

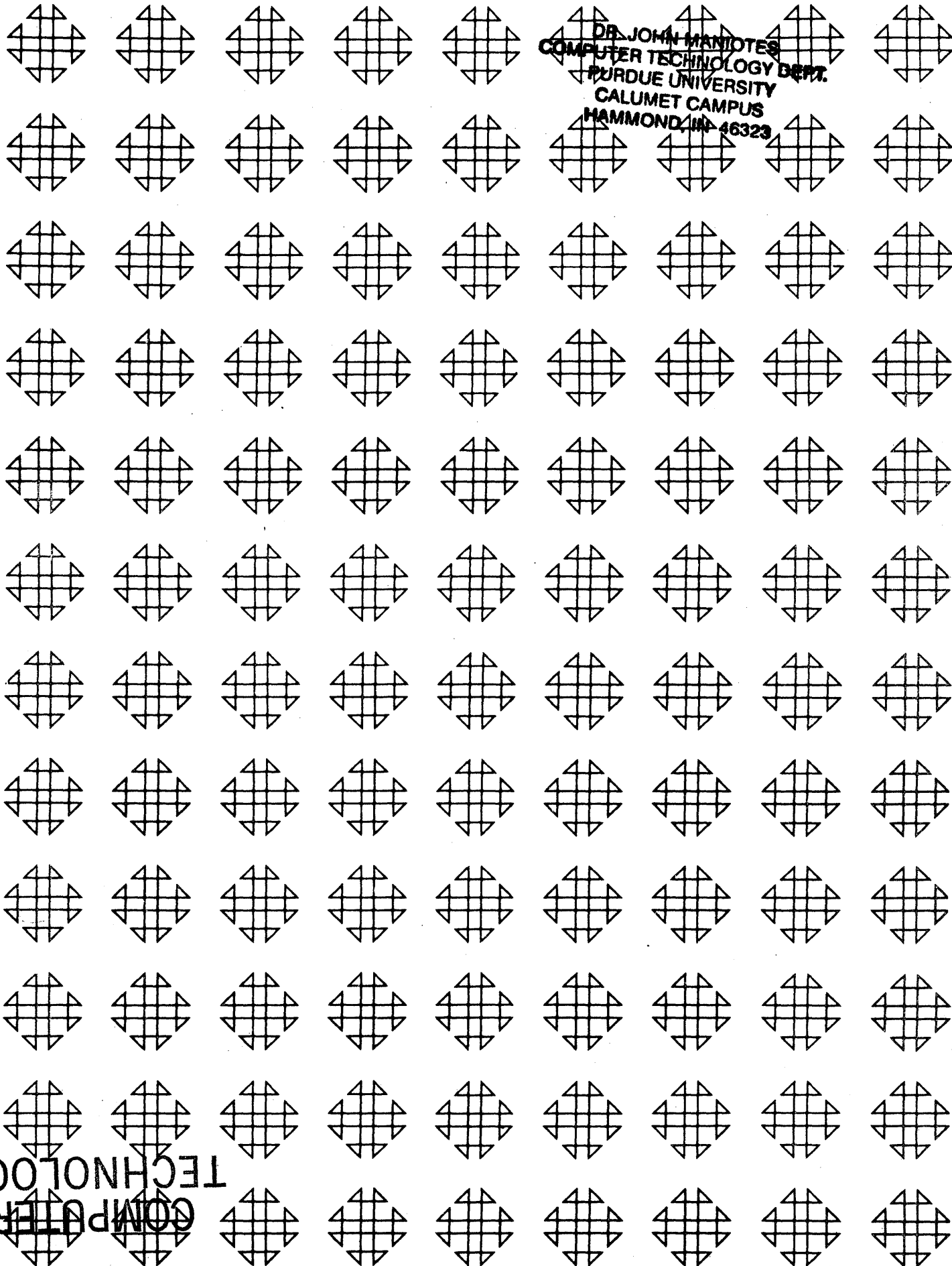
1620 "CRITICAL PATH SCHEDULE"

Bar Graph Generator Program

1620-10.3.020

CONTRIBUTED PROGRAM LIBRARY

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(fill out in typewriter, ink or pencil)

Program No. _____

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Program Name: _____

1. Does the abstract adequately describe what the program is and what it does? Yes ___ No ___
Comment _____
2. Does the program do what the abstract says? Yes ___ No ___
Comment _____
3. Is the description clear, understandable, and adequate? Yes ___ No ___
Comment _____
4. Are the Operating Instructions understandable and in sufficient detail? Yes ___ No ___
Comment _____
Are the Sense Switch options adequately described (if applicable)? Yes ___ No ___
Are the mnemonic labels identified or sufficiently understandable? Yes ___ No ___
Comment _____
5. Does the source program compile satisfactorily (if applicable)? Yes ___ No ___
Comment _____
6. Does the object program run satisfactorily? Yes ___ No ___
Comment _____
7. Number of test cases run _____. Are any restrictions as to data, size, range, etc. covered adequately in description? Yes ___ No ___
Comment _____
8. Does the Program meet the minimal standards of COMMON? Yes ___ No ___
Comment _____
9. Were all necessary parts of the program received? Yes ___ No ___
Comment _____
10. Please list on the back any suggestions to improve the usefulness of the program. These will be passed onto the author for his consideration.

Please return to:

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1620 "Critical Path Schedule"

Bar Graph Generator Program

DECK KEY

1. Filling Station Sample Problem - Output cards from "LESS," file number 10.3.003, to be used as input for this program - 46 cards
2. Object Deck - 84 cards
the numbering is in columns 77 through 80
3. Source Deck

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Modifications or revisions to this program, as they occur, will be announced in the appropriate Catalog of Programs for IBM Data Processing Systems. When such an announcement occurs, users should order a complete new program from the Program Information Department.

1620 USERS Group Library

Program Abstract

Title (If subroutine state in Title) 1620 "Critical Path" Schedule Bar Graph Generator Program
 Subject Classification 10.3

Author; Organization: Donald C. Walker, Dravo Corporation, Engineering Works Division, Pittsburgh 25, Pennsylvania

Direct Inquires to:
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Dravo Corporation, Computer Services Dept. Phone 771-1200, Ext. 592
Building N-2

Purpose/Description: To represent a large volume of numerical output data from the "LESS" critical path program in bar graph form.

Mathematical Method: _____

Restrictions. Range: Latest finish may not be greater than day 430, see remarks.

Storage Requirements: 39,304 digits of memory.

Equipment Specifications:
 Memory 20K ___ 40K 60K ___ K ___ Automatic Divide: Yes ___ No
 Indirect Addressing: Yes ___ No Other Special Features Required ___
Transfer numerical strip (WNS-72) instruction.

Additional Remarks (Include at author's discretion: Language; Fixed/Float, Relocatability) (Optional: Running time; Approximate number of times run successfully; Programming Hours) This program may easily be adapted and recompiled for graphing activities with a latest finish beyond day 430. The procedure is described in detail within the contents of the program write-up.

Table of Contents

	<u>Page</u>
Description	1
Abstract of Program	2
Construction of Graphs	4
Equipment Necessary	4
Operating Procedure	5
Operating Time	5
Adaptions Permissible for Flexibility	6
Program Listing	1-A
Block Diagram of Program Logic	1-B
Arrow Diagram of Sample Problem	1-S
Listing of Input for Sample Problem	2-S
Sample Problem "LESS" Output Listing	3-S
Bar Graph of Sample Problem	4-S

"Critical Path Schedule" Bar Graph Generator ProgramDESCRIPTION

The purpose of this program is to represent a large volume of numerical output data from the "LESS" (program 10.3.003) critical path program in a form which is readily understandable to those people who must use the results. It is a problem to utilize efficiently a numerical listing of several hundred activities along with their respective start dates, finish dates, and float times.

This program will generate a series of bar graphs using the "LESS" output cards as one pass input. There is no limitation as to the number of bars to be graphed. All "dummy" cards are ignored. However a bar cannot be graphed beyond a latest finish of 430 days above the lowest index day used. This is because of memory limitations of the program.

If an activity has a latest finish beyond 430 days, it is very easy to recompile the program by adding only three source deck cards and adjusting the ten "TITLE" declarative source cards. This procedure is outlined in a later paragraph.

"Critical Path Schedule" Bar Graph Generator Program - continuedPROGRAM ABSTRACT

The program was written in SPS (1620 - SP-020 system). A subroutine deck is not necessary for operation. A total of 39304 locations of memory is required for the program as written. Fixed point arithmetic is used throughout.

One full page of activities (31) is read into the computer for each series of computations. Successive pages are used if needed to continue the graph out in a horizontal direction. The highest value of the latest finish figures for each page of activities is used to determine only the number of pages necessary to fully express each set of activities.

A title description card is punched starting the first page of each set of activities to be illustrated. The last group read in may be less than 31 in number. In this case the program allows for enough blank cards and vertical index cards to completely fill out the last sheets.

All numeric and descriptive information contained on the "LESS" output cards in columns 1 through 50 is transferred into a work area of storage labeled "STORE". In this area of memory beyond the job description three symbols are placed at the proper addresses to represent the earliest start, duration, free float, and remaining total float. Address modification is used throughout to do this and to punch them out on cards sheet by sheet for listing.

The symbol (X) represents a day duration of a job, the symbol (*) represents a day of free float, and finally the symbol (o) represents the total float minus the free float.

The following illustrations are given to show how these symbols are used in the bar graphs.

- I XXXX***o000
This bar represents a job of five days, four days of free float, and eight days of total float.
- II XXXXX
This bar represents a critical job of six days.
- III Xx0000
This bar represents a two day job with four days of total float. (No free float)

"Critical Path Schedule" Bar Graph Generator Program - continuedPROGRAM ABSTRACT - continued

Total float time is the time an activity may be delayed without changing the minimum project completion time. Free float time is the length of time the start of an activity may be delayed without changing the earliest start for another activity.

It should be noted that each activity in Figure 4 of the sample problem is shown on the graph as starting one day later than the earliest start time as listed in figure 3. Actually the listed time represents the number of days which must have passed before a job can begin, so the graph shows each job as starting on the next day. The last day of total float on the graph corresponds exactly with the latest finish day as it appears on the listing in Figure 3.

"Critical Path Schedule" Bar Graph Generator Program - continuedCONSTRUCTION OF GRAPHS

Constructing the complete graph from the sheets as they come from the printer is very simple. The IBM 407 printer is recommended using 11 inch page depth paper for which the program was written. The printer should be set to begin printing at the very top of the first sheet. Then all subsequent printing will be in the proper location.

After printing all sheets pertaining to a set of activities (page) are torn apart. Each sheet must be trimmed on the right hand side just beyond the last vertical index character (I). Then using scotch tape or a glue application the graph is extended horizontally by putting each sheet to be added under the previous sheet at the left, and attaching. This procedure is repeated for each set of activities. The next set is easily identified by the job description printed out on the first sheet along with each activity description and the reindexing of days.

EQUIPMENT NECESSARY

40,000 digit memory capacity

Transfer numerical strip (TNS-72) instruction feature.

1622 card read-punch unit.

"Critical Path Schedule" Bar Graph Generator Program - continuedOPERATING PROCEDURE

1. Punch 1 heading card with full project title description. All 80 columns of this card may be used. Place this card in front of input deck after removing all other heading cards.
2. Remove last card of "LESS" output deck which contains "project completion time". Replace this card with a blank card. Input deck is now ready.
3. All program switches off.
4. PARITY SWITCH, I/O SWITCH, and O FLOW SWITCH - all set on PROGRAM.
5. Load punch hopper on 1622 unit with blank cards.
6. Place object deck for program in read hopper followed by input deck arranged as described above.
7. Clear memory.
8. Press RESET.
9. Press LOAD.
10. Press PUNCH START.
11. When program has read all cards and punched output, it will stop with a 48 in the operation register.
12. All punched output cards are then listed on an IBM 407 printer.

OPERATING TIME

To give the reader an idea of computing and printing time involved, a "critical path" schedule on which this program was tested is cited. This schedule involved approximately 700 cards (dummies included) upon which the computer acted and punched out nearly 3000 bar graph cards in 30 minutes. About 20 minutes of printing time on the IBM 407 printer was required for a full listing.

"Critical Path Schedule" Bar Graph Generator Program - continued

Adapting Program For Graphing Activities With a Latest Finish Date Beyond 430.

Sort "LESS" output deck by latest finish dates in columns 68, 69, and 70. Determine highest value. Sort the same deck by earliest start dates in columns 53, 54, and 55. Determine the lowest earliest start value. If the difference between the lowest earliest start and the highest latest finish is 430 or less these activities may be graphed with only one alteration to the SPS source program and recompilation. If the difference is greater than 430 more than one alteration is necessary and the project may be graphed in steps.

Insert a declarative statement card (EES DC 3, XXX) into the source deck following the "DORG" card where XXX is the lowest earliest start value or preferably the next lower number divisible by 10. (If this value is 430 less than the highest latest finish). Reindex 10 declarative statement cards beginning with "TITLE" card using XXX as the first number after DAY -. Shift the (DAY) back 2 columns if XXX is 3 digits.

Prepare a new source card (S LF, EES) and place as the second card after the card labeled "TRANS" in the source deck. Prepare another source card (S ES, EES) and place in the source card immediately in front of card labeled "DICK".

Recompile this source deck and use with special input cards.

LCCTN	CP	P/L	Q	PG LN	LABEL	MNEM	OPERANDS AND REMARKS	PAGE	1-A
							* CRITICAL PATH BAR GRAPH GENERATOR PROGRAM		
0C4C2						DORG	402		
0C4C3		80			HDR	DAS	80		
0C563		2			COUNT	DS	2		
0C565		2			FINISH	DS	2		
0C570		5			CHECK	DS	5		
0C573		2480			INPUT	DAS	2480		
05533		2			PAGE	DC	2,0		
05535		2			PAGEA	DC	2,0		
05540		5			LF	DS	5		
05543		35			DTL	DAC	35,DURATION EXCEEDS LIMITS OF PROGRAM.,		
05613		14880			STORE	DAS	14880		
35373		1			BLANK	DAC	1, ..		
35375		2			CTR	DC	2,0		
35380		5			CTR2	DC	5,0		
35385		5			ES	DS	5		
35389		4			DUR	DS	4		
35391		1			XDX	DAC	1,X,.,		
35393		1			ASTK	DAC	1,.,.,		
35395		1			LTR	DAC	1,0,.,		
35400		5			CTR3	DC	5,0		
35405		5			TF	DS	5		
35410		5			FF	DS	5		
35412		2			CTR4	DC	2,0		
35414		2			CARD	DC	2,0		
35417		50			TITLE	DAC	50, I J DUR COST QD DESCRIPTION DAY- ..		
35517		30			DAC	30,12345	10 20 30,,		
35577		50			DAC	50, 40 50 60 70 80,,			
35677		50			DAC	50, 90 100 110 120 130,,			
35777		50			DAC	50, 140 150 160 170 180,,			
35877		50			DAC	50, 190 200 210 220 230,,			
35977		50			DAC	50, 240 250 260 270 280,,			
36077		50			DAC	50, 290 300 310 320 330,,			
36177		50			DAC	50, 340 350 360 370 380,,			
36277		50			DAC	50, 390 400 410 420 430,,			
36377		40			BLANKS	DAC	40, ..		
36457		40			DAC	40, ..			
36537		50			INDEX1	DAC	50, ..		
36637		30			DAC	30, I I I,.,			
36697		50			INDEX2	DAC	50, I I I, I,.,		
36797		30			DAC	30, I I I,.,			
36856	37	00403	00500		START	RACD	HCR		
36868	32	00562	00000		SF	COUNT-1			
36880	32	00564	00000		SF	FINISH-1			
36892	32	35406	00000		SF	FF-4			
36904	12	35401	00000		SF	TF-4			

BOTTOM

LCCTN	CP	P/L	Q	PG LN	LABEL	MNEM	OPERANDS AND REMARKS	PAGE	2-A
36916	32	00566	00000			SF	CHECK-4		
36928	32	37926	00000			SF	PLOT&2		
36940	32	38118	00000			SF	PLOT&62		
36952	32	05536	00000			SF	LF-4		
36964	32	35381	00000			SF	ES-4		
36976	32	35386	00000			SF	DUR-3		
36988	32	37662	00000			SF	CLEAR&2		
37000	16	00563	000-0			TFM	COUNT,0,10		
37012	37	00573	00500		READ	RACD	INPUT		
37024	72	00583	00570			TNS	INPUT&10,CHECK		
37036	14	00570	-0000			CM	CHECK,0		
37048	46	37216	01200			BE	OUT		
37060	72	00591	35389			TNS	INPUT&18,DUR		
37072	14	35389	-0000			CM	DUR,0		
37084	46	37012	01200			BE	READ		
37096	11	37018	-0160			AM	READ&6,160		
37108	11	37030	-0160			AM	READ&18,160		
37120	11	37066	-0160			AM	←-54,160		
37132	11	00563	-0001			AM	COUNT,1		
37144	14	00563	-0031			CM	COUNT,31		
37156	47	37012	01300			BL	READ		
37168	16	37018	-0573			TFM	READ&6,INPUT		
37180	16	37030	-0583			TFM	READ&18,INPUT&10		
37192	16	37066	-0591			TFM	READ&54,INPUT&18		
37204	49	37240	00000			B	BEN		
37216	14	00563	-0000		OUT	CM	COUNT,0		
37228	46	39292	01200			BE	HALT		
37240	16	05533	000-0		BEN	TFM	PAGE,0,10		
37252	16	35375	000-0			TFM	CTR,0,10		
							* EXAMINES ALL LATEST FINISH DATES TO DETERMINE NO. OF PAGES REQUIRED		
37264	72	00711	05540		TRANS	TNS	INPUT&138,LF		
37276	11	37270	-0160			AM	←-6,160		
37288	11	35375	000-1			AM	CTR,1,10		
37300	24	35375	00563			C	CTR,COUNT		
37312	46	37468	01100			BH	NEXT		
37324	16	05535	000-0			TFM	PAGEA,0,10		
37336	14	05540	-0031		JOE	CM	LF,31		
37348	47	37396	01300			BL	FINAL		
37360	11	05535	000-1			AM	PAGEA,1,10		
37372	11	37347	-0080			AM	←-25,80		
37384	49	37336	00000			B	JOE		
37396	11	05535	000-1		FINAL	AM	PAGEA,1,10		
37408	24	05533	05535			C	PAGE,PAGEA		
37420	46	37444	01100			BH	RENEW		
37432	26	05533	05535			TF	PAGE,PAGEA		
37444	16	37347	-0031		RENEW	TFM	JOE&11,31		
37456	49	37264	00000			B	TRANS		

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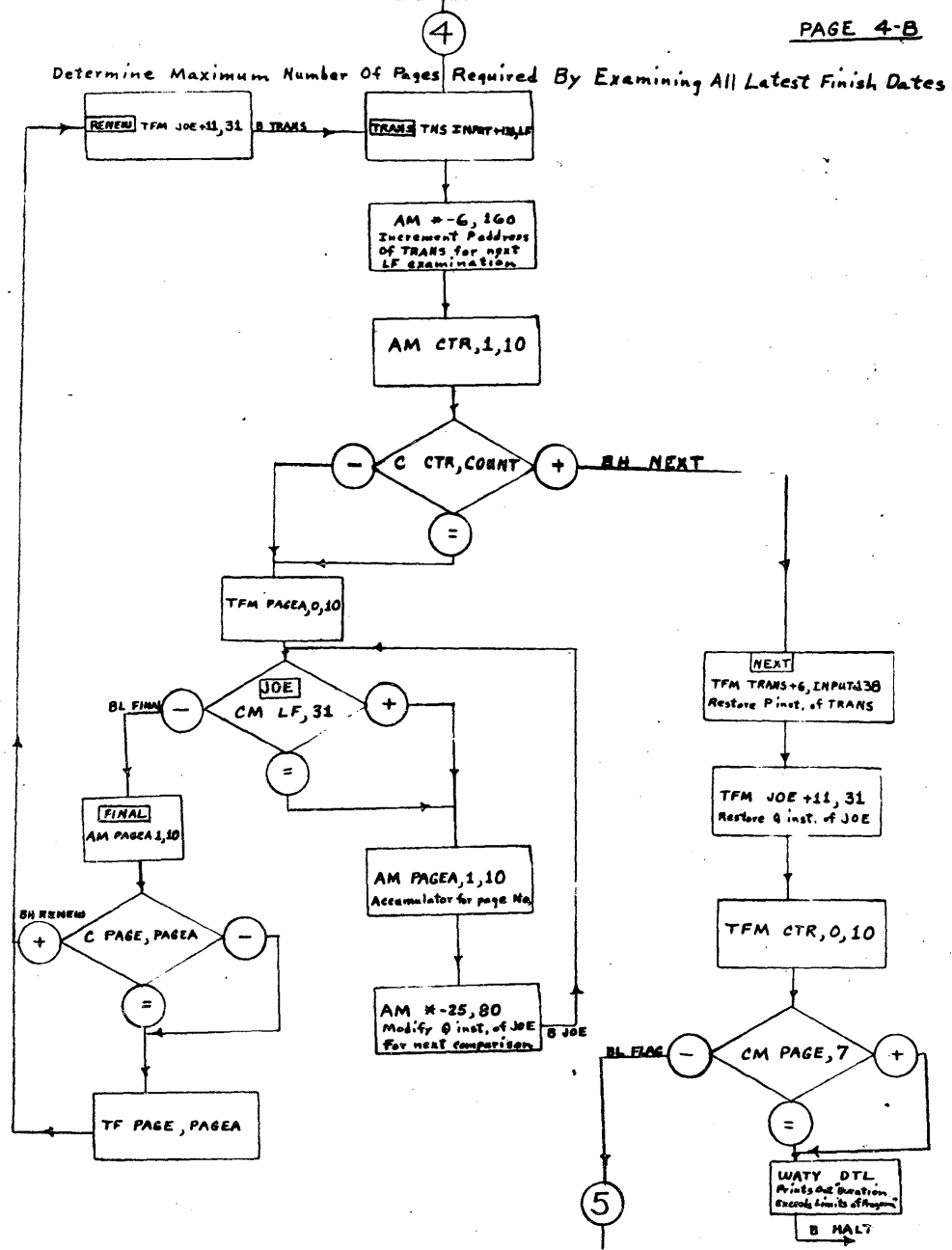
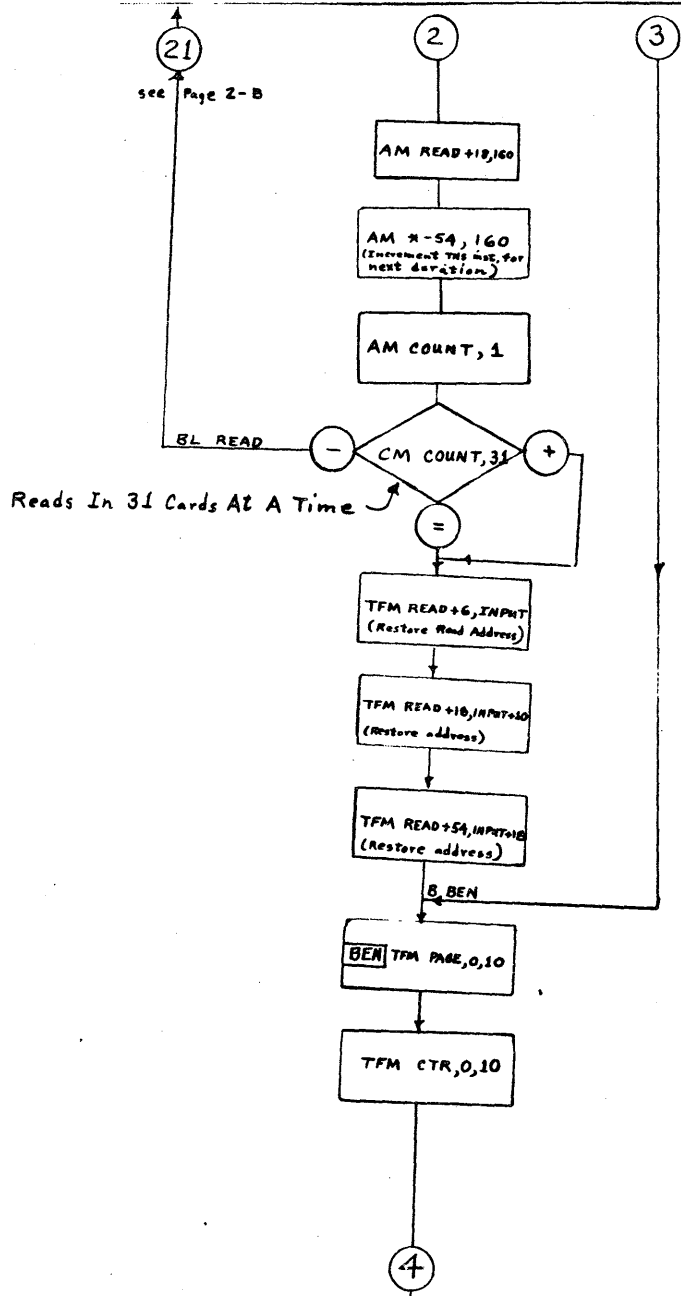
37468 16 37270 -0711      NEXT  TFM  TRANSE&6,INPUT&138
37480 16 37347 -0031      TFM  JCI&11,31
37492 16 35375 000-0      TFM  CTR,0,10
37504 14 05533 -C007      CM   PAGE,7
37516 47 37540 01300      BL   FLAG
37528 39 05543 00100      WATY DTL
37540 32 00572 00000      FLAG SF  INPUT-1
37552 11 35375 000-1      AM  CTR,1,10
37564 24 35375 00563      C   CTR,COUNT
37576 46 38500 01100      BH  PUNCH
37588 11 37546 -0160      AM  *-42,160
37600 26 05771 00731      ABLE TF  STORE&158,INPUT&158
37612 33 00572 00000      BAKER CF  INPUT-1
37624 11 37618 -0160      AM  *-6,160
37636 11 37606 -0960      AM  *-30,960
37648 11 37611 -0160      AM  *-37,160
37660 26 05713 35373      CLEAR TF  STORE&100,BLANK
37672 33 05712 00000      ODD  CF  STORE&99
37684 11 37666 -C002      AM  *-18,2
37696 11 37678 -C002      AM  *-18,2
37708 14 37666 -6573      JACK CM  *-42,STORE&960
37720 47 37660 01300      BL   CLEAR
37732 11 37666 -0100      AM  CLEAR&6,100
37744 11 37678 -0100      AM  ODD&6,100
37756 11 37719 -0960      AM  JACK&11,960
37768 72 00681 35385      BILL TNS INPUT&108,ES
37780 11 37774 -0160      AM  *-6,160
37792 72 00591 35389      DICK TNS INPUT&18,DUR
37804 11 37798 -0160      AM  *-6,160
37816 16 35380 -0000      TFM  CTR2,0
37828 14 35375 -0001      CM  CTR,1
37840 46 37888 01200      BE  FIRST
37852 21 37930 35385      A   PLOT&6,ES
37864 21 37930 35385      A   PLOT&6,ES
37876 49 37924 00000      B   PLOT
37888 16 37930 -5713      FIRST TFM PLOT&6,STORE&100
37900 21 37930 35385      A   *E30,ES
37912 21 37930 35385      A   *E18,ES
* PLOTS JOB DURATION
37924 26 00000 35391      PLOT TF  ,XOX
37936 12 37930 -0001      SM  *-6,1
37948 26 37966 37930      TF  *E18,PLOT&6
37960 33 00000 00000      CF
37972 11 37930 -C003      AM  *-42,3
37984 11 35380 -0001      AM  CTR2,1
37996 24 35380 35389      C   CTR2,DUR
38008 47 37924 01300      BL  PLOT
    
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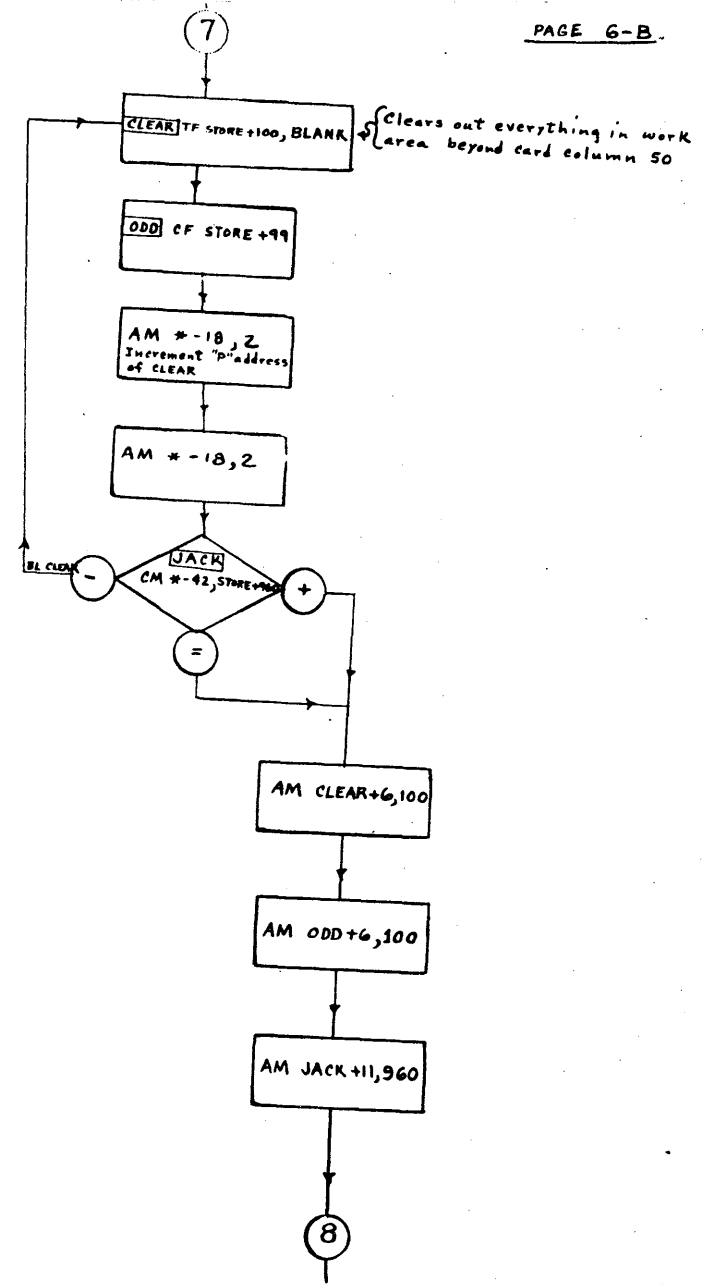
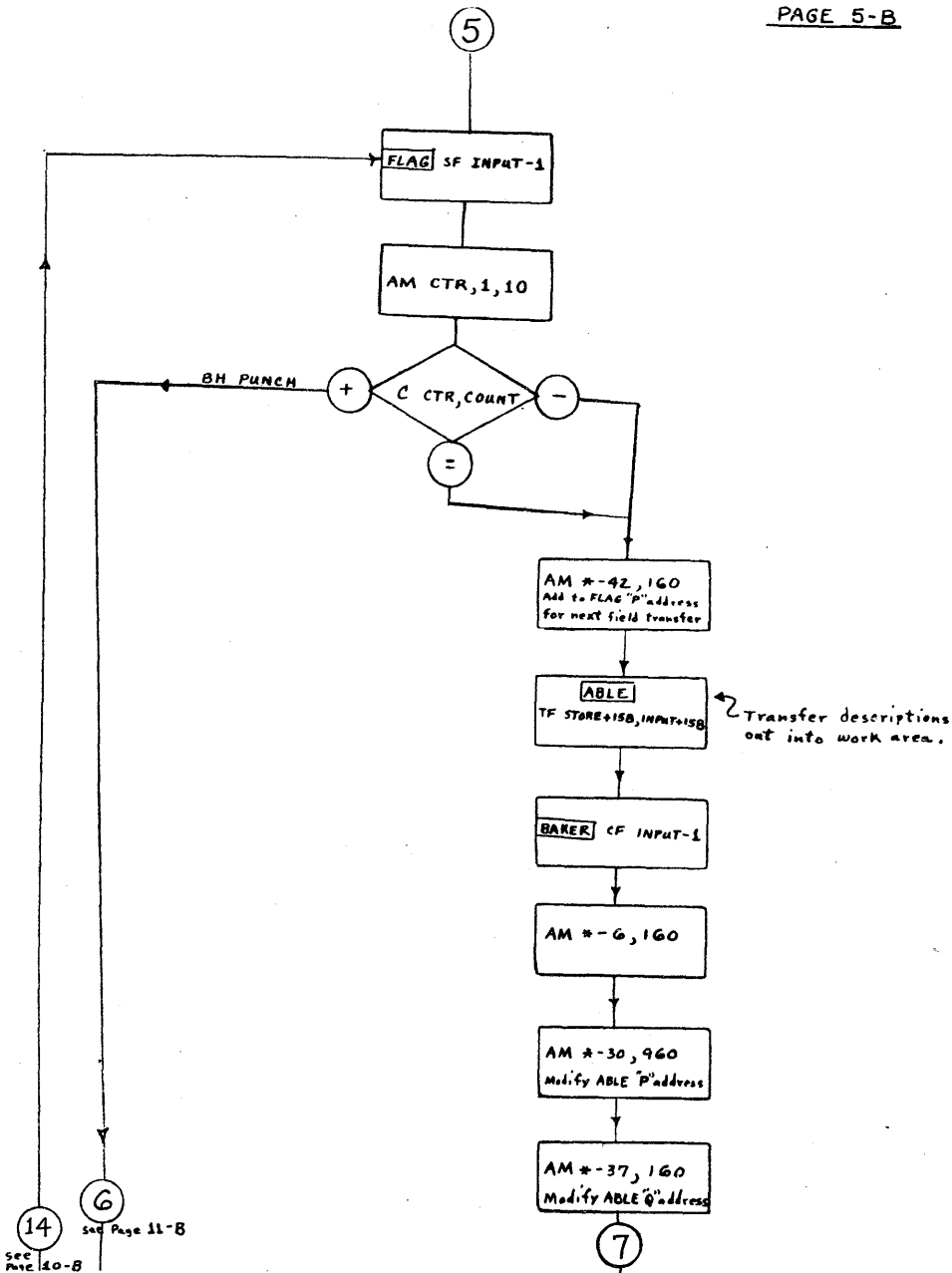
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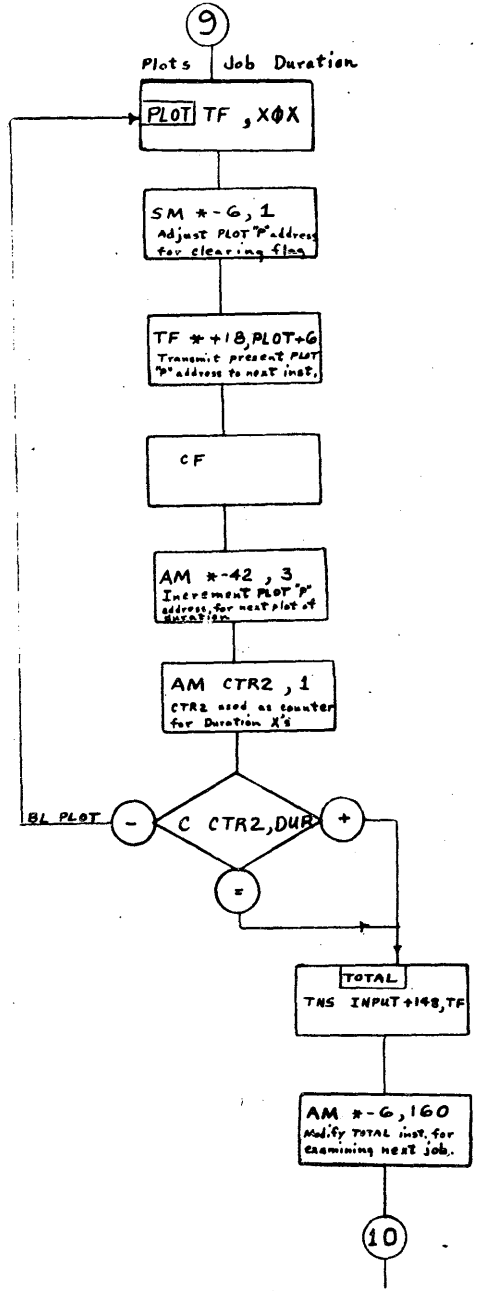
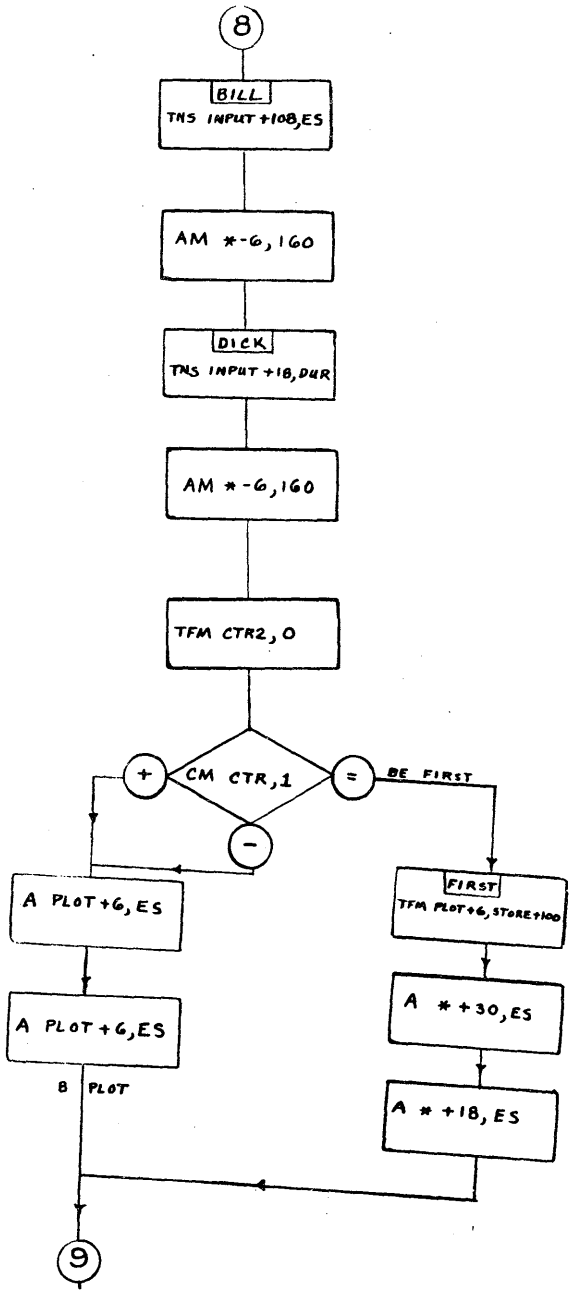
38020 72 00721 35405      TOTAL TNS INPUT&148,TF
38032 11 38026 -0160      AM  *-6,160
38044 72 00731 35410      FREE  TNS INPUT&158,FF
38056 11 38050 -0160      AM  *-6,160
38068 16 35400 -C000      TFM  CTR3,0
38080 14 35410 -C000      CM  FF,0
38092 46 38272 01200      BE  FLOAT
* PLOTS FREE FLOAT IF ANY IS FOUND
38104 26 38122 37930      TF  *E18,PLOT&6
38116 26 00000 35393      PLCTA TF  ,ASTK
38128 12 38122 -0001      SM  *-6,1
38140 26 38158 38122      TF  *E18,PLCTA&6
38152 33 00000 00000      CF
38164 11 38122 -0003      AM  *-42,3
38176 11 35400 -0001      AM  CTR3,1
38188 24 35400 35410      C   CTR3,FF
38200 47 38116 01300      BL  PLOTA
38212 16 35400 -0000      TFM  CTR3,0
38224 22 35405 35410      S   TF,FF
38236 14 35405 -C000      CM  TF,0
38248 46 38428 01200      BE  ADJUST
38260 49 38320 00000      B   GUS
38272 14 35405 -0000      FLOAT CM  TF,0
38284 46 38428 01200      BE  ADJUST
38296 26 38338 37930      TF  *E42,PLOT&6
38308 49 38332 00000      B   PLOTB
* PLOTS ALL FLOAT OR REMAINING FLOAT AFTER FREE FLOAT IS SUBTRACTED
38320 26 38338 38122      GUS  TF  *E18,PLOTA&6
38332 26 00000 35395      PLOTB TF  ,LTR
38344 12 38338 -0001      SM  *-6,1
38356 26 38374 38338      TF  *E18,PLOTB&6
38368 33 00000 00000      CF
38380 11 38338 -0003      AM  *-42,3
38392 11 35400 -0001      AM  CTR3,1
38404 24 35400 35405      C   CTR3,TF
38416 47 38332 01300      BL  PLOTB
38428 22 37930 35385      ADJUST S  PLOT&6,ES
38440 22 37930 35385      S   PLOT&6,ES
38452 22 37930 35389      S   PLOT&6,DUR
38464 22 37930 35389      S   PLOT&6,DUR
38476 11 37930 -0960      AM  PLOT&6,960
* P ADDRESS OF %PLOT# NOW SET TO GRAPH NEXT JOB
38488 49 37540 00000      B   FLAG
38500 16 37546 -0572      PUNCH TFM FLAG&6,INPUT-1
38512 16 35412 000-1      TFM  CTR4,01,10
* BEGIN PUNCHING CARDS
38524 39 36377 00400      NEW  WACD BLANKS
    
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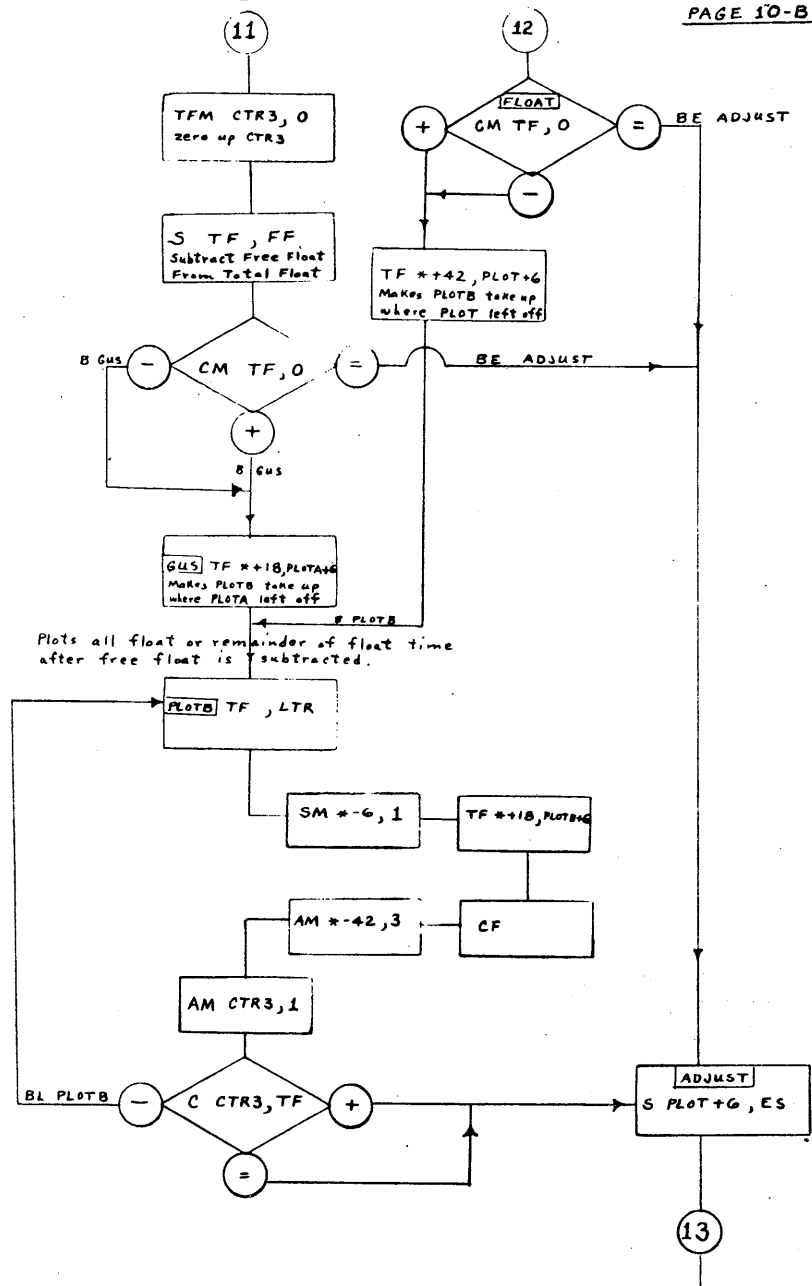
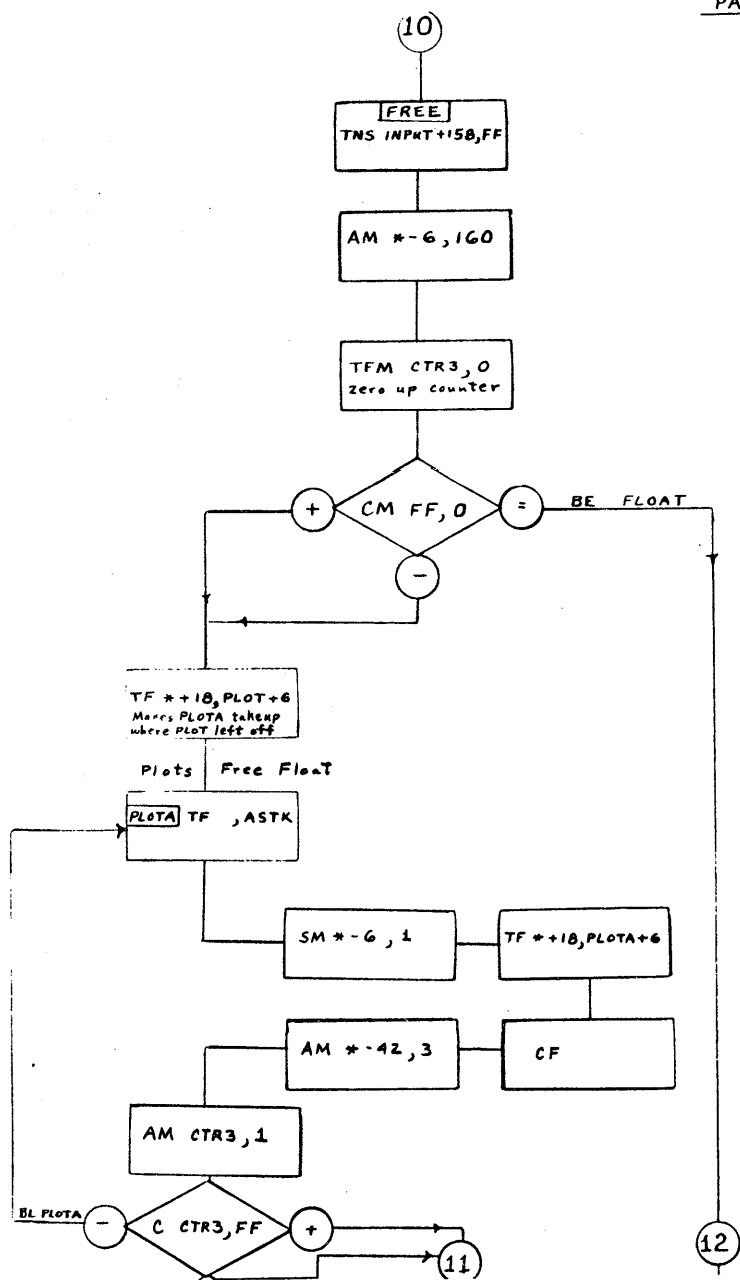
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38536	14	35412	-0001			CM	CTR4,1		
38548	46	38584	01200			BE	*636		
38560	39	36377	00400			WACD	BLANKS		
38572	49	38596	00000			B	*624		
38584	39	00403	00400			WACD	HCR		
38596	39	36377	00400			WACD	BLANKS		
38608	14	35412	-0001		DAYCD	CM	CTR4,1		
38620	47	38680	01200			BNE	CHANGE		
38632	39	35417	00400			WACD	TITLE		
38644	16	38638	15417			TFM	*-6,TITLE		
38656	16	38619	-0001			TFM	DAYCD&11,1		
38668	49	38716	00000			B	GO		
38680	11	38619	-0001		CHANGE	AM	*-61,1		
38692	11	38638	-0160			AM	*-54,160		
38704	49	38608	00000			B	DAYCD		
38716	16	35414	000-0		GO	TFM	CARD,00,10		
38728	39	05613	00400		JOB	WACD	STORE		
38740	11	38734	-0960			AM	*-6,960		
38752	11	35414	000-1			AM	CARD,1,10		
38764	14	35412	-0001			CM	CTR4,1		
38776	47	38812	01200			BNE	TCM		
38788	39	36537	00400			WACD	INDEX1		
38800	49	38824	00000			B	JOHN		
38812	39	36697	00400		TOM	WACD	INDEX2		
38824	24	35414	00563		JOHN	C	CARD,COUNT		
38836	47	38728	01300			BL	JOB		
38848	14	00563	-0031			CM	COUNT,31		
38860	46	38992	01200			BE	FIN		
* FILLS OUT SHEET WITH BLANKS IF SET IS LESS THAN 31 CARDS									
38872	26	00565	00563			TF	FINISH,COUNT		
38884	39	36377	00400		HIT	WACD	BLANKS		
38896	11	00565	000-1			AM	FINISH,1,10		
38908	14	35412	-0001			CM	CTR4,1		
38920	46	38956	01100			BH	DCN		
38932	39	36537	00400			WACD	INDEX1		
38944	49	38968	00000			B	ROB		
38956	39	36697	00400		DON	WACD	INDEX2		
38968	14	00565	-0031		ROB	CM	FINISH,31		
38980	47	38884	01300			BL	HIT		
38992	24	35412	05533		FIN	C	CTR4,PAGE		
39004	47	39196	01200			BNE	INCR		
39016	14	00563	-0031			CM	COUNT,31		
39028	47	39292	01300			BL	HALT		
39040	16	37666	-5713			TFM	CLEAR&6,STORE&100		
39052	16	37678	-5712			TFM	ODD&6,STORE&99		
39064	16	37606	-5771			TFM	ABLE&6,STORE&158		
39076	16	37611	-0731			TFM	ABLE&11.INPUT&158		

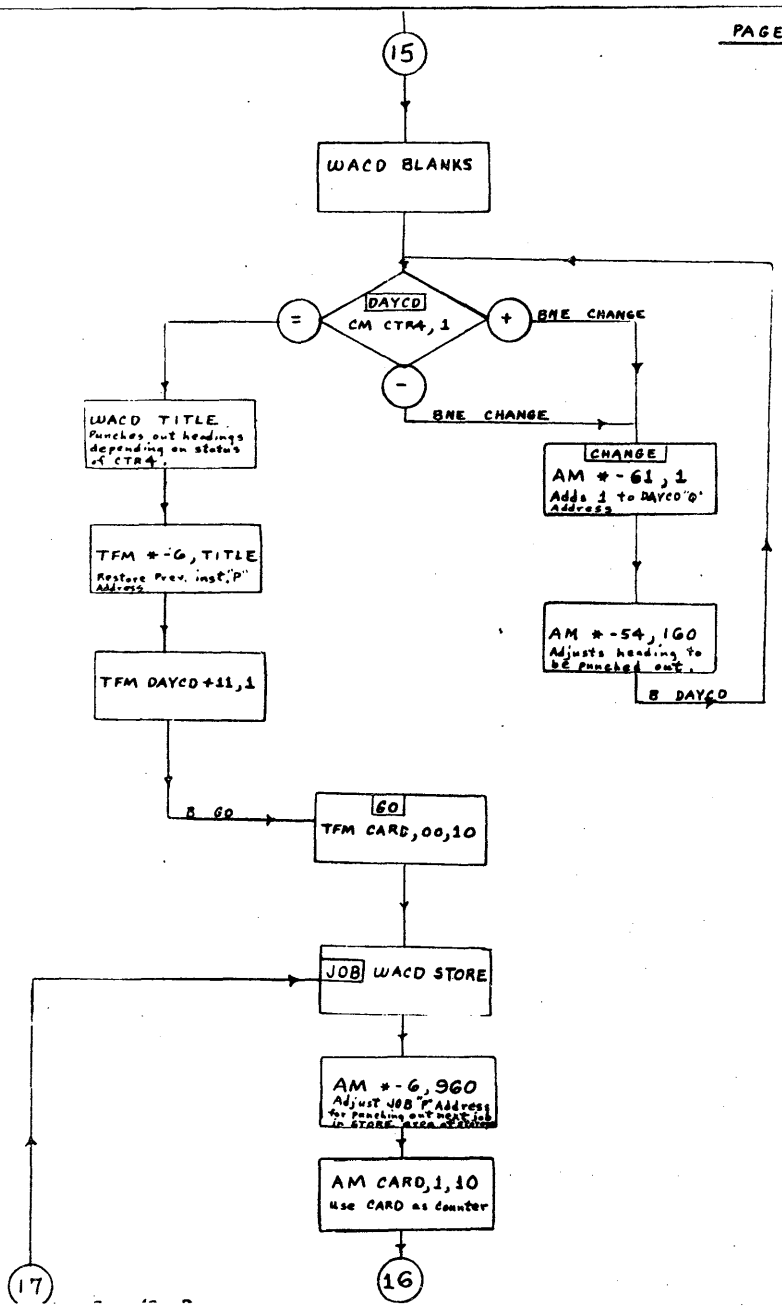
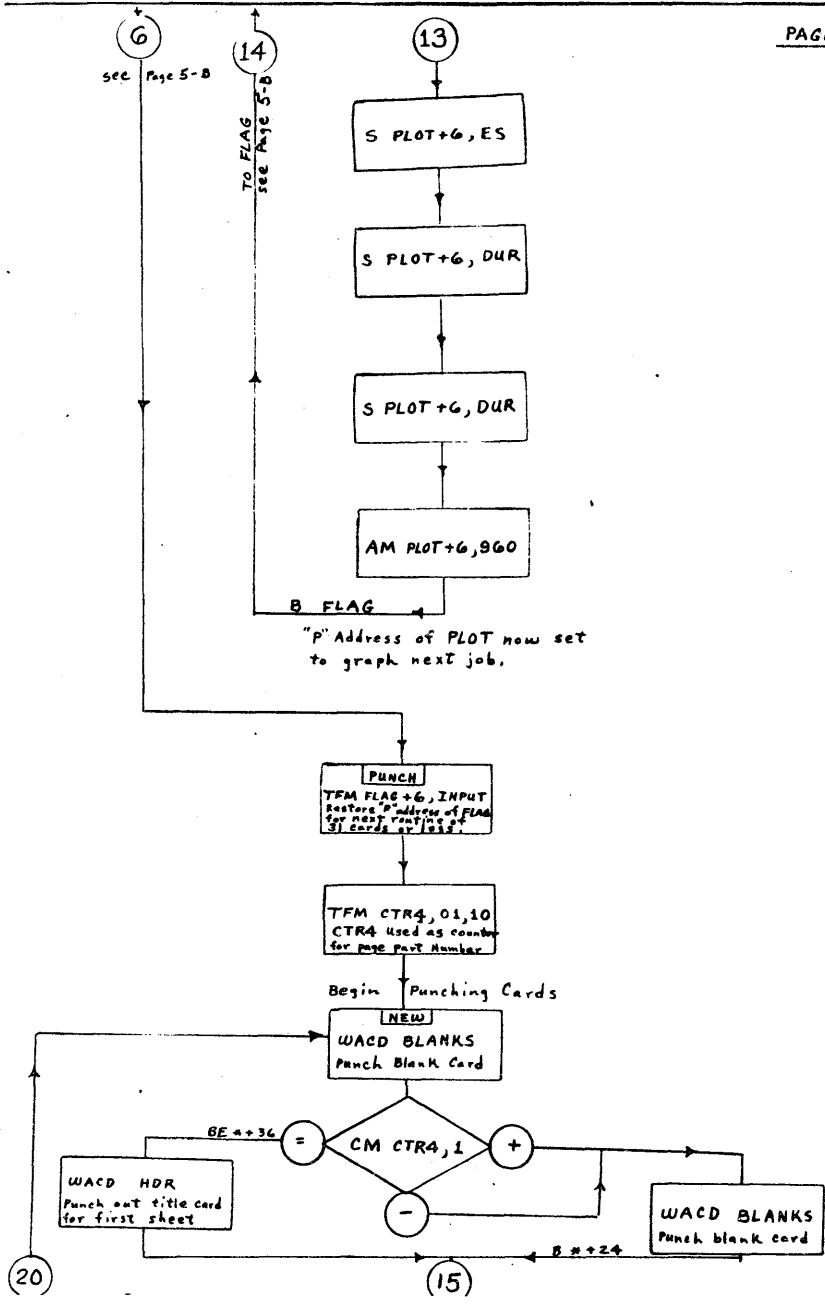
LCCTN	CP	P/L	Q	PG LN	LABEL	MNEM	OPERANDS AND REMARKS	PAGE	6-A
39088	16	38734	-5613			TFM	JOB&6,STORE		
39100	16	37774	-0681			TFM	BILLE&6,INPUT&108		
39112	16	37798	-0591			TFM	DICK&6,INPUT&18		
39124	16	37719	-6573			TFM	JACK&11,STORE&960		
39136	16	38026	-0721			TFM	TOTAL&6,INPUT&148		
39148	16	38050	-0731			TFM	FREE&6,INPUT&158		
39160	16	37618	-0572			TFM	BAKER&6,INPUT-1		
39172	16	00563	000-0			TFM	COUNT,0,10		
39184	49	37012	00000			B	READ		
39196	11	35412	000-1		INCR	AM	CTR4,1,10		
39208	16	38734	-5613			TFM	JOB&6,STORE		
39220	16	39243	-0001			TFM	*623,1		
* BEGIN PROCEDURE FOR GETTING %JOB% INSTRUCTION CORRECT FOR NEXT PAGE									
39232	14	35412	-0000		COMPR	CM	CTR4,		
39244	46	38524	01200			BE	NEW		
39256	11	38734	-0160			AM	JOB&6,160		
39268	11	39243	-0001			AM	*-25,1		
39280	49	39232	00000			B	COMPR		
39292	48	00000	00000		HALT	H			
36856							DEND START		

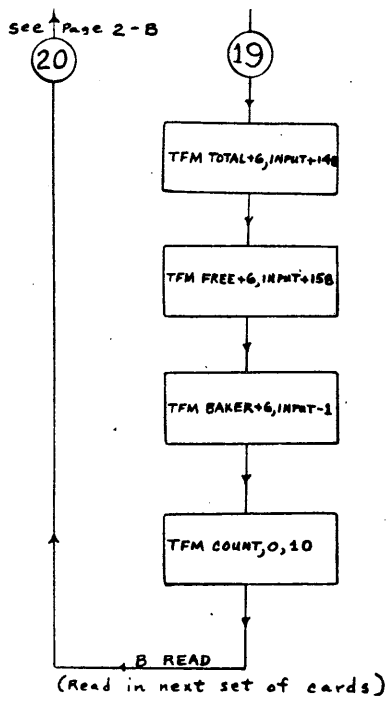
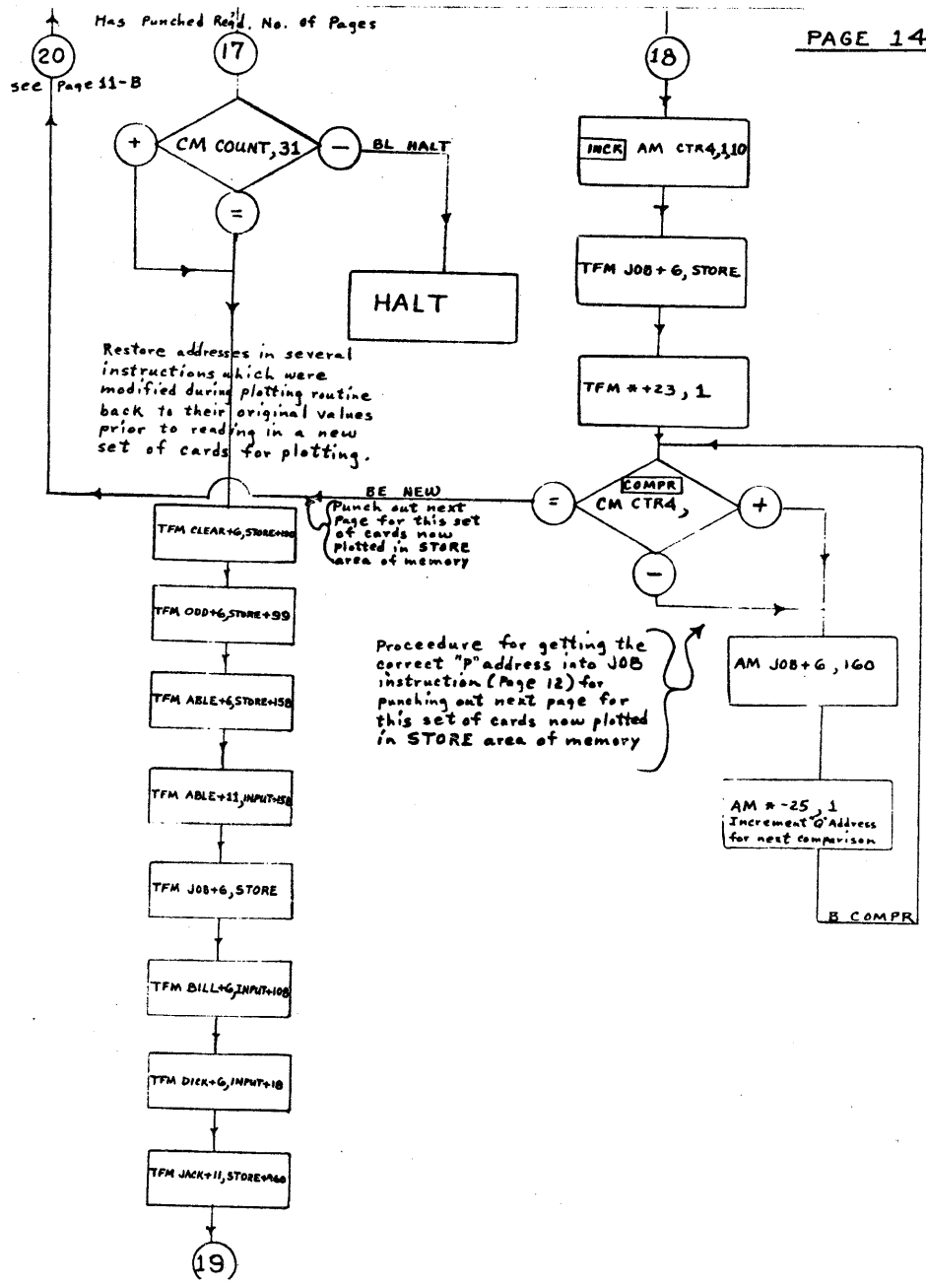






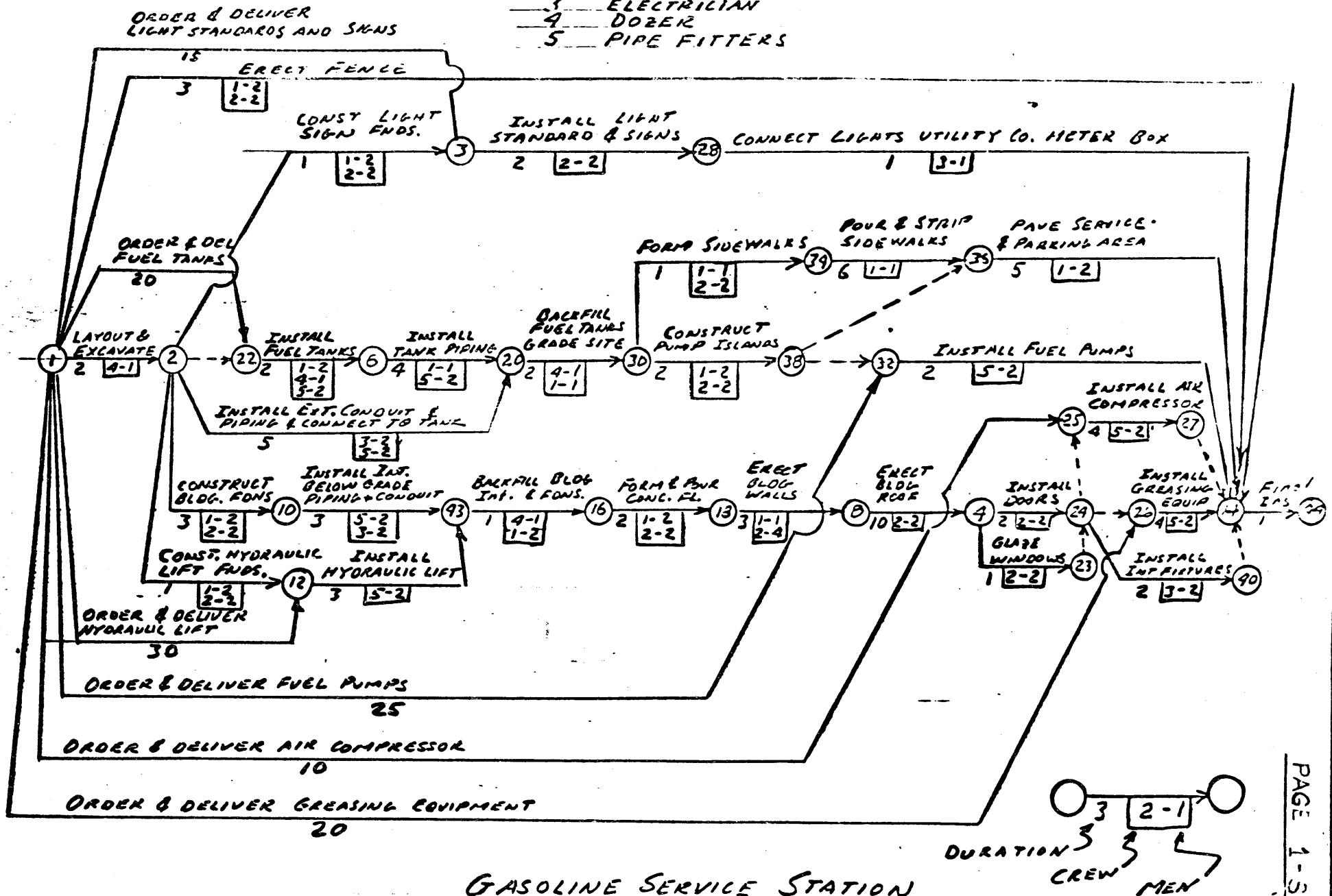






SAMPLE PROBLEM

- CREW**
- 1 LABORS / CEMENT FINISHERS
 - 2 CARPENTERS / BLOCK LAYERS
 - 3 ELECTRICIAN
 - 4 DOZER
 - 5 PIPE FITTERS



GASOLINE SERVICE STATION

FIG. 1

INPUT FOR CRITICAL PATH PROGRAM

I	J	DUR	COST	DQ	DESCRIPTION	CREW
1	2	2			LAYOUT AND EXCAVATE	4
1	3	15			ORDER * DEL LT STDS * SIGNS	
1	12	30			ORDER * DEL HYDRAULIC LIFT	
1	14	3			ERECT FENCE	12
1	22	20			ORDER * DEL FUEL TANKS	
1	25	10			ORDER * DEL AIR COMPRESSOR	
1	26	20			ORDER * DEL GREASING EQUIP	
1	32	25			ORDER * DEL FUEL PUMPS	
2	3	1			CONST LIGHT SIGN FOUNDATIONS	12
2	10	3			CONST BLDG FOUNDATIONS	12
2	12	1			CONST HYD LIFT FOUNDATIONS	12
2	20	5			INSTL EXT CONDT+PIPG * CNECT	3 5
2	22	0			DUMMY	
3	28	2			INSTL LIGHT STANDARD* SIGNS	2
4	23	1			GLAZE WINDCWS	2
4	24	2			INSTALL DOORS	2
6	20	4			INSTALL TANK PIPING	1 5
8	4	10			ERECT BUILDING ROOF	2
10	43	3			INSTL INT PIPING + CONDUIT	3 5
12	43	3			INSTALL HYDRAULIC LIFT	5
14	44	1			FINAL INSPECTION	
16	18	2			FORM * POUR CONCRETE FLOOR	12
18	8	3			ERECT BUILDING WALLS	12
20	30	2			BACKFILL FUEL TANKS * GRADE	1 4
22	5	2			INSTALL FUEL TANKS	1 45
23	24	0			DUMMY	
24	25	0			DUMMY	
24	26	0			DUMMY	
24	40	2			INSTALL INT FIXTURES	3
25	27	4			INSTALL AIR COMPRESSOR	5
26	14	4			INSTALL GREASING EQUIPMENT	5
27	14	0			DUMMY	
28	14	1			CONNECT LIGHTS * METER BOX	3
30	34	1			FORM SIDEWALKS	12
30	38	2			CONSTRUCT PUMP ISLANDS	12
32	14	2			INSTALL FUEL PUMPS	5
34	36	6			POUR AND STRIP SIDEWALKS	1
36	14	5			PAVE SERVICE * PARKING AREA	1
38	32	0			DUMMY	
38	36	0			DUMMY	
40	14	0			DUMMY	
43	16	1			BACKFILL BLDG INT AND FDNS	1 4

ANSWERS FROM CRITICAL PATH PROGRAM

I	J	DUR	COST	DQ	DESCRIPTION	CREW	ES	EF	LS	LF	TF	FF	
1	2	2			LAYOUT AND EXCAVATE	4		2	25	27	25		
1	3	15			ORDER * DEL LT STDS * SIGNS			15	37	52	37		
1	12	30			ORDER * DEL HYDRAULIC LIFT			30		30			
1	14	3			ERECT FENCE	12		3	52	55	52	52	
1	22	20			ORDER * DEL FUEL TANKS			20	15	35	15		
1	25	10			ORDER * DEL AIR COMPRESSOR			10	41	51	41	41	
1	26	20			ORDER * DEL GREASING EQUIP			20	31	51	31	31	
1	32	25			ORDER * DEL FUEL PUMPS			25	28	53	28	5	
2	3	1			CONST LIGHT SIGN FOUNDATIONS	12		2	3	51	52	49	12
2	10	3			CONST BLDG FOUNDATIONS	12		2	5	27	30	25	
2	12	1			CONST HYD LIFT FOUNDATIONS	12		2	3	29	30	27	27
2	20	5			INSTL EXT CONDT+PIPG * CNECT	3 5		2	7	36	41	34	19
2	22	0			DUMMY			2	2	35	35	33	18
3	28	2			INSTL LIGHT STANDARD* SIGNS	2		15	17	52	54	37	
4	23	1			GLAZE WINDCWS	2		49	50	50	51	1	
4	24	2			INSTALL DOORS	2		49	51	49	51		
6	20	4			INSTALL TANK PIPING	1 5		22	26	37	41	15	
8	4	10			ERECT BUILDING ROOF	2		39	49	39	49		
10	43	3			INSTL INT PIPING + CONDUIT	3 5		5	8	30	33	25	25
12	43	3			INSTALL HYDRAULIC LIFT	5		30	33	30	33		
14	44	1			FINAL INSPECTION			55	56	55	55		
16	18	2			FORM * POUR CONCRETE FLOOR	12		34	36	34	36		
18	8	3			ERECT BUILDING WALLS	12		36	39	36	39		
20	30	2			BACKFILL FUEL TANKS * GRADE	1 4		26	28	41	43	15	
22	5	2			INSTALL FUEL TANKS	1 45		20	22	35	37	15	
23	24	0			DUMMY			50	50	51	51	1	1
24	25	0			DUMMY			51	51	51	51		
24	26	0			DUMMY			51	51	51	51		
24	40	2			INSTALL INT FIXTURES	3		51	53	53	55	2	
25	27	4			INSTALL AIR COMPRESSOR	5		51	55	51	55		
26	14	4			INSTALL GREASING EQUIPMENT	5		51	55	51	55		
27	14	0			DUMMY			55	55	55	55		
28	14	1			CONNECT LIGHTS * METER BOX	3		17	18	54	55	37	37
30	34	1			FORM SIDEWALKS	12		28	29	43	44	15	
30	38	2			CONSTRUCT PUMP ISLANDS	12		28	30	48	50	20	
32	14	2			INSTALL FUEL PUMPS	5		30	32	53	55	23	23
34	36	6			POUR AND STRIP SIDEWALKS	1		29	35	44	50	15	
36	14	5			PAVE SERVICE * PARKING AREA	1		35	40	50	55	15	15
38	32	0			DUMMY			30	30	53	53	23	
38	36	0			DUMMY			30	30	50	50	20	5
40	14	0			DUMMY			53	53	55	55	2	2
43	16	1			BACKFILL BLDG INT AND FDNS	1 4		33	34	33	34		

PROJECT COMPLETION

56

