



PROGRAMMING
CONVENTIONS

univac® II
data
automation
system

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I N T R O D U C T I O N

Experiences at a number of UNIVAC I installations have indicated the desirability of adopting a uniform set of programming conventions for use throughout all installations. In order to take advantage of such experience the UNIVAC Sales Support Department and the New York Research Office of Remington Rand UNIVAC, in cooperation with Sales Support and customer personnel at the various installations, and the UNIVAC programming and applications research groups, have developed these conventions.

The programming conventions presented here are designed for use at UNIVAC II data processing installations for production runs. They are to standardize aspects of programming which are arbitrary and to provide a common format of data between runs. These conventions are not intended to be complete. Each installation will have to examine them to determine what additions are necessary to meet its individual needs. Every attempt was made, however, to insure that there would be no need to delete any portions.

Use of this basic set of conventions will offer UNIVAC II users efficiencies and time-saving in the design, programming and operation of their applications. The system designers will not have to concern themselves with conventions in setting up the job. The programmer will always work with a fixed set of conventions and therefore will become quickly adept in handling them. A more uniform set of procedures for the operating personnel is a natural outcome of a system of the type recommended. Thus operator personnel are easier to train and less subject to error.

In the past, routines of general application have been freely exchanged among the various users. The acceptance of one set of standards by all would allow more efficient interchange among them and offer considerable savings to all.

a. SUPERVISORY CONTROL PRINTER

1. **FORMAT** The SCP will utilize 8½" by 11" pin fed 3 ply paper. One copy of each day's output is retained by the computer staff and filed for reference. During production the SCP is set on normal with left margin ½" from the edge of the paper.

Tab stops are set 1/3 and 2/3 the distance across the page. Thus the page may be considered as divided into 3 equal columns. The right column pertains to outputs, the center column to inputs and the left column to all other information. Each set of printed words starts with a carriage return in the case of general information, carriage return-tab in the case of input information, and carriage return-tab-tab in the case of output information.

2. **BREAKPOINT CONVENTION** Standard printouts are described in the appropriate sections. In addition the following convention is followed: Wherever a program contains a breakpoint option, the normal path is set for No-transfer. If the option is exercised, i.e., if transfer is forced, a unique notation is made on the SCP.

b. INSTRUCTION TAPE CONVENTIONS

1. **INTRA-RUN CONVENTIONS** Each run is recorded on tape in the following format:

,ΔRUNΔ,RXXXX

External rerun (if programmed) Run XXXX.

,ΔRUNΔ,ΔXXXX

Read-in block, Run XXXX.

"Zero" block Run XXXX.

} Run XXXX

- a. READ-IN BLOCK This block contains the run identification in word 00 in the form, Δ RUN Δ , Δ XXXX where XXXX is the run number. In addition it contains instructions which will read all instructions into the memory, overlaying itself with the "zero" block and stopping. Hitting the start bar will transfer control to 0060 of the run itself. Options present within this block are Bkpt 3 (to obtain external rerun, see Sect. D) and Bkpt 7 (for servo elimination see Sect. B,1,c).

- b. THE "ZERO" BLOCK This block is placed into 0000 -0059 by the read-in block and remains there for the remainder of the run. Clearing C and I at anytime during the run will thus allow the operator to rerun the problem as explained in section D. The format of the zero block would always be as shown in section F.

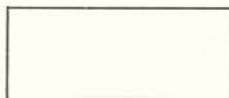
(Available space within this block may be used for storage of miscellaneous constants, counters, etc.).

- c. ELIMINATION OF SERVOS Any run employing all servos will contain a servo elimination option Bkpt 7. Should a servo not be usable, it will be replugged as Servo 7. (Note: Since Servos 8, 9, - are employed for Tape-to-Card output, Servo 7 has been selected.) Bkpt 7 will be depressed until it is returned to service. Every time Bkpt 7 is reached, the operator will force transfer causing the program to modify itself by rewinding the instruction servo, Servo 1, using this as an alternate, or, if this is not possible, by eliminating the alternate servo for a particular file. If the installation does not possess a stand-by servo, it is advisable that a Bkpt 6 option be similarly incorporated to allow the routine to operate with two less servos, namely: Servos 6 and 7.

- d. SEQUENCE OF OPERATIONS
 - (1) The read-in block reads the routine into the memory, printing Δ RUN Δ , Δ XXXX and stopping. Hitting the start bar transfers control to 0060 to commence the program.

- (2) Printouts as described in other sections are made as necessary.
- (3) At the end of the run $r\Delta END\Delta RUNirr$ is printed and the inter-run locator is read into 1940, I is emptied, control is transferred to 1940, and the computer stops on breakpoint 2 (which is always depressed, see Chart A).

2. INTER-RUN CONVENTIONS The format of the instruction tape for a chain of runs is:



Master locator and dating routines



Run 0001, as described in A



Inter-run locator



Run 0002, as described in A



Inter-run locator



Last run, as described



Inter-run locator



Sentinel blocks, as described

- a. MASTER LOCATOR AND DATING ROUTINE. These routines must be capable of:
 - (1) Locating any run on the tape
 - (2) Inserting the proper date parameters and other parameters for the days runs.
- b. INTER-RUN LOCATOR. It is read into 1940 as part of the ending routine of the run just completed.

It will normally locate the next run in the sequence. If this is not desired, forcing transfer on Bkpt 2 will cause rLOCATE△RUN to be printed out and a 10m order to be set-up. Typing another run number as 000 000 00XXXX will cause run XXXX to be located.

Typing RRRRRRRRRRRR will cause rerun of the problem just completed (see section D).

Typing ZZZZZZZZZZZZ will rewind the instruction tape.

- c. SENTINEL BLOCKS. The last 2 blocks on the instruction tape are sentinel blocks which contain ,△RUN△,ZZZZZ in word 00.

- NOTE:
- (1) Runs must be placed on the instruction tape in order by run number.
 - (2) Word 03 of the first block of all instruction tapes must contain a label indicating what the tape is and its last date of modification in conformity with the conventions C. I.

c. DATA TAPE CONVENTIONS

1. IDENTIFICATION BLOCKS AND PROCEDURES. Each tape in the system is identified by a tape label which appears on the reel and also by an identification block which is the first block recorded on the tape. The following convention applies to all tapes except those prepared by or for the Univac auxiliaries which are discussed in section E.

The identification word is contained in word 03 of the identification block. The format of the word is *not* fixed except that the reel number appears in the least significant digits of the word. A typical word is DDD DDD FFF RRR, where D denotes the date the tape was produced. F is the file identification and R is the reel number which is 01 for the first tape, 02 for the second, etc. As each tape is read into the computer, the following operations occur:

- a. The tape label is printed as:

rtiONΔSXΔiii

DDDDDDFFFRRR

- b. A comparison is made between the identification word (in 03 of the I.D. Block) and the word in the memory (see section B 1.b). If equality is found processing continues, if inequality is found the computer prints

ΔWRONGiiiiiii

rtiMOUNTΔiii

DDDDDDFFFRRR

and stops on Bkpt 1 (which is always depressed).

The operator may then exercise the following options:

- a. If he operates the start bar, the tape rewinds with interlock and the computer stalls with a read order in the SR, allowing the operator to change tapes.
- b. Forcing transfer and operating the start bar will cause the program to accept the current tape, the tape label in the memory to be replaced by the label in the identification block and SCP to print ΔFORCDiiiiiii.

As each output tape is completed, the SCP prints after the rewind order

rttONΔSXΔiii

DDDDDDFFFRRR

2. SENTINEL BLOCKS AND PROCEDURES: If the valid data ends in a partial block, a sentinel word appears in the first word of the first invalid item and in word 59 of the block.

If the data ends in a complete block of valid information, this block is followed by a full sentinel block containing the sentinel in word 00 and in word 59 of the block.

There will always be a second sentinel or "buffer" block on the tape. Word 59 of this block should contain hash, i.e., information which could not be accepted as the block count.

Only the first 6 characters of the sentinel words are significant and the formats are as follows:

ZZZYYY000000 - sentinel block end of an intermediate tape of a file.

ZZZZZ000000 - sentinel block end of last tape of a file

ZZZXXX000000 - information to be by-passed, more valid data on the tape.

3. BLOCK COUNTS AND PROCEDURES: Every tape produced on the central computer contains a block count in order to check on manual operations. The block count is programmed immediately following the write order. The count starts with 001 for the first data Blk. and includes all data blocks and the first

sentinel block, but not the identification block. It will be placed in the least significant digits of word 059 of the first sentinel block.

When the tape is read on the computer a block count is maintained. This count is programmed immediately following the instructions which transfer the data from I to the memory. When the first sentinel block is reached, a comparison of the block counts is made. If a discrepancy is found the computer prints the following:

```
rtTAPEΔXΔCNT          00000000XXXX
rtCOMPΔCNTΔi          00000000XXXX
```

and stops on a 90 000 U. Processing may be continued by hitting the start bar, which also causes the SCP to print: FORCDiiiiiii Otherwise re-run should be initiated (See section D).

d. RERUN PROCEDURES

1. RESTART: Clearing C and I during the running of a problem will transfer control to 001 of the "zero" block where instructions are located to read the read-in block into 000, rewind all but the instruction servo and stop. Hitting the start bar will begin the run over.
2. EXTERNAL RERUN:
 - a. Provision for external rerun is made by:
 - (1) Writing a memory dump after the second sentinel block of multi-reel output files.
 - (2) Placing in the main routine a connector to be set prior to the writing of the memory dump which allows one to re-enter the routine at the correct point after re-establishing the contents of I.
 - (3) Clearing the block count of each tape to zero as it is completed.
 - b. Initiating external re-run:
 - (1) During the run: Depress bkpt 3, clear C and I.
 - (2) At any other time: Depress bkpt 3 and locate the run as usual. Note that bkpt 3 is located in the read-in block.

Forcing transfer on Bkpt 3 will read the external re-run block (s) into the memory and stop after printing, ΔRUNΔ,RXXXX. Hitting the start bar initiates the following sequence:

- a. rWHICH△RERUN is typed out and a 10m order is set up. Type in the label of the tape whose memory dump is to be employed.
- b. rWHICH△SERVO is typed out and a 10m order is set up. Type in SSSSSS-SSSSSS where S is the servo on which the memory dump is mounted.
- c. The external re-run will then locate the memory dump, reposition all tapes, allow a Bkpt 7 option for servo elimination, re-establish the memory and transfer control to the connector described in D.1.

NOTE: If re-run is possible from only one output file points, (a) and (b) are not essential.

e. AUXILIARY EQUIPMENT

1. UNIVAC PUNCHED CARD-TO-MAGNETIC TAPE CONVERTER: Tapes prepared on the Univac Card-to-Tape converter conform to the following conventions:
 - a. The first card (blockette) contains the identification word.
 - b. The next 5 cards contain a test pattern which when checked on the computer will determine that the correct plugboard is used and the plugboard is functioning properly. After the test cards are converted the operator resets the card counter on the converter and processes the data cards.
 - c. When the data cards are converted the operator notes the card count (to be affixed to the tape label) and then operates the fill-in key twice (thereby causing a partial and a full, or two full sentinel blocks to appear on tape).
 - d. Tapes from the Card-to-tape converter, when first read on the computer, in addition to having the standard label check performed, have the test blockettes checked. In the event that the test pattern does not agree with the expected one, the same options are available to the operator as in the case of a tape label disagreeing with the expected one.
 - e. A card count (blockette Count) is maintained for card-to-tape inputs. When the end of valid data has been reached the computer prints; where XXXXX is the card count:

rtiON△SX△iii

△Cards△XXXXX

2. UNIVAC HIGH-SPEED PRINTER: Tapes prepared for the high speed printer conform to the normal conventions in addition to the following:

- a. The identification block contains in the first blockette (but not necessarily in word 003) the identification word. The four blockettes which follow the first, (and the first blockette) contain a test pattern, which when printed will determine that the correct plugboard is installed, and the plugboard is functioning properly. The sixth blockette and only the sixth contains a printer stop.
- b. If a paper loop is utilized to control printing format the first line of printing on each page commences with a fast feed one (@). The home paper punch in channel 7 corresponds to the perforations between pages. The end of the valid data is followed by a blockette containing a fast feed one character and the word
END PRINTING.
- c. Preprinted forms have vertical and horizontal alignment marks.
- d. A page of printing is not split across two tapes.
- e. The standard sentinel convention follows the last printing blockette, the blockette containing the first sentinel word also contains the printer stop.
- f. For multi-tape outputs from the High Speed Printer, in addition to printing the tape label on the SCP. the key of the last item on the tape appears as:

rttON△SX△iii	(Label)
rttLAST△KEY△	(Key)

3. UNIVAC MAGNETIC TAPE-TO-PUNCHED CARD CONVERTER: Tapes prepared for the Univac Tape-to-Card Converter will follow the standard conventions:

In addition, these conventions are followed:

- a. The conventions under Section E-2, paragraphs a and f.
- b. The end of valid data is marked by 3 identical blockettes containing printer stops in non-punching positions. In order that the operator may know which cards are to be discarded, these cards should contain unique information.

CHART A - SUMMARY CHART OF OPERATOR OPTIONS

BKPT	SECT.	PURPOSE	LOCATION	WHEN DEPRESSED	RESULT OF FORCING	IF TRANSFER IS NOT FORCED
1	C-.1	To force the use of an unexpected label	In every label check routine	Always	FORCD printed on SCP and the unexpected label is accepted as the base label for the remainder of the run.	The tape concerned is rewound W/interlock allowing operator to mount different tape.
2	B 2.b	To locate a run out of normal sequence, a rerun, or to windup instructions	Inter-run locator	Always	Type out: r Locate△run△ Type in : R-R for re-run Type in : 0-0XXXX for new run Type in : Z--Z for rewind	Automatically locates next run as predetermined
3	D 2.b	To initiate external re-run	Read in BLK.	When needed	External re-run initiated	Restart initiated
6	B 1.c	To perform run with 2 Servos down	Read in blk. ext. re-run blk	When 2 Servos down	Printout of servos being used for affected files. Modification of output.	No servo elimination
7	B 1.c	To perform run with 1 Servo down	Read in blk. ext. re-run blk.	When a Servo is down	Printout of servos being used for affected files. Modification of output.	No servo elimination
90U	C-3	To force processing even though input block count does not check	In every input block count routine		Hitting the start bar causes FORCD to be printed and processing to continue	A re-run must be initiated



CHART B - SUMMARY CHART OF SCP PRINTOUT FORMATS

WORD	LOCATION	USE
,ΔRUNΔ ,ΔXXXX	0000 of read-in block	Key for locators, Printout --XXXX is run No.
rΔENDΔ RUNirr	Within Run	Printout at end of run
rLOCAT EΔRUNΔ rINSIR ΔREWΔ	Locators	Printout before type in of run to be located
,ΔRUNΔ ,ZZZZ	Word 0000 of last block of instruction tapes.	Instruction tape sentinel
DDDDDD FFFFRF	Instruction tape-zero blk. data tape-label blk.	Label D-date, F File Identification, R Reel
rtiONΔ SXΔiii	Within Run	Printout before label (input)
rttONΔ SXΔiii	Within Run	Printout before label (output)
ΔWRONG iiiiii	Within Run	Printout wrong label
rtiMOU NIΔiii	Within Run	Printout before label (input)
ΔFORCD iiiiii	Within Run	Printout after forcing label or block count
rtTAPE ΔXΔCNT	Within Run	Printout block count
rtCOMP ΔCNTΔi	Within Run	Printout block count
rWHICH ΔRERUN	Within Run	Printout for re-run
rWHICH ΔSERVO	Within Run	Printout for re-run
ΔCARDS ΔXXXX	Within Run	Printout for no. of cards
rttLAS TΔKEYΔ	Within Run	Printout for High-Speed Printer Tape-to-Card Output

CHART C - UNISERVO ALLOCATION

Servo 1	Instructions
Servo 7	First Servo to be excluded, should servo elimination be necessary.
Servo 6	Second Servo to be excluded, should servo elimination be necessary.

F. ZERO BLOCK FORMAT

000 . . .	free (for O.F. considerations)
001 -- U xxxx	to clear C-1 routine
002	free, or connector for generalized rerun
003	W.S. for Servo swap
 004 .40000 ;40000	Enter:
 005 H 0003 .60000	A - to clear block count
006 F 0009 E 0003	B - to retain block count
007 ;10000 EF0003	
008 [-- U EXIT]	
009 111111	
010 FILE ID-A	
011 423423 00BBBB	3 servos allocated to file A, bbbb=block count
012 FILE ID-B	
013 656565 00BBBB	2 servos allocated to file B
014 FILE ID-C	
015 999999 Z0BBBB	1 servo allocated to file C *Z in 7th digit position indicates last file packet. Remainder of zero block at disposal of programmer.
SAMPLE SWAP	File A
xx2 -- B 0011	
xx3 R 0008 U 0004	
xx4 H 0011 F YYYY	
xx5 EFxxxx EF	
xx6 :	
xx7 :	



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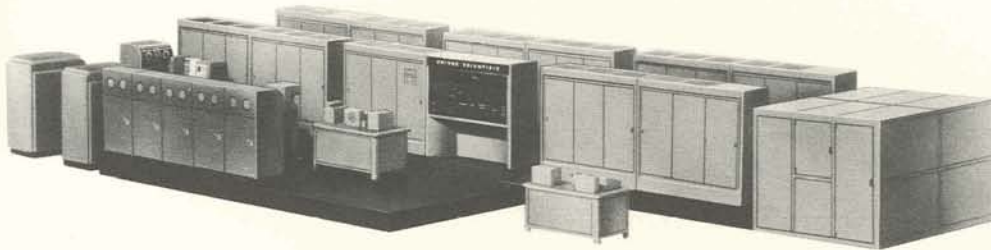


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