. After accessing the computer you must type in your user number and a secret password or the computer will break the connection.
- (6) A file is created and the tape is fed to the computer. This file is then saved and will now contain a permanent listing of the program commands. Let us refer to this as FILE #1.
- (7) A second dummy file referred to here as FILE #2 is created and

saved. This will be used later to store the co-ordinates if required.

- (8) The actual program "Survey" (or other) is accessed and asked to RUN.
- (9) At the appropriate places certain questions will be typed by the computer. These must be answered by the correct response. The questions are kept to a minimum as they tend to slow the machine down considerably. The most usual question is FILE NAME? or NEXT FILE? In our current case we would type FILE #1 to the question FILE NAME? The computer would then carry out the list of instructions included in FILE #1. Answers may or may not be printed depending on the operator's earlier instruction. To the question NEXT FILE? the response could be one of many but it is usual to end a run with the word STORE. This will enable the operator to store the information for recall at any time. In this case all the calculated co-ordinators would be stored in FILE #2. The word NONE to the question NEXT FILE? will cause the computer to exit the program.
- (10) If the work in FILE #1 is without error and is no longer required it is removed from permanent storage by the word UNSAVE.
- (11) If the list of co-ordinates in FILE #2 are required they are listed.
- (12) All work completed, the line is disconnected by typing BYE. Obviously this does not describe fully the complete operation. A sample job is shown elsewhere.

It is my opinion that a time-shared computer system has enough advantages over the programmable calculator method that it should be carefully considered before acquiring any new hardware.

It is not my intention, however, to sell computer time, and as I have not yet reached my goal in this article, I had better get down to brass tacks.

It is a foregone conclusion that most
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of us are using a computer of one kind or another. Who, though, is doing your calculations and I do mean who is pushing the buttons? If you are using Co-Go, it is a group from M.I.T.

Is it a tape deck or a card supplied by the manufacturer or another program supplied by a soft-ware company? If so, there is a strong chance that you have not seen the program, you do not know how it works and you are unable to modify it to suit your needs. If this makes you feel that you have turned your calculations over to hirelings and you are on longer in control but that the machine is beginning to rule your life then I strongly suggest that you learn a computer language. I do not think that it particularly matters which language but I myself have a preference for BASIC as that is the language with which I am most familiar.

With no more than four hours of instruction, we at George Brown have developed several programs, all written in BASIC, which do all kinds of work. Some of these are as follows:

COROTE — rotates and moves co-ordinates from one axis to another.

CO PLOT — plots a co-ordinate file on the teletypewriter by a series of asterisks to within one/twelfth of an inch.

CURVAL — calculates curve alignment problems — gives all curve data and stake-out information.

SURVEY — closes, balances, calculates new points, determines areas; in short, does all usual survey calculations.

You too, can learn in a very short time enough programming to solve all your usual survey problems, calculate your payroll, keep a status file on current jobs or even play noughts and crosses with the kids.

If you would like a copy of any of the above programmes or a user's manual for SURVEY, please drop us a line and we will be glad to send them out. There is no charge and you are completely free to chop and change as you see fit. The address is Harry Coupland, O.L.S., George Brown College of Applied Arts and Technology, 51 Teraulay Street, Toronto, Ontario.

(Ed. Note — Illustrations for the article are on pages 24, 25, 26 and 27)

Law and Surveying

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Sacred 66

A further example of this strange phenomenon was observed, again during my formative years, surveying in northern Ontario, where posts planted during the original survey (Circa 1900) may still be found in place, the scribed lettering still legible. Imagine if you will, the surveyor having found an original post marking a lot corner, carefully cross referencing the centre of the post before replacing it to the nearest hundredth of a foot with a standard iron bar. He would then proceed to the intersection of two road allowances where, on finding two original posts on opposite sides of the intersection, he would measure between them only to discover that they were 63 feet apart rather than the sacred 66. Without any apparent pangs of conscience, he replaced one of the posts with great precision summarily yanked out the other and planted an S. I. B. 66 feet from the first.

The moral (if such is the term) to be drawn from these anecdotes has two elements. The first is that roads are not necessarily the same width as might be indicated by the plan of survey that creates them. The second suggests that the unalterable status of original monuments is not fully understood.

Re-establish Limit

To pursue the matter a bit further,

the question arises as to the manner of re-establishing street limits after the original evidence has disappeared. The responses must sound redundant and will come as no surprise — the limit must be re-established from the best available evidence of its original location.

If any conclusions may emerge from this dissertation, surely the most prominent would be the acknowledgment that I have barely scratched the surface of the philosophy I set out to examine. The status and affect of conventional lines, surveys by unqualified surveyors, fences, and lines by parol agreement, etc. come to mind and with the kind forbearance of publisher and reader, we may examine some of these in future Quarterlies.

Guest Editorial

(continued from page 3)

acceptable, practical experience. We cannot understand why the A.O.L.S. Council is so reluctant to investigate and evaluate our Program.

We intend to demonstrate to business, industry, prospective students, parents, alumni and the general public the uniqueness of Ryerson and the kind of education it offers.

Our program is and will be open for further comments and improvements, and we would appreciate receiving from you any remarks or suggestions in order that revisions, if necessary, may be made.

A SAMPLE SURVEY JOB

In order to illustrate our method of computation using the program "Survey" we enclose the following pages:

Page 1 — a sample page of notes with all necessary points numbered.

Page 2 — the two input files — Coup 2 for set up — Coup 3 for limits and area.

Page 3 — the results of a computer run showing limits and area.

Page 4 — a listing of the final co-ordinates taken from file Coup 1.

It is interesting to note that the time required to set up and prepare the inputs for his job was approximately one hour. This compared with 7 minutes of real time to run but only 24 seconds of computer time to compute. Obviously a typist could save even more time. Incidentally, the errors that occur are usually the same errors that one would find if the job was calculated in the conventional manner; i.e. wrong quadrant, transposition of figures, or data left out.

Regional Group News

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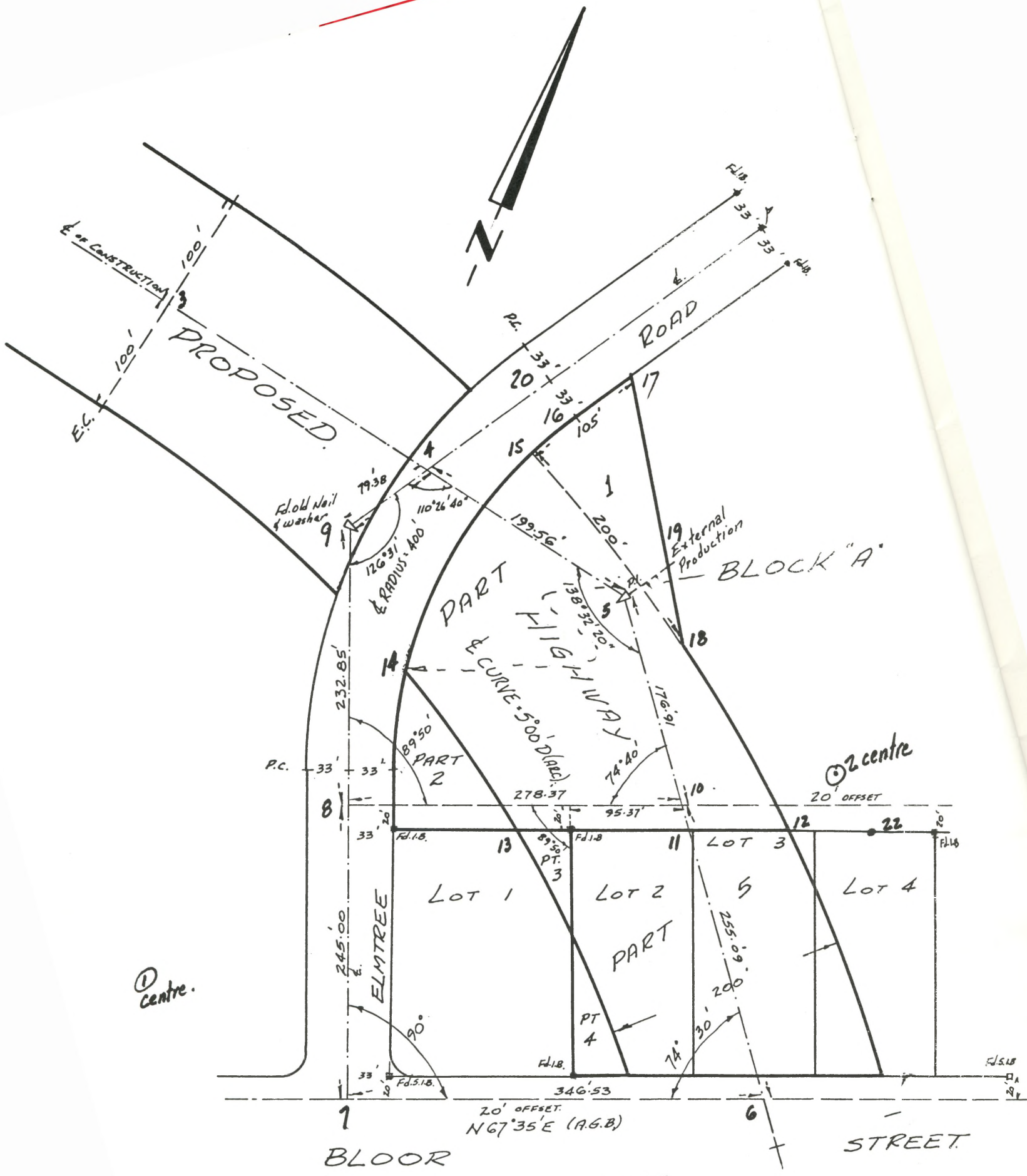
of the subdivision.

J. G. O'Grady, a solicitor having a great deal of experience in property law and a background including experience in the land titles office at Toronto, spoke on possessory boundaries, stressing not only the period of time over which the possession had been in existence, but also its character and the fact there can be no break in the time, that is the possession must be every day for 10 years with no break even for one day. Mr. O'Grady supported his talk with judgements handed down by the Courts regarding possessory boundaries and also in some cases, judgements handed down by the Appeal Court. As Mr. O'Grady pointed out, it was interesting to note the high percentage of successful appeals.

G. MacKay of the Director of Titles Office, spoke on water boundaries, he also included in his address, judicial decisions on some of the more interesting cases he had encountered.

After a lunch break, the meeting resumed with the three speakers forming a panel and answering questions from the floor. This proved to be quite a lively afternoon session.

We were very fortunate to secure speakers of the calibre we did and we thank these men for giving up the time necessary to make the meeting a success.



E.C. 100'
 E. of CONSTRUCTION 100'

PROPOSED

ROAD

Rd. old Nail & washer
 9

126°31'
 & RADIUS 400'
 110°26'40"

PART
 & CURVE 500' DIAMETER
 HIGHWAY

19 External Production

BLOCK 'A'

232.85'
 89°50'
 PART 2

P.C. 33'

278.37'

20' centre
 20' OFFSET

33' 33' 33' 33' 33' 33'
 Fd. 1.B. 13 11 LOT 3 12 22
 PT. 3

LOT 1 LOT 2 LOT 3 LOT 4

① Centre.

ELM TREE

PART

PT 4

245.00'
 90°
 33' 20' Fd. 5.1.B. 346.53' 74° 30' 255.09' 200' 30' 74°
 Fd. 1.B. Fd. 1.B. Fd. 1.B. Fd. 1.B.

20' OFFSET N67°35'E (A.G.B.)

BLOOR

STREET

B.C. -

FILE NAME: SURVEY

READY
RUNNH

PRINT ALL ? 0
FILE NAME ? COUP2

CLOSURE FROM 6 TO 6

ERROR=ONE PART PER 234785 2.4803281E-3 -6.0505867E-3

N 67 42 35 W 0.01

CONTINUE ? 1
CHECK TIE

10 - 8 S 67 24 60 W 278.36

USE LINE FOR NEXT CALCULATION

15 - 16 N 27 54 49 E 40.37 ARC 40.39 RADIUS 367.00

NEXT FILE ? L

? 4

? 16 17 1 31 04 00 64.61

NEXT FILE ? COUP3

LIMITS OF PART ONE

17 - 19 S 33 8 32 E 171.26

19 - 18 S 33 8 32 E 52.94

18 - 12 S 52 7 16 E 188.06 ARC 188.24 RADIUS 1245.92

12 - 11 S 67 25 0 W 84.54

11 - 13 S 67 25 0 W 141.41

12 - 13 S 67 25 0 W 225.96

13 - 26 N 55 51 35 W 101.72 ARC 101.76 RADIUS 1045.92

26 - 14 N 60 32 22 W 69.08 ARC 69.09 RADIUS 1045.92

14 - 16 N 11 17 19 E 248.37 ARC 253.37 RADIUS 367.00

16 - 17 N 31 4 0 E 64.61

AREA OF PART ONE ALONG CHORDS

AREA OF 6 SIDED FIGURE= 64548.99 SQ.FT. OR 1.4818409 ACRES

SUBTRACT FOLLOWING

AREA OF SEGMENT 13 14 IS 396.83537 SQ.FT. OR 9.1100866E-3 ACRES

ADD FOLLOWING

AREA OF SEGMENT 14 16 IS 3606.3353 SQ.FT. OR 8.2790067E-2 ACRES

ADD FOLLOWING

AREA OF SEGMENT 18 12 IS 445.59062 SQ.FT. OR 1.0229353E-2 ACRES

NEXT FILE ? STORE

STORE IN ? COU1

STORED

NEXT FILE ? NONE

RUNNING TIME: 9.9 SECS I/O TIME : 12.5 SECS

THE RESULTS OF A RUN

OLD:COUP2

READY

LISTNH

80 50 CLOSURE FROM 6 TO 6

90 1 6 10000 10000

100 13 6 6 7

110 6 7 3 67 35 0 346.53

120 7 8 4 22 25 0 245

130 8 9 4 22 25 0 232.85

140 9 4 1 31 04 0 79.38

150 4 5 2 79 22 40 199.56

160 5 10 2 37 55 0 176.91

170 10 6 2 37 55 0 255.09

175 50 CHECK TIE

180 2 10 8

190 4 5 3 4 79 22 40 433.71

200 11 3 5 1 90 0 0 1145.92

205 4 9 20 1 31 04 00 201.54

210 12 20 9 2 90 0 0 400

220 4 8 21 2 22 25 0 20

230 4 21 22 1 67 25 0 400

240 20 5 10 21 22 11

250 8 1 11 13 1045.92 3 67 25 0

260 8 1 22 12 1245.92 3 67 25 0

270 5 1 2 14 1045.92 367

280 5 1 2 15 1245.92 367

290 4 20 16 2 58 56 0 33

300 9 1 15 18 1245.92 200

315 50 USE LINE FOR NEXT CALCULATION

320 3 15 16 367

CLOSE

SET LIMITS

READY

OLD:COUP3

USE "LINE" HERE.

READY

LISTNH

1 11 5 4 25 110 43 45 200

2 20 5 25 18 17 19

3 8 1 5 26 1045.92 3 31 21 10

4 50 LIMITS OF PART ONE

5 2 17 19 2 19 18 3 18 12 1245.92

6 2 12 11 2 11 13 2 12 13 3 13 25 1045.92

7 3 26 14 1045.92 3 14 16 367 2 16 17

8 50 AREA OF PART ONE ALONG CHORDS

9 14 6 12 13 14 16 17 18

10 50 SUBTRACT FOLLOWING

11 15 13 14 1045.92

12 50 ADD FOLLOWING

13 15 14 16 367

14 50 ADD FOLLOWING

15 15 18 12 1245.92

SET LIMITS

CALC. LIMITS

CALC AREAS.

ACTUAL FILES

OLD:COUP1

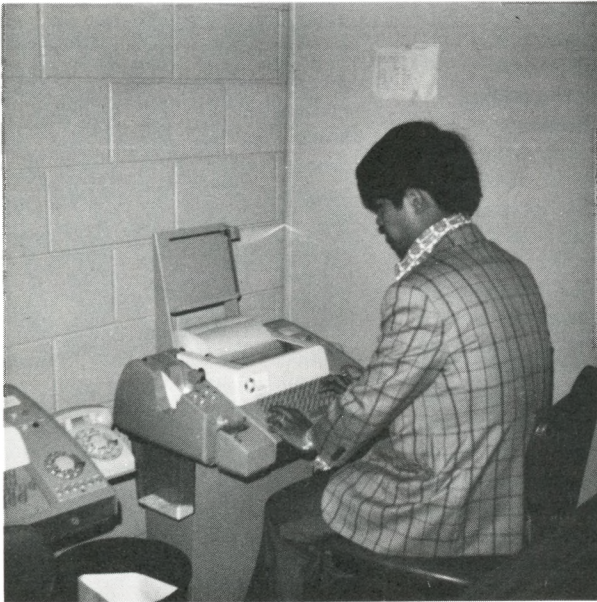
READY
LISTNH

1	1	1	9294.470	9097.023
2	1	2	10275.816	9944.058
3	1	3	10420.753	9308.253
4	1	4	10377.592	9538.392
5	1	5	10340.806	9734.531
6	1	6	10000.000	10000.000
7	1	7	9867.855	9679.654
8	1	8	10094.342	9586.225
9	1	9	10309.597	9497.429
10	1	10	10201.241	9843.244
11	1	11	10184.881	9855.988
12	1	12	10217.348	9934.049
13	1	13	10130.574	9729.417
14	1	14	10221.637	9581.079
15	1	15	10429.526	9610.798
16	1	16	10465.201	9629.698
17	1	17	10520.543	9663.039
18	1	18	10332.814	9785.615
19	1	19	10377.144	9756.670
20	1	20	10482.230	9601.431
21	1	21	10075.853	9593.852
22	1	22	10229.464	9963.181
23	1	25	10511.605	9838.588
24	1	26	10187.662	9641.225

ABOVE

LIST OF CO-ORDINATES

BELOW THE JOB



A TIME SHARING TERMINAL

