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Final Technical Report
Appendix

AD No. 407 255

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**ANALYTICAL
AERIAL TRIANGULATION
ERROR ANALYSIS AND
APPLICATION OF COMPENSATING
EQUATIONS TO
THE GENERAL BLOCK
TRIANGULATION AND
ADJUSTMENT PROGRAM**

MARCH 1960 TO FEBRUARY 1962
DEPARTMENT OF THE ARMY TASK NO. 8T35-11-001-05
CONTRACT NO. DA-44-009 ENG 4420

U.S. Army Engineer
Geodesy, Intelligence, and Mapping
Research and Development Agency

407 255

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JUN 26 1962
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FINAL TECHNICAL ~~REPORT~~

APPENDIX

⑥ ANALYTICAL AERIAL TRIANGULATION ERROR ANALYSIS

and

APPLICATION OF COMPENSATING EQUATIONS

to

THE GENERAL BLOCK TRIANGULATION AND ADJUSTMENT PROGRAM.

APPENDIX.

Mar. 1960 to Feb. 1962

Department of the Army Task 8T35+11+001+05

⑮ Contract DA-44-009 ENG 4420

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⑰ NA

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㉑ NA

U. S. Army Engineer
Geodesy, Intelligence, and Mapping
Research and Development Agency

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CIVIL ENGINEERING SYSTEMS LABORATORY
Department of Civil Engineering
Research Report R62+4
Massachusetts Institute of Technology
Cambridge, Massachusetts

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PREFACE

These investigations were carried out under the authority contained in Contract No. DA-44-009 ENG 4420, "Analytical Aerial Triangulation Error Analysis and Application of Compensating Equations to the General Block Triangulation Adjustment Program."

The investigation was conducted under the direction of Professor Charles L. Miller and Mr. E. Phillip Gladding, Instructor, Department of Civil Engineering. The investigation was conducted, *Phys* from March 10, 1960 to March 10, 1962, by Messrs. Luis Andrew R., Ziad M. Elias, and Frank S. Greateorex, Research Assistants in the Department of Civil Engineering. Also contributing to the investigation were Messrs. Daniel R. Schurz, Instructor, Armen Gabrielian, Student Assistant, and Lawrence Kalman, Student Assistant.

ABSTRACT


~~The objective of the activities reported is to effect~~ Improved
accuracy in the supplied General Block Triangulation digital computer
program, ^{is described} through incorporation ^{now} in the program means of error adjustment
and compensation, ^{as follows:} ~~The first volume of the report presents.~~

-  (1) the nature of random and systematic errors and the basic techniques for treating their effects as applicable to the analytical photogrammetric problem;
- (2) the basic least squares method and its incorporation in the computer program;
- (3) complete mathematical description of the program;
- (4) studies of the nature and effects of the important error sources: lens and camera errors, atmospheric refraction, film distortion;
- (5) the study of various techniques for the solution of simultaneous equations;
- (6) operating instructions; *and*
- (7) the results, conclusions, and resulting recommendations of test runs of the final computer program.

The second volume contains the  appendices which consist of the complete flow charts representing the original and final programs.



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↑

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FLOW CHART OUTLINE

Original IBM 704 Computer Program - Flow Chart

Segment I - Chain I

START - Initializations	A1
Read Control cards: J,P	A1-A2
FILE - Input card read routine	A3
ECARD - Preliminary processing and storing of E-card data	A4-A9
GCARD - Preliminary processing and storing of G-card data	A10-A18
DEXFR - Normal Matrix Bookkeeping	A19
DEXPR - Termination of Segment I - tape writing for Segment II and print outs.	A20

Segment II - Chain 2

CEQBE - Preliminary initializations	A22
CEQES - General exposure station equation forming routine	A22
ESTYT - Test for type of exposure station and transfer to corresponding equation forming routine	A23
ESTYA, ESTYB, ESTYC, ESTYD, ESTYE, ESTYF, ESTYG, and ESTYH - control for forming of equations by exposure station type	A24-A29
CEQST - Scaling and printing of condition equations	A26-A27
MATFR - Form normal equations	A27
EQ11, EQ12, EQ12A, and EQ13 - Conditional equation forming routine	A30-A34
PHXYZ - Exposure station data processing	A35
CEQFA - General ground point data bookkeeping for equation forming	A36-A43

GPTYB, GPTYC, GPTYD, GPTYE, GPTYF, GPTYG, GPTYH, CEQFJ - control for forming of equations by ground point type	A44-A48
SUB1, SUB2, XYZRA - subroutines for computing quantities used in equation forming	A49-A59
TEFCL - Process type A ground point	A59-A61
SUEFX - Process type C ground point	A62
EQ56 - Equation former for ground point equation 56	A62-A65
EQ1 - Equation former for ground point equation 1	A66-A69
EQ2 - Equation former for ground point equation 2	A69-A76
EQ34 - Equation former for ground points equation: 34	A77-A80
EQ5 - Equation former for ground point equation 5	A80-A81
EQ6 - Equation former for ground point equation 6	A82-A83
EQ6A - Equation former for ground point equation 6A	A83-A85
EQ7 - Equation former for ground point equation 7	A85-A87
EQ70 - Equation former for ground point equation 70	A87-A91
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FCVSQ - Compute sum of squares of right hand sides of the normal equations and print normal matrix and constant vector and transfer to Segment III	A98

Segment III - Chain 3

RESEG3 - Initialize for Chebyshev routine	A99-A102
CEBYA, CEBYB, CEBYC, CEBYD, CEBYE, CEBYF, CEBYG - Chebyshev routine for generating initial values for the Steifel iteration method	A103-A104
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SSVAL - Error print out routine	A107
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CMRBE - Testing for sufficient convergences of exposure station position vector	A121
CORMR, CORREC, CMPTU, AYESEE, BEET, BB, DD, FF - Routines using Steifel solution to correct position vectors and orientation matrices of exposure stations	A121-A125
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RESBE - Initializations for resection routine	A127
RESTR, LFXYZ, FXMAT, ... , FULLC, PRANG, PREST - Computation, storing, and printing out of exposure station position and orientation parameters	A127-A134
GPRES, GPANL, GPCAL, GBCCB - Print out the given ground point coordinates corresponding to different pairs of photographs. Rewind magnetic tape, halt, and transfer to start a new segment 3 iteration if desired.	A134-A139

Additions and Modifications to Original Program - Flow Chart

Segment 2 - Chain 2

TMX*	- Formation of T matrix associated with each image point	B1-B3
FRBWN	- Write on magnetic tape condition equation and control data	B3-B5
CEQST	- Print out coefficients of unknowns as in original program. Compute control words defining equation type	B5-B8
MFALP	- Equation 70 tape writing routine	B8-B9
SUB1	- Modified to include computations introduced by changes in conditional equations	B9-B10
EQ1	- Additions to original EQ1	B11-B12
EQ2	- Additions to original EQ2	B13-B17
EQ34	- Additions to original EQ34	B18-B20
EQ5	- Additions to original EQ5	B21-B22
EQ6	- Additions to original EQ6	B23-B25
EQ6A	- Additions to original EQ6A	B26-B28
EQ7	- Additions to original EQ7	B29-B30
ESTYA	- Additions to original ESTYA	B30-B32
EQ11	- Additions to original EQ11	B32
EQ12	- Additions to original EQ12	B32-B33
EQ12A	- Additions to original EQ12A	B33-B34
EQ13	- Additions to original EQ13	B34
EQ56	- Additions to original EQ56	B35-B38
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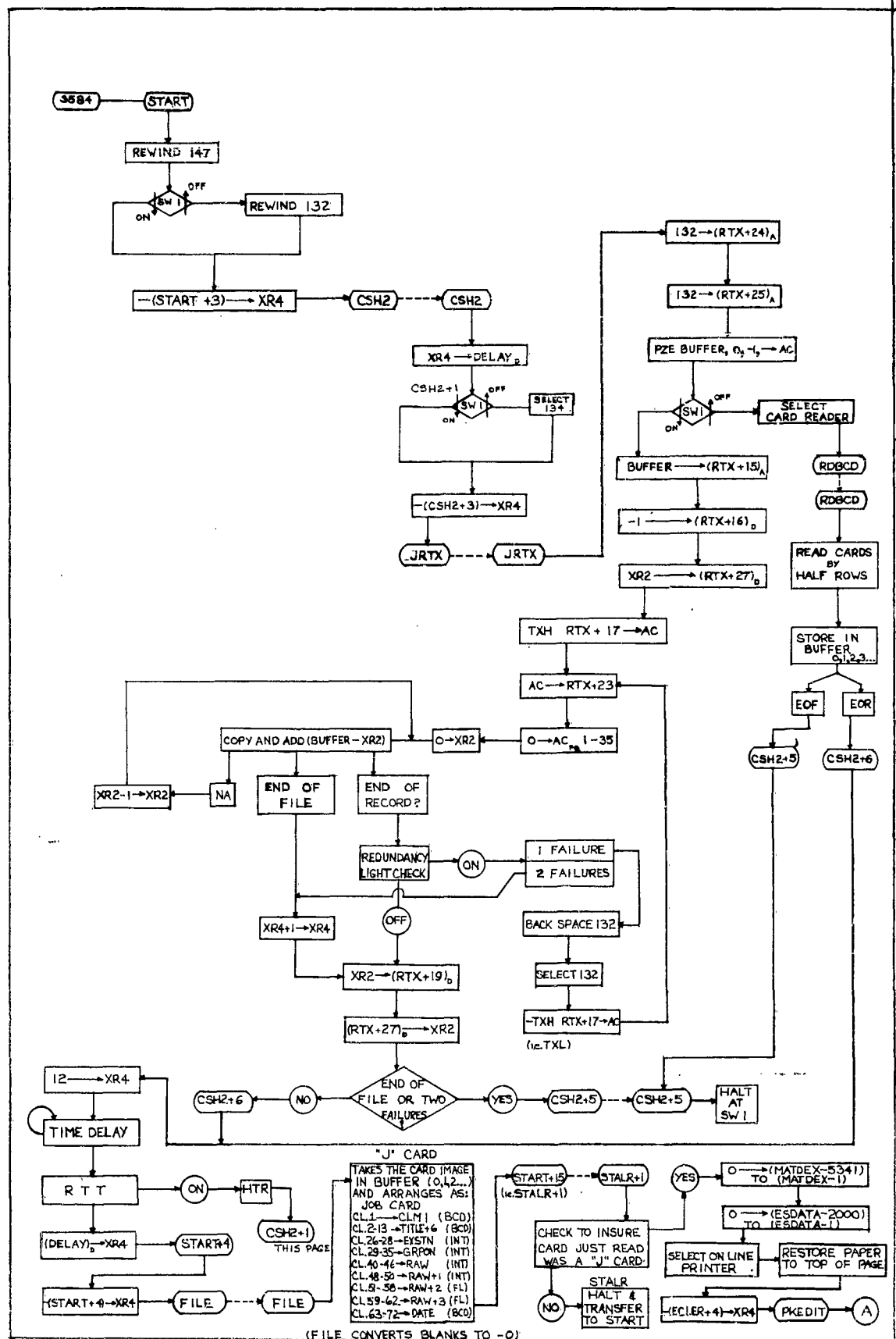
Segment 23 - Chain 23

ECHO*	- Read conditional equations from tape	B41-B43
FRBWN*	- Weight matrix and normal equation forming and storing routine	B44-B50

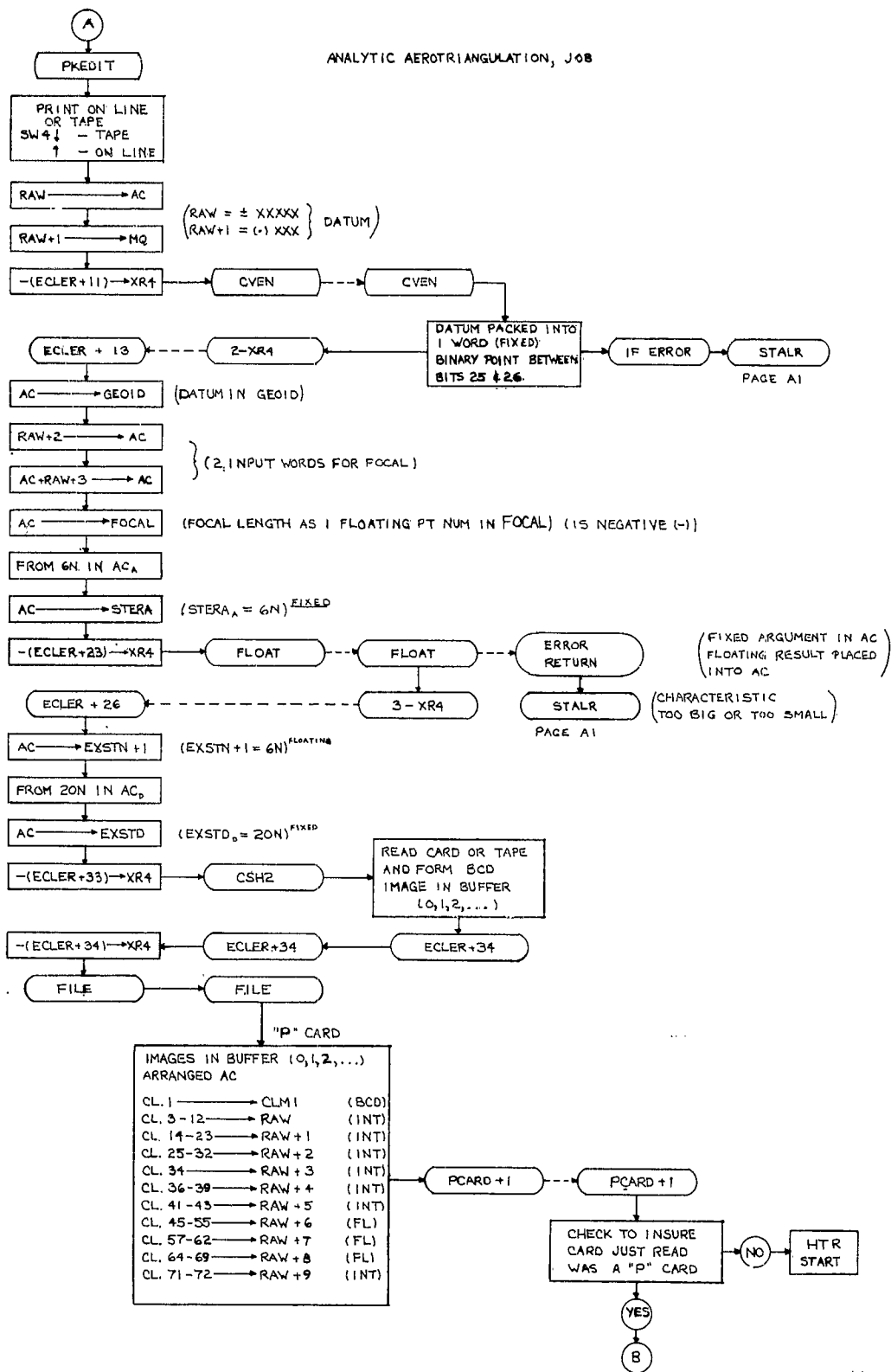
* Additions

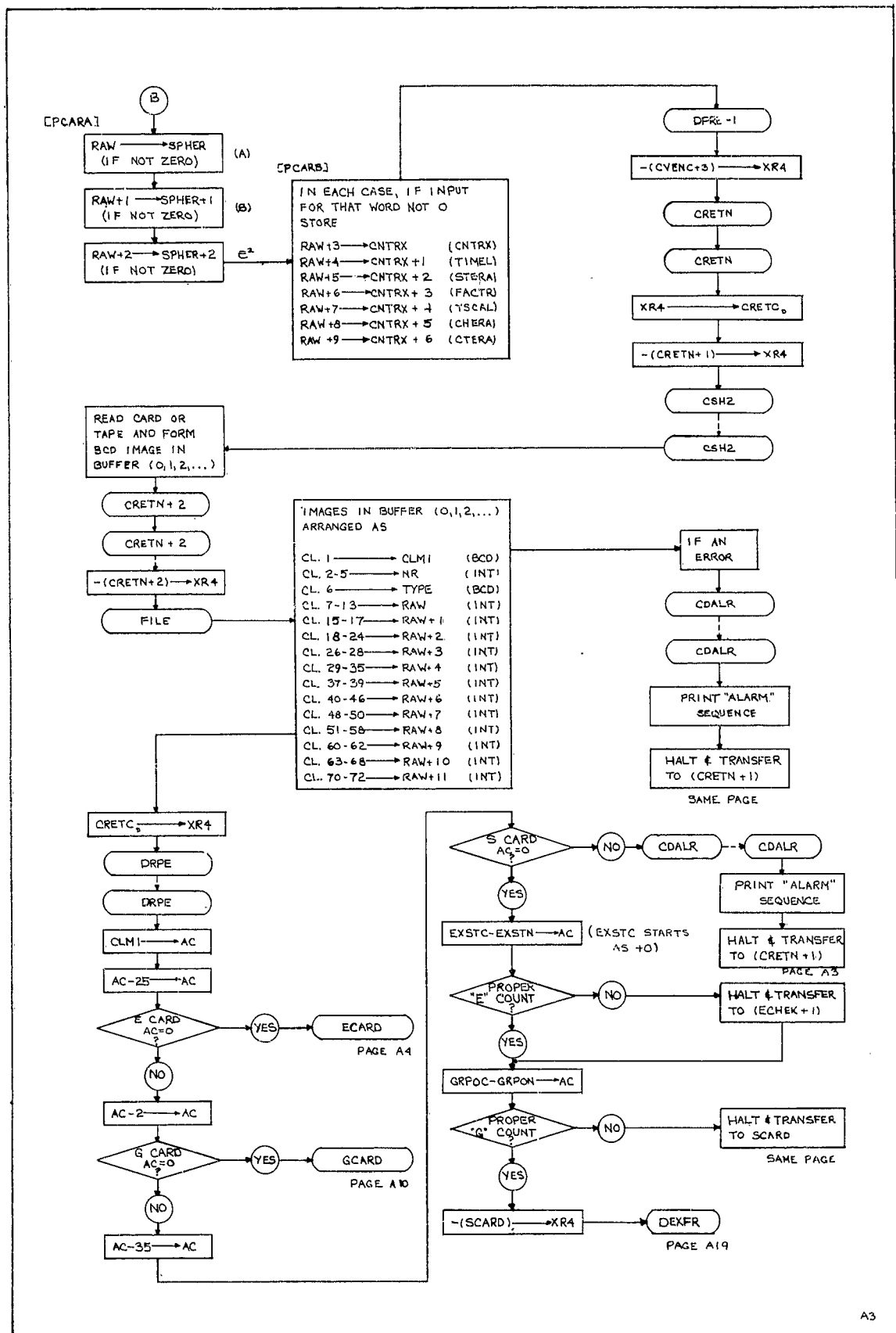
APPENDIX A

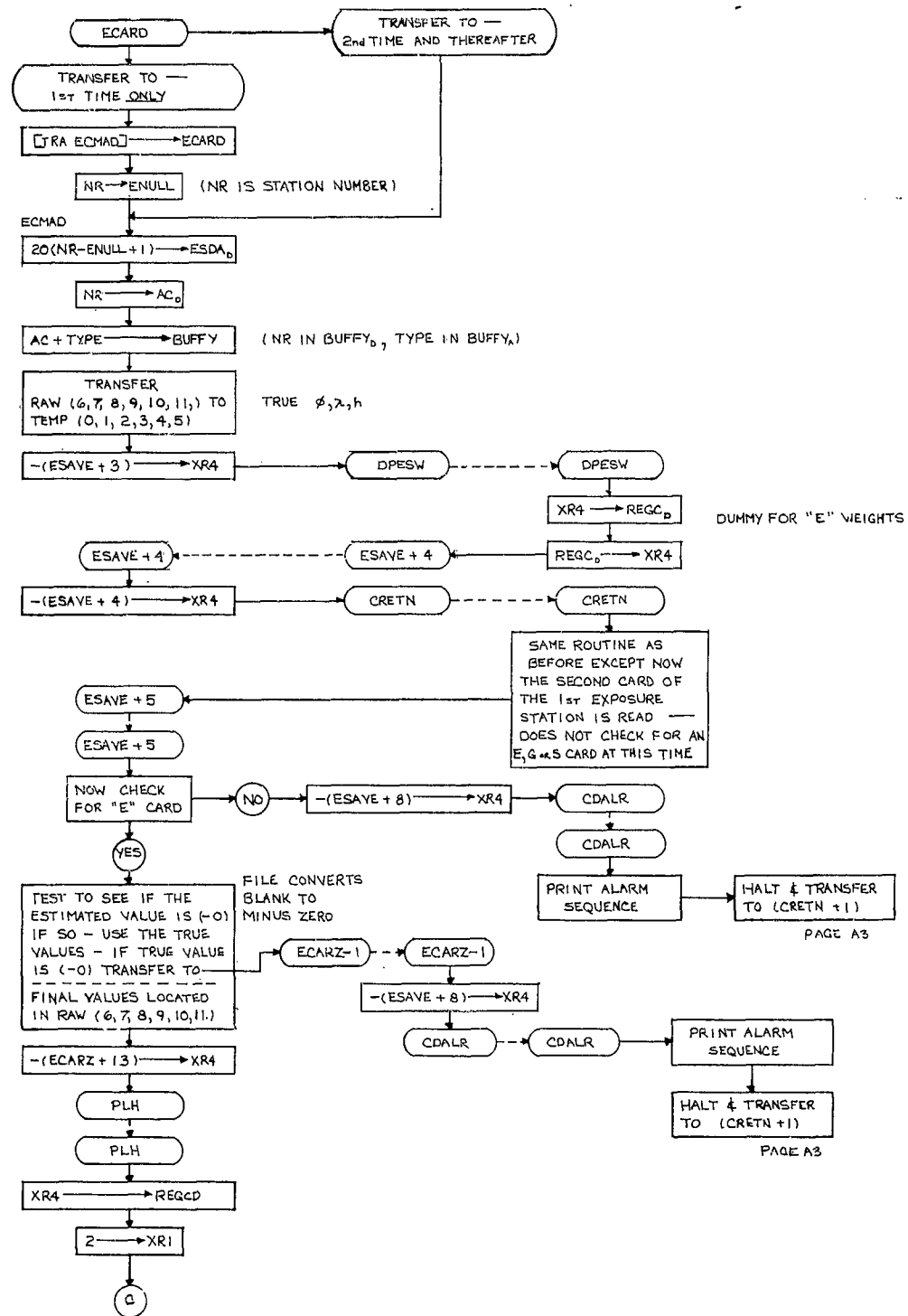
ORIGINAL IBM 704 COMPUTER PROGRAM - FLOW CHART

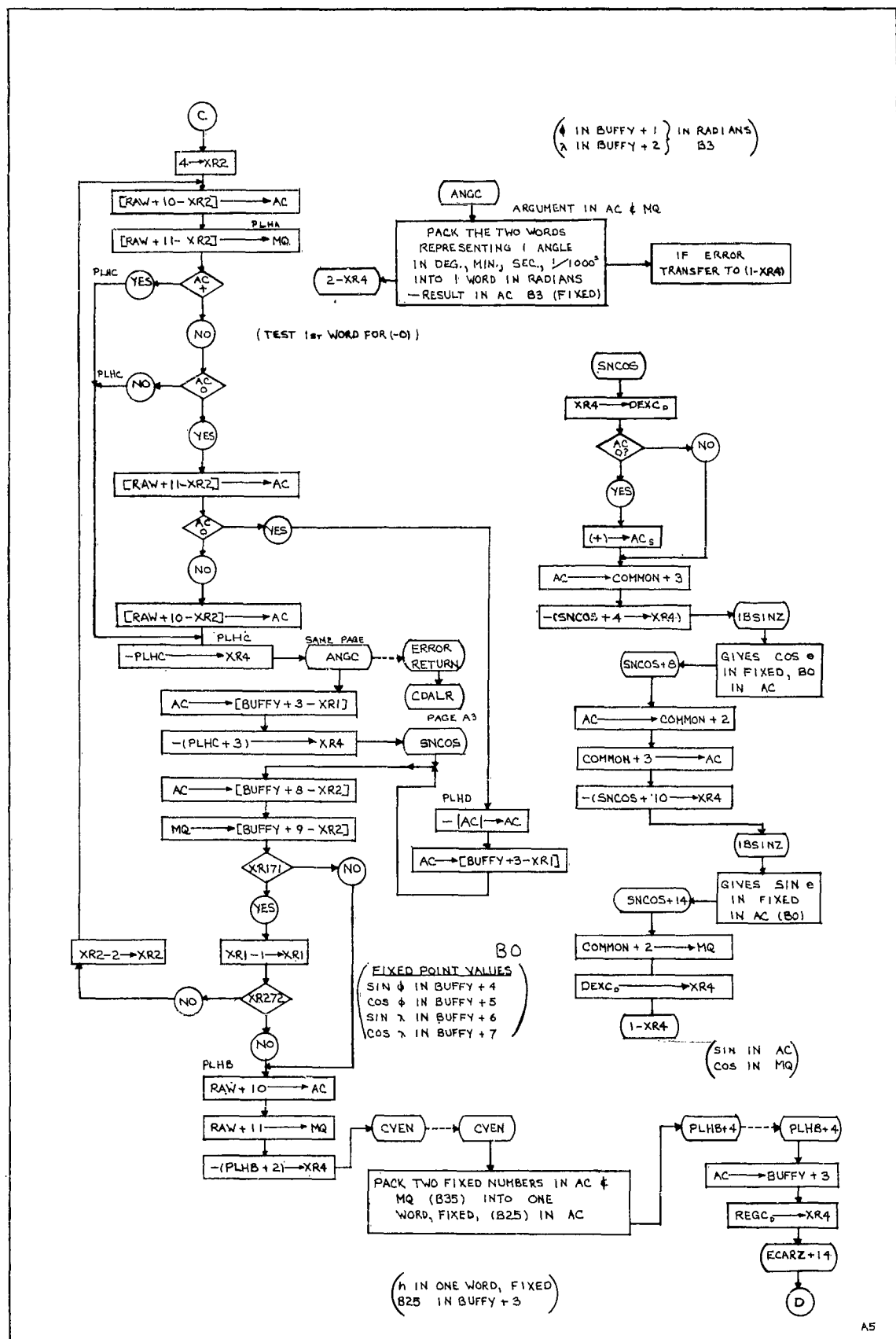


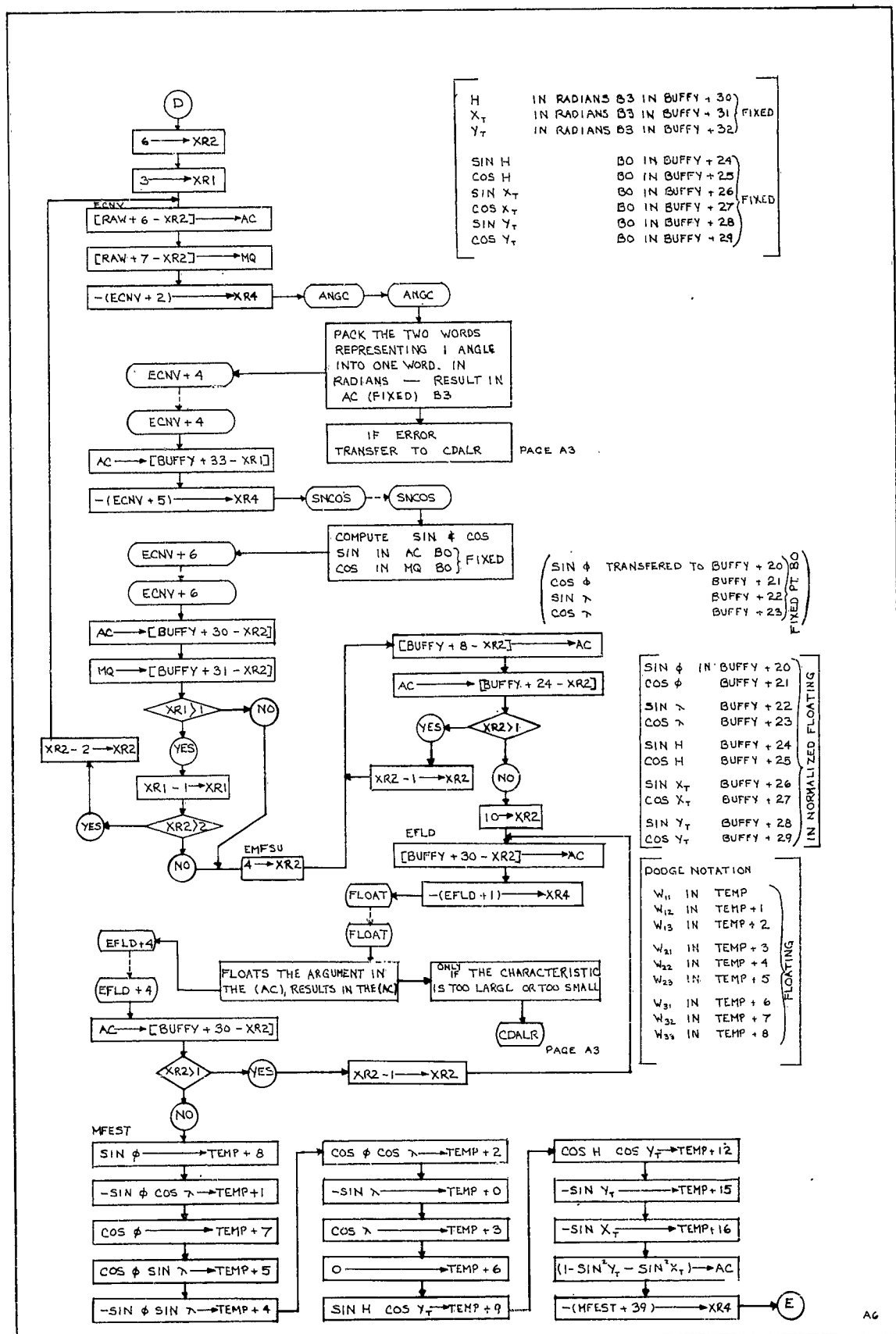
ANALYTIC AEROTRIANGULATION, JOB

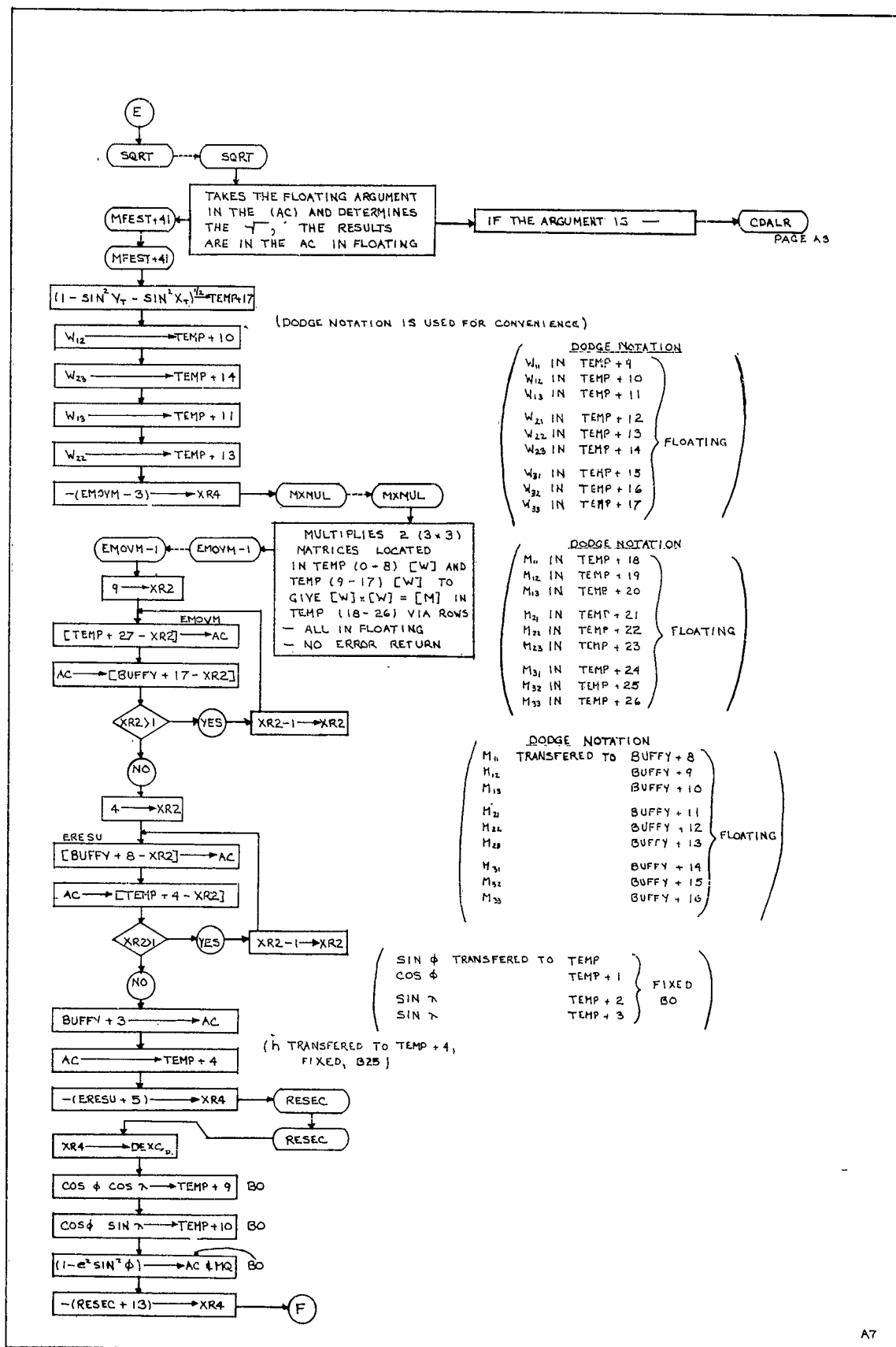


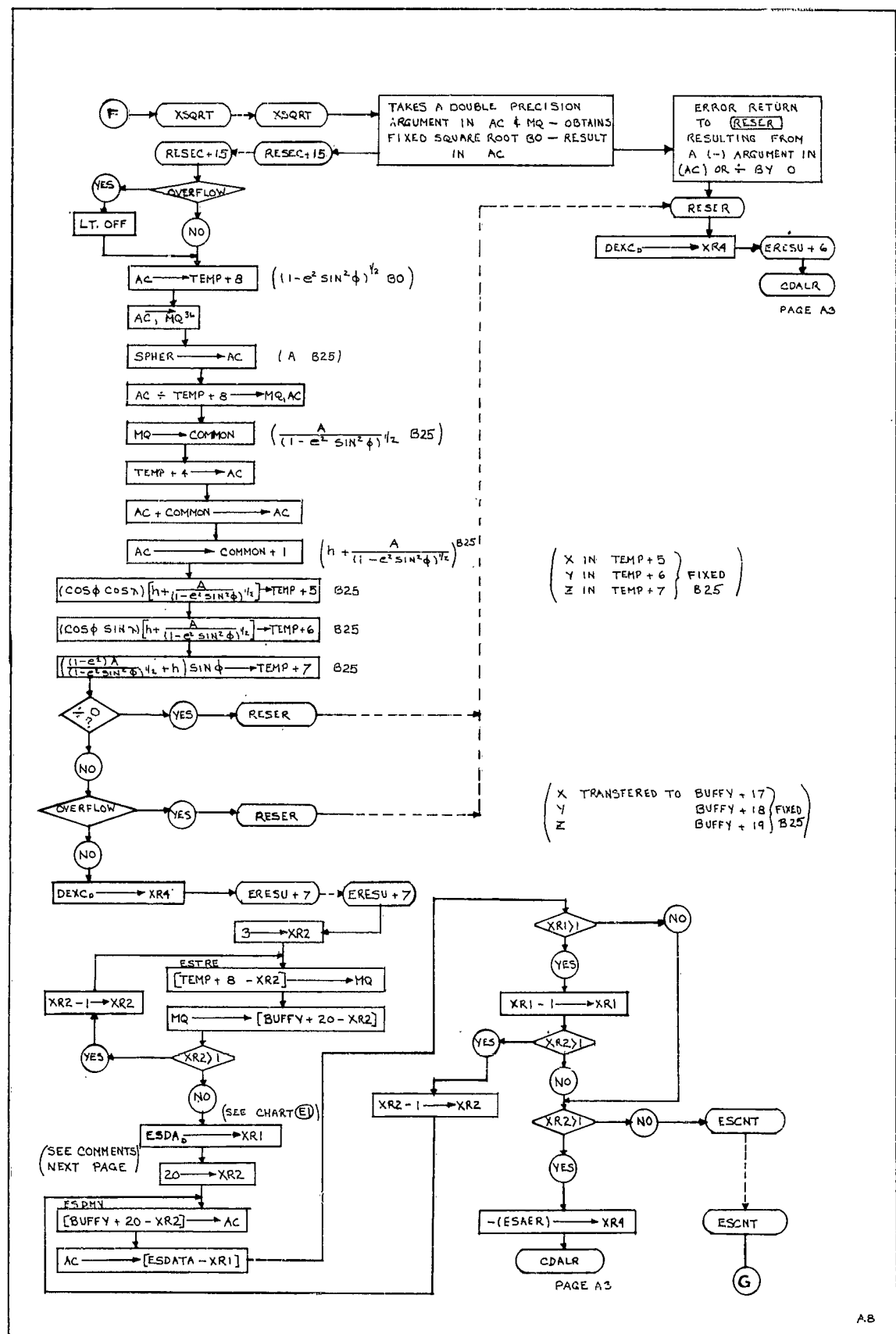




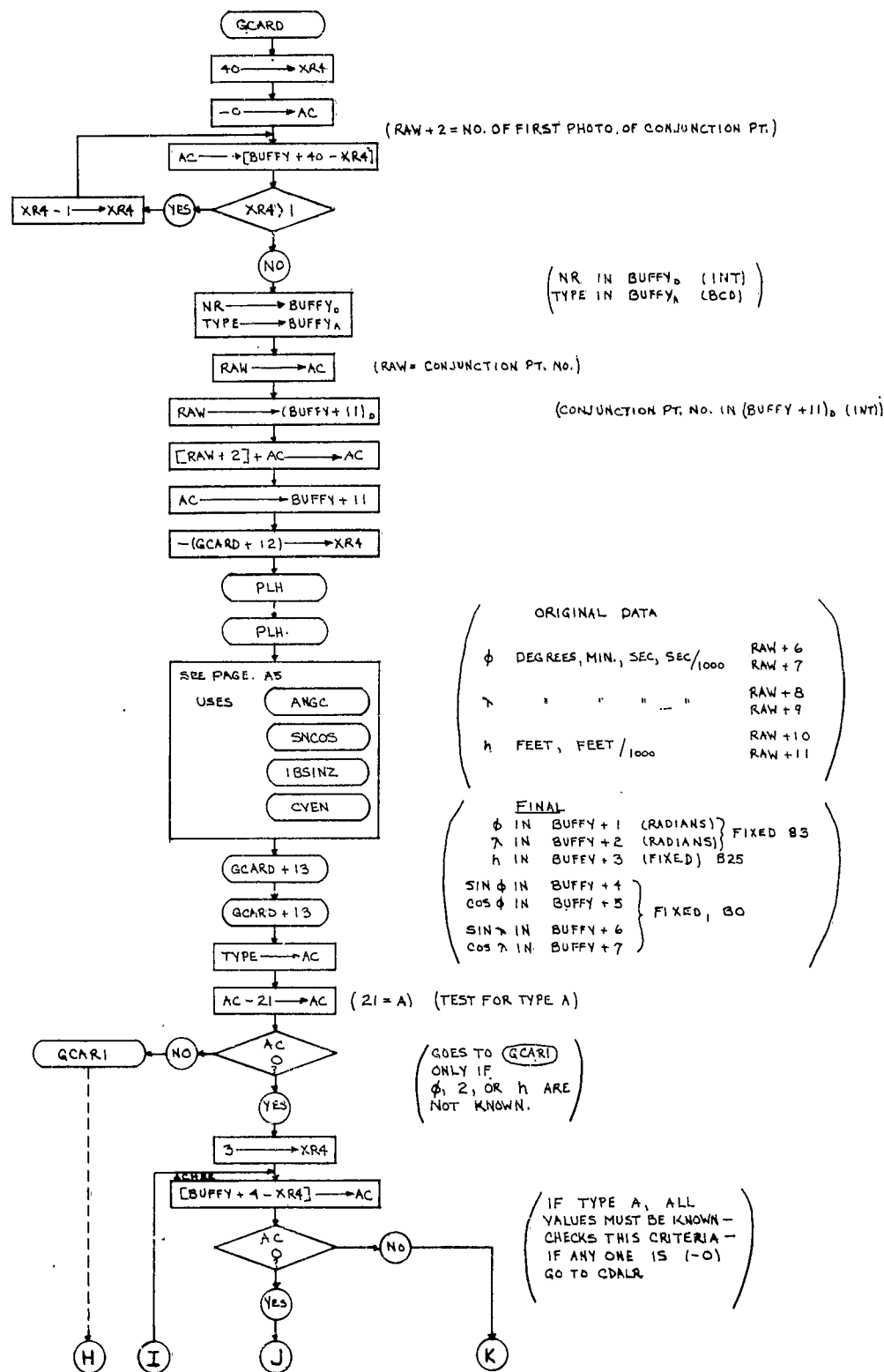


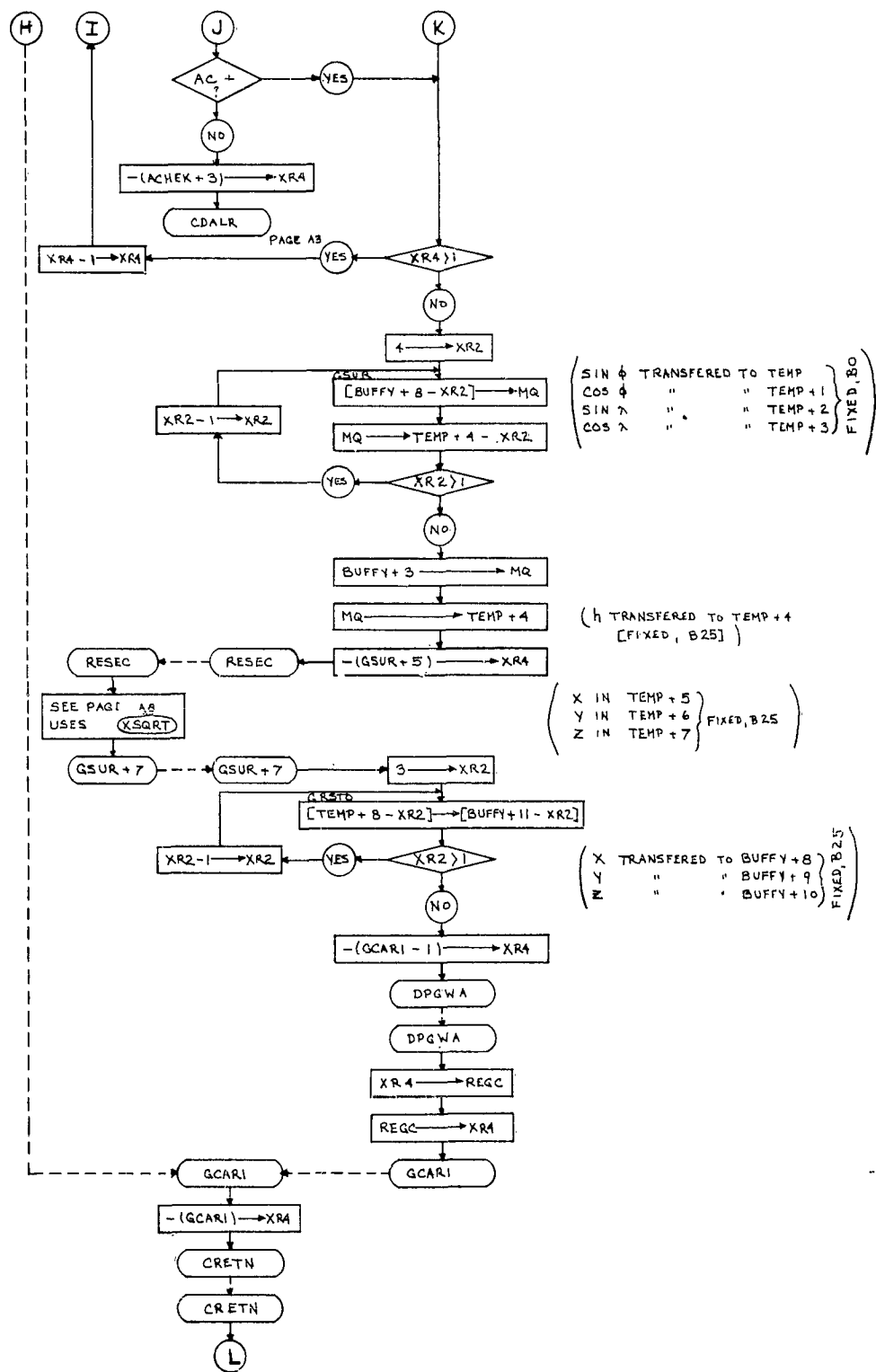


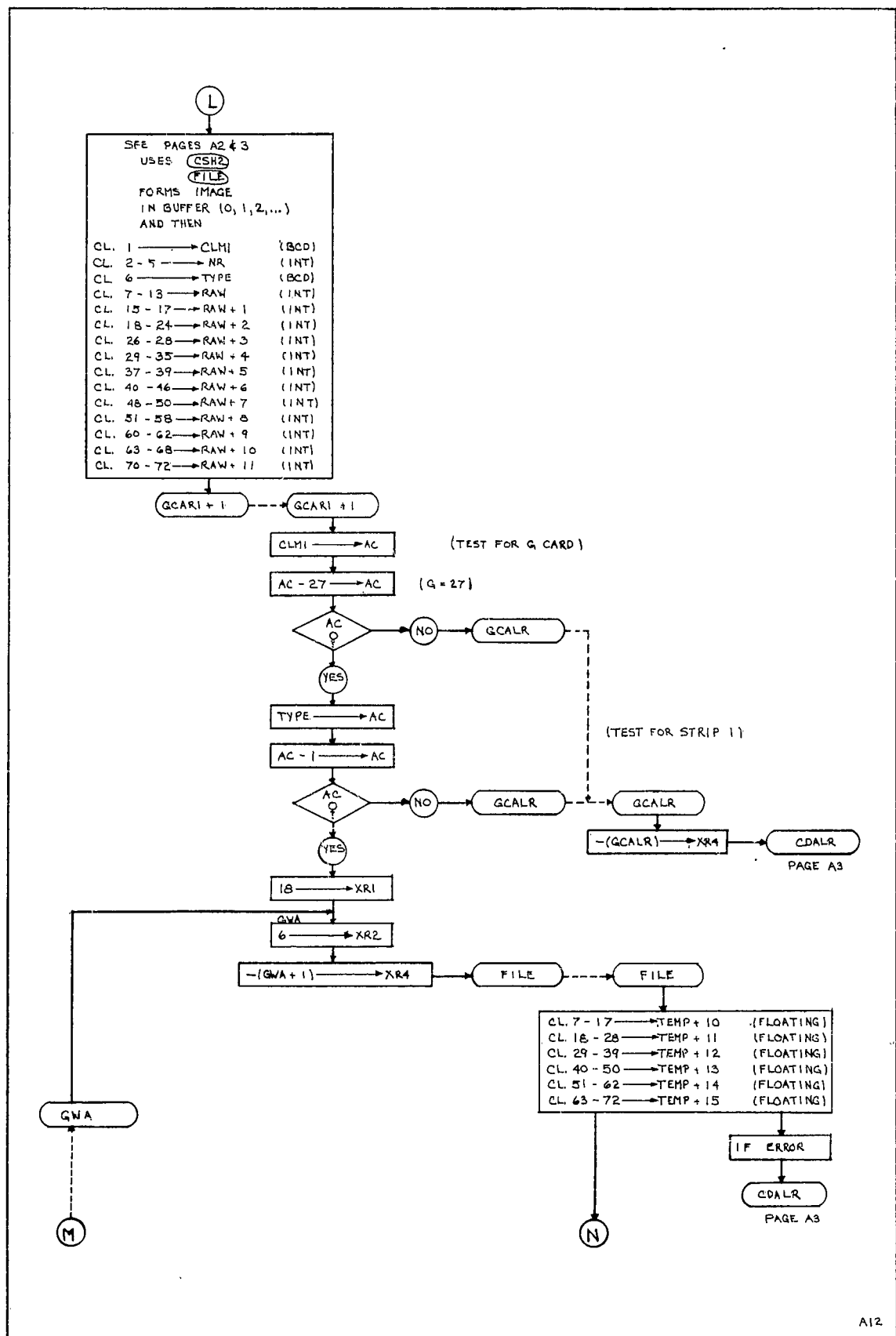


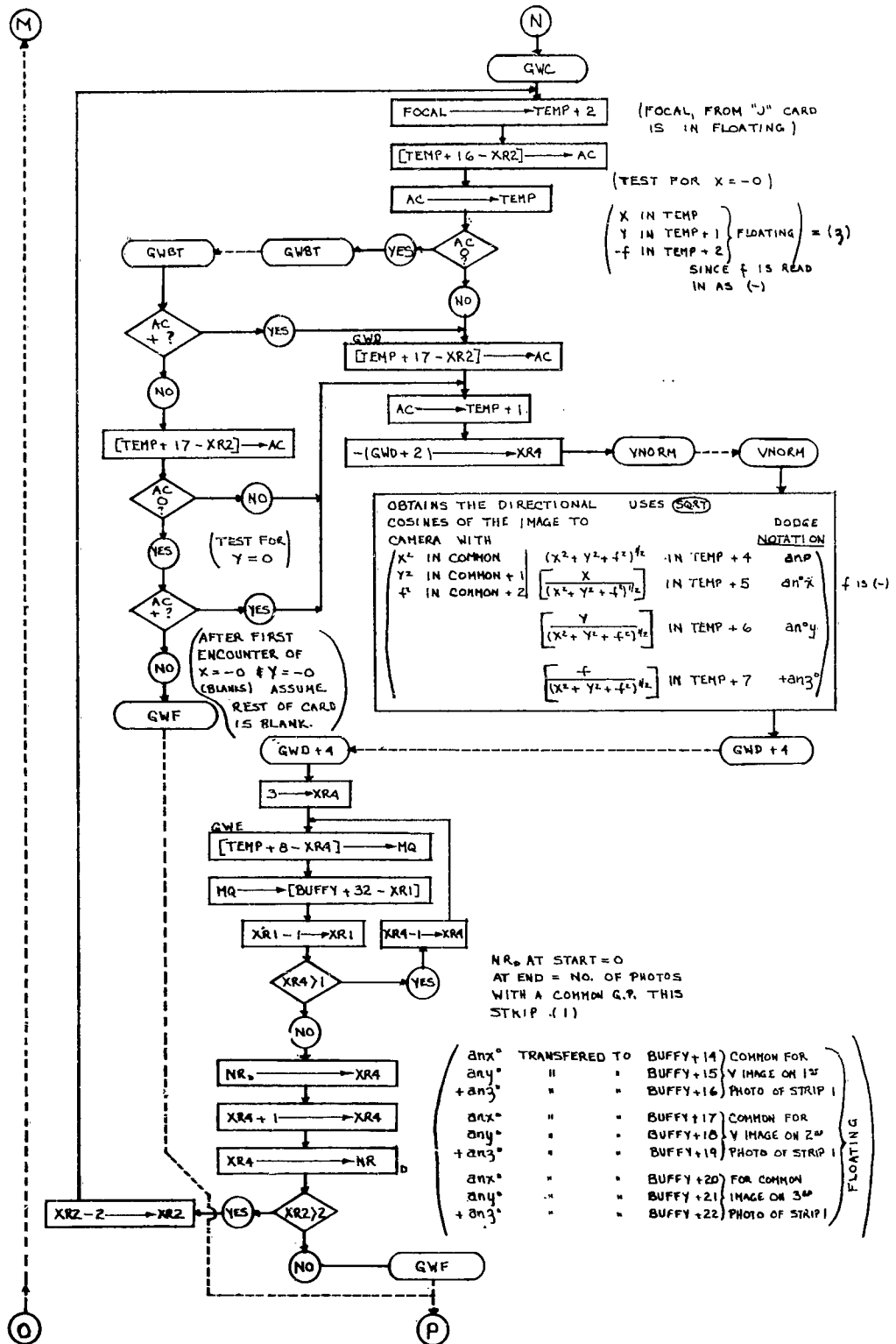




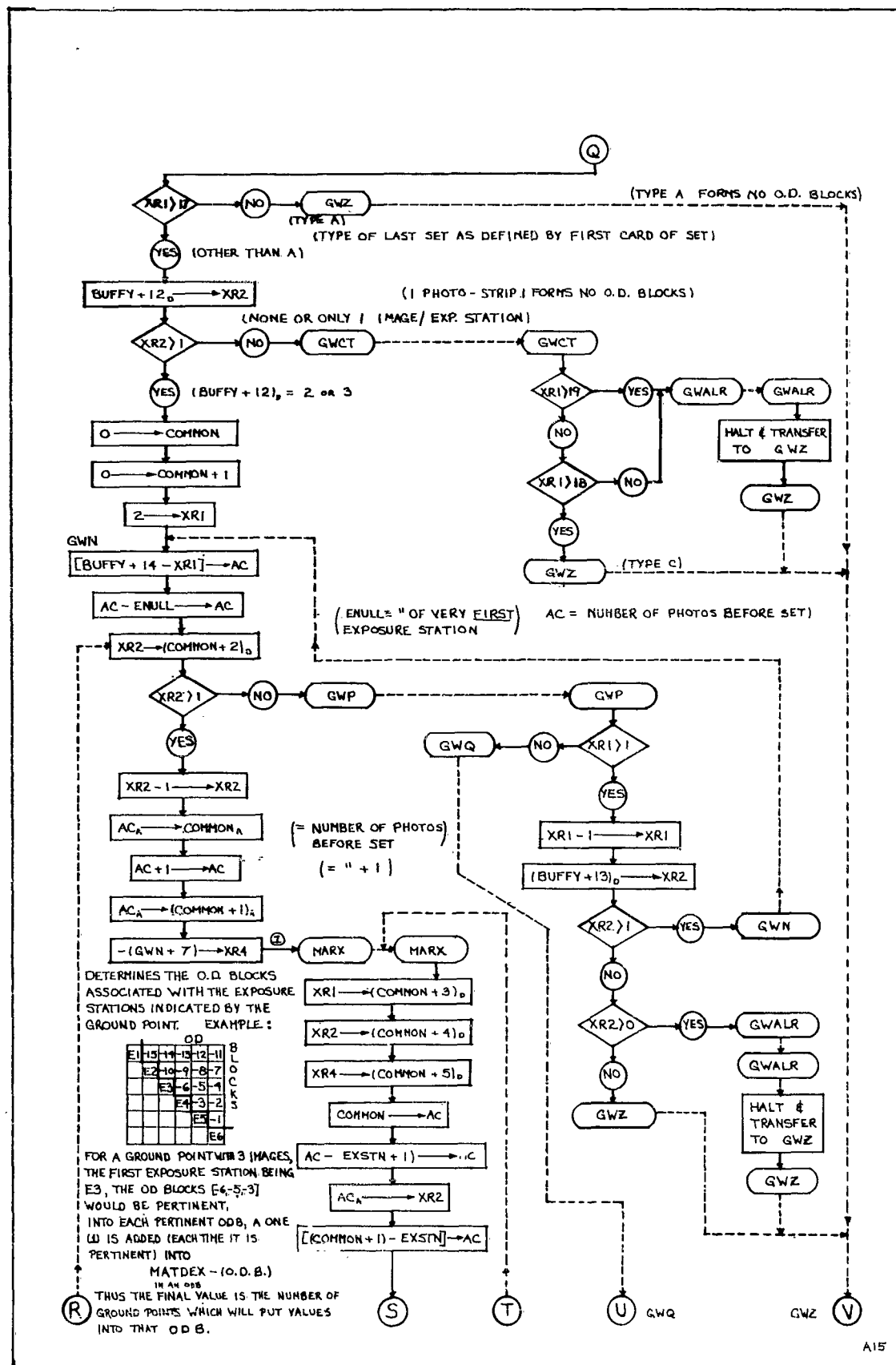


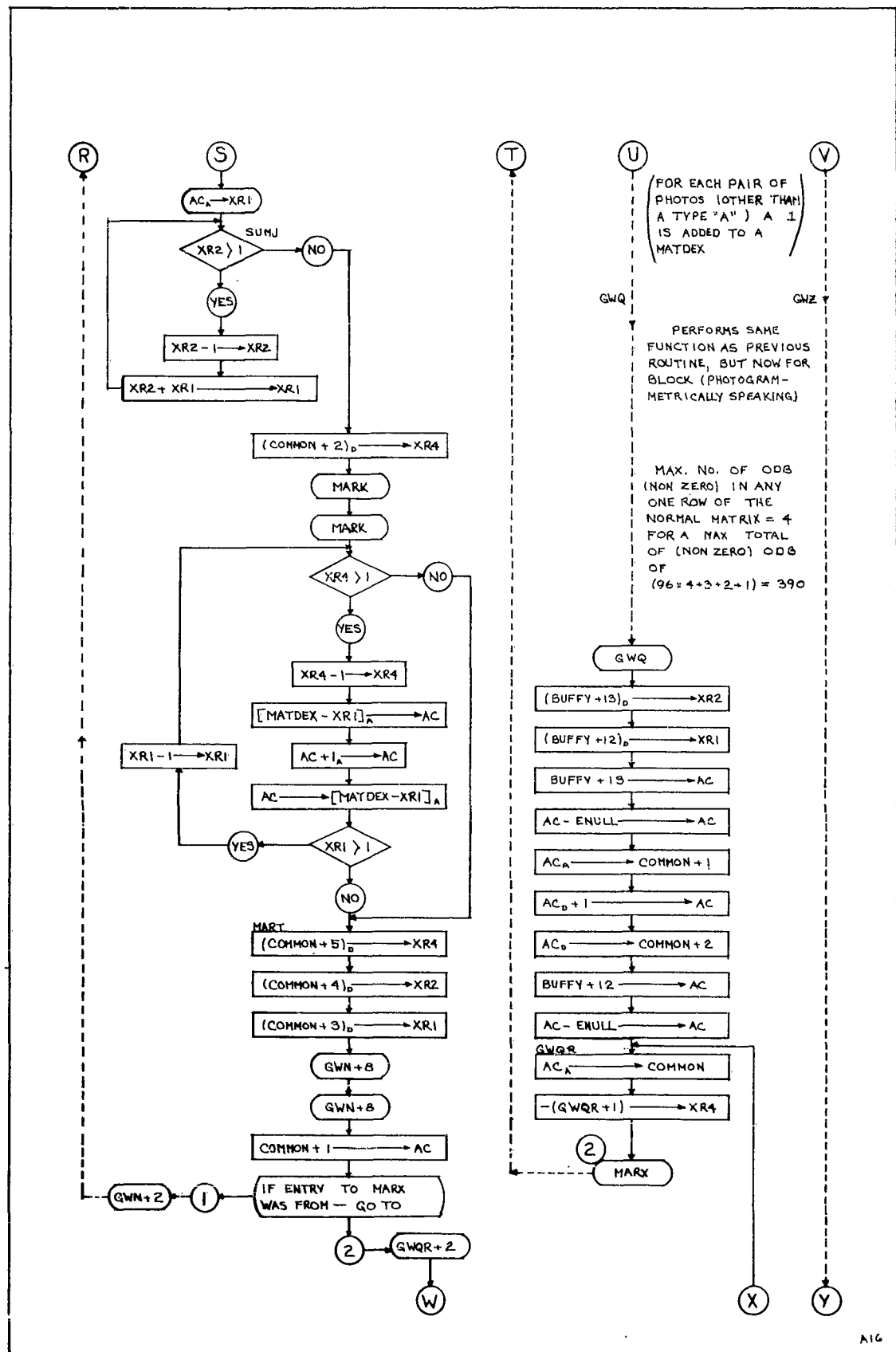


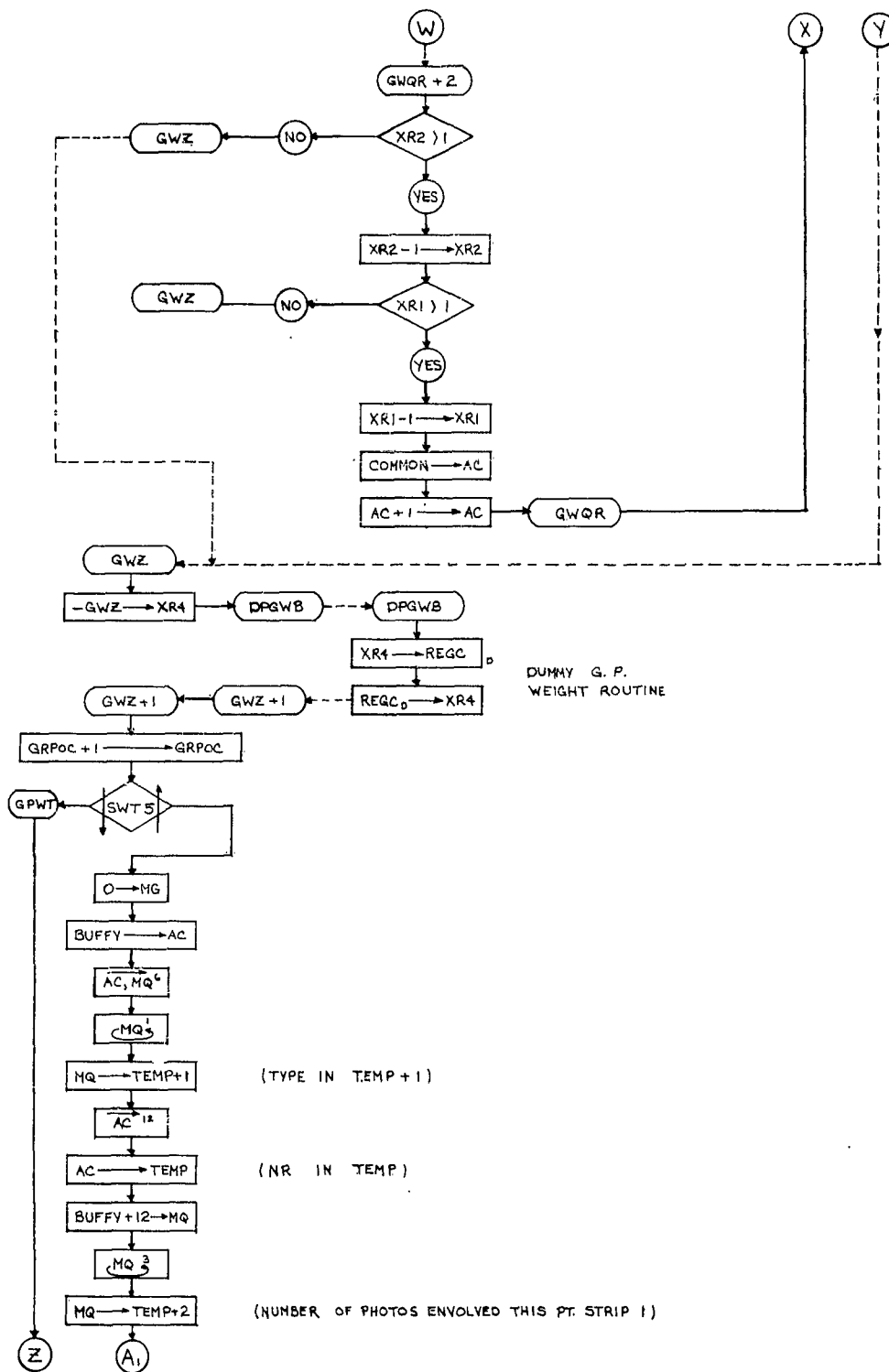


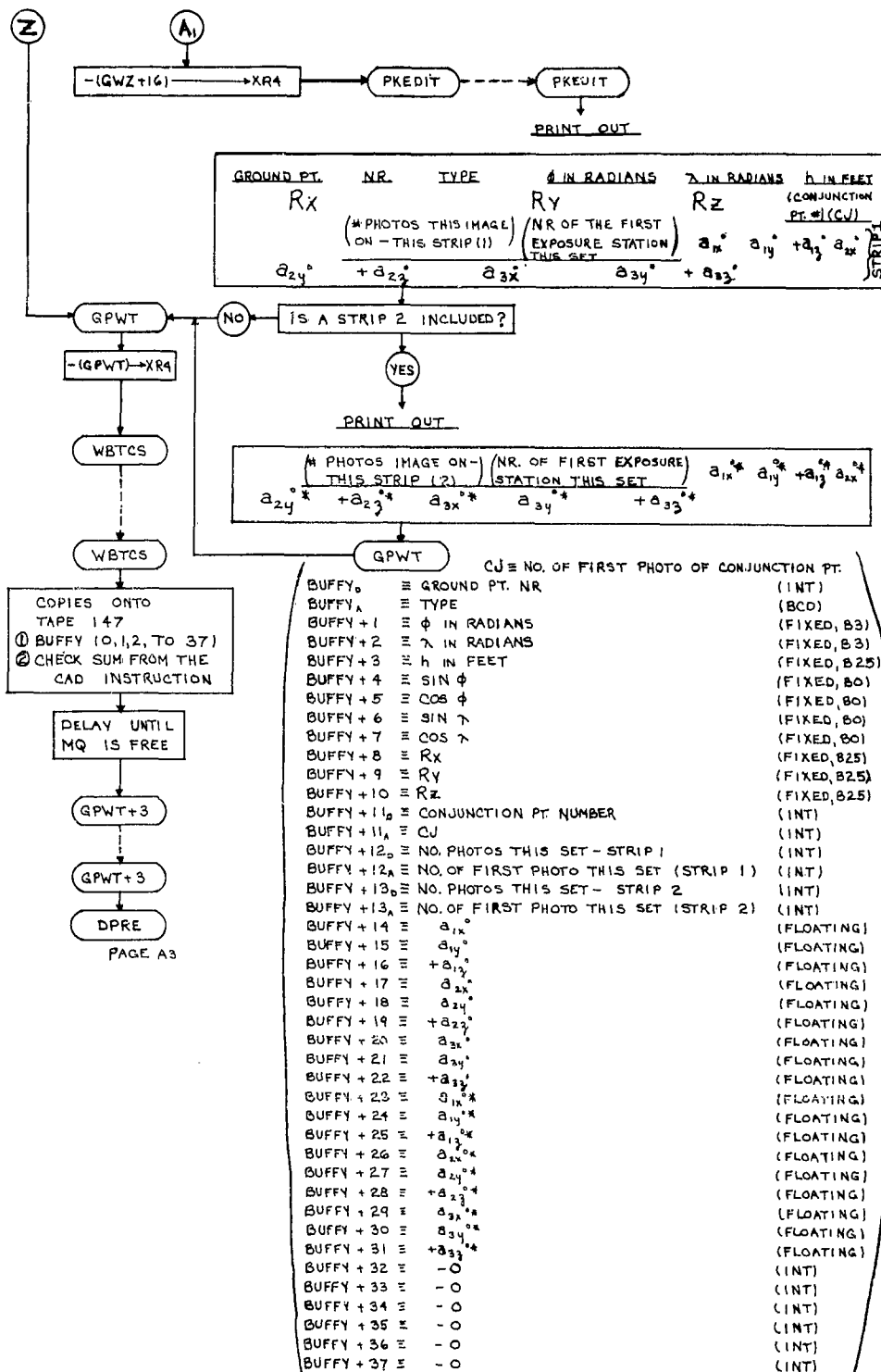




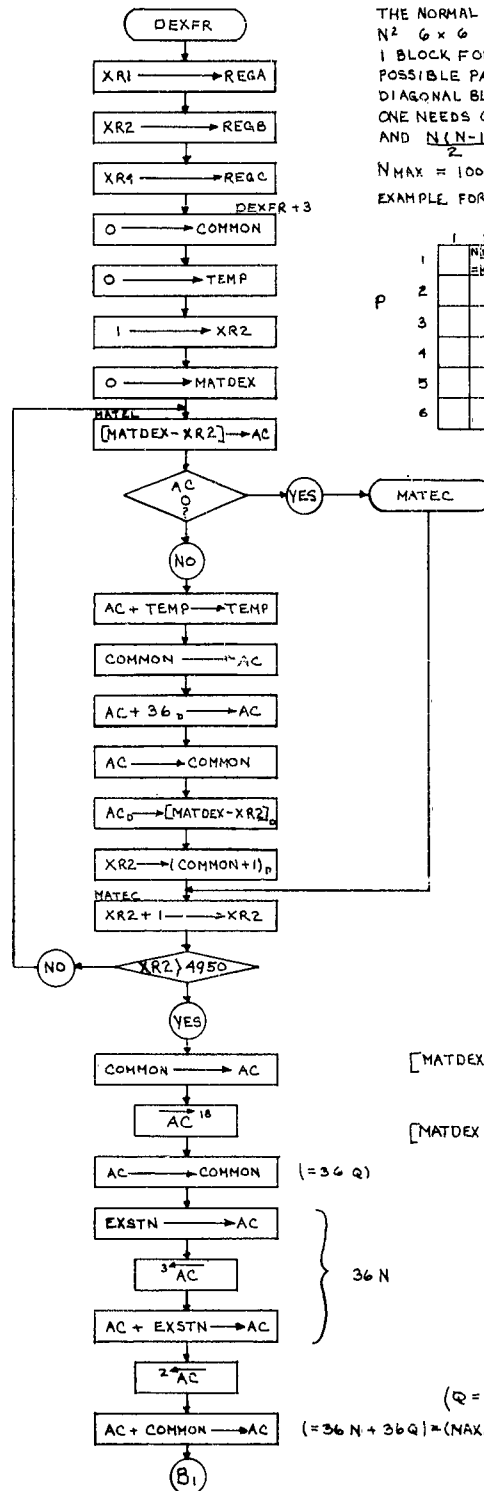








PAGE A3



THE NORMAL MATRIX WILL BE $6N \times 6N$ SIZE AND WILL CONTAIN N^2 6×6 BLOCKS. THE BASE IS 1 BLOCK PER PHOTO PLUS (N) 1 BLOCK FOR EACH POSSIBLE PAIR. NOW THERE ARE $N(N-1)$ POSSIBLE PAIRS OF PHOTOS (OR, THINK OF THEM AS OFF-DIAGONAL BLOCKS). SINCE THE NORMAL MATRIX IS SYMMETRICAL, ONE NEEDS ONLY TO WORRY ABOUT THE N DISTINCT BLOCKS AND $\frac{N(N-1)}{2}$ OFF-DIAGONAL BLOCKS. FOR THIS PROGRAM

$$N_{MAX} = 100 \quad \therefore \frac{N(N-1)}{2} = 4950$$

EXAMPLE FOR $N = 6$

	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

NOTATION INSIDE IS FOR MATDEX ADDRESSING

$$MATDEX - [N - q + 1 + \sum_{j=1}^{j=N-q-1} (j)]$$

$M \equiv MATDEX$

(MATDEX - 1 TO MATDEX - 4950 COME IN AS ZERO IF NOT RELEVANT TO PROBLEM)
(EXIST WITH SUCCESSIVE JUMPS IN VALUES OF 36)

EXAMPLE ASSUME MATDEX (13, 12, 11, 9, 8, 7, 5, 4, 2) CONTAIN ZEROS, THEN

MATDEX - 1 = 36
- 2 = 0
- 3 = 72
- 4 = 0
- 5 = 0
- 6 = 108
- 7 = 0
- 8 = 0
- 9 = 0
- 10 = 144
- 11 = 0
- 12 = 0
- 13 = 0
- 14 = 180
- 15 = 216

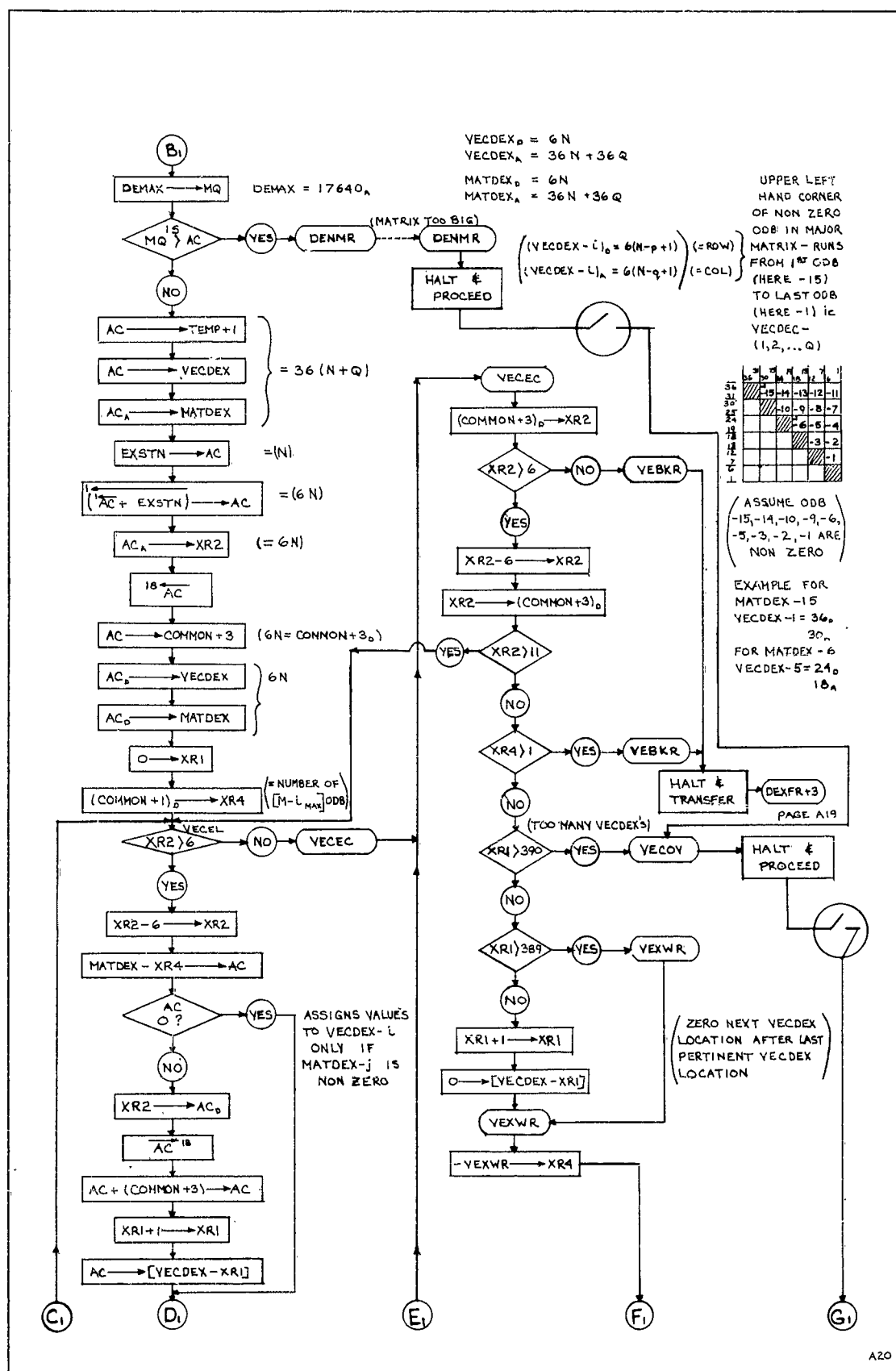
(COMMON + 1)₀ = 15
TEMP = 180

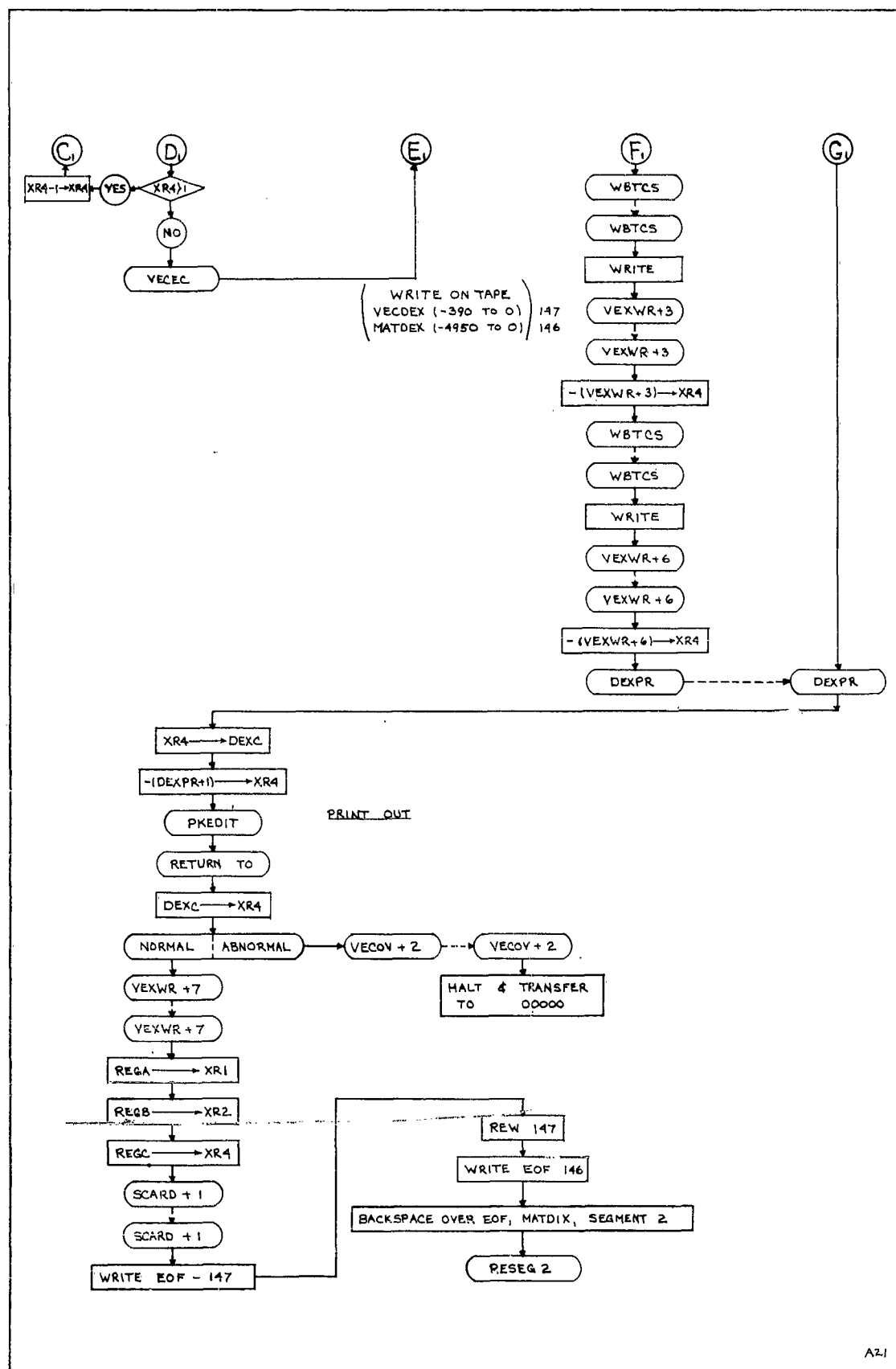
$[MATDEX - j]_0$ = MULTIPLES OF 36 (ONLY FOR PERTINENT ODB)
- PROVIDES A BOOKING SYSTEM FOR STORING THE BLOCKS - GOES BACKWARDS.

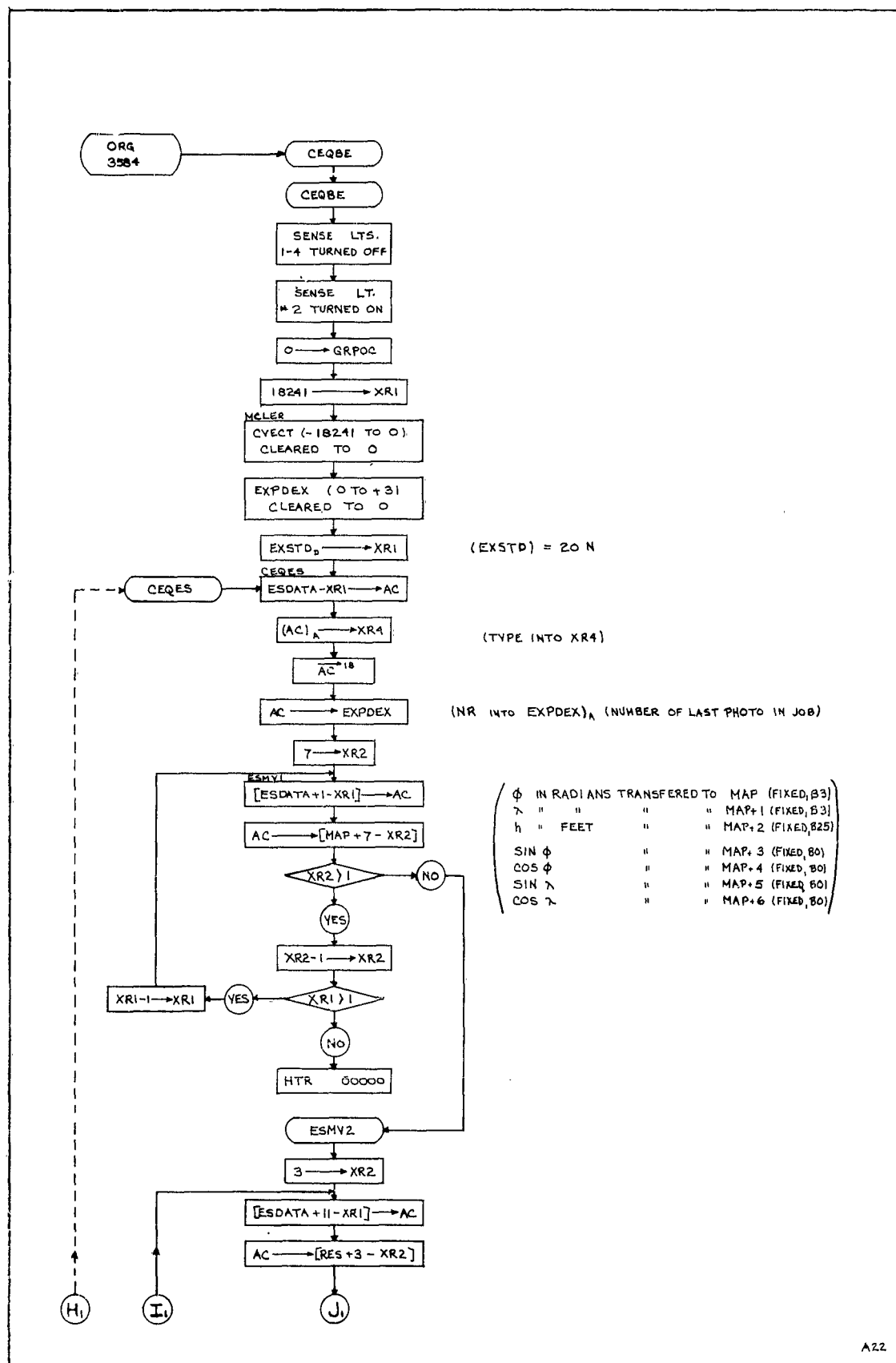
$[MATDEX - j]_A$ = NUMBER OF GROUND PTS. CONTRIBUTING TO THIS ODB

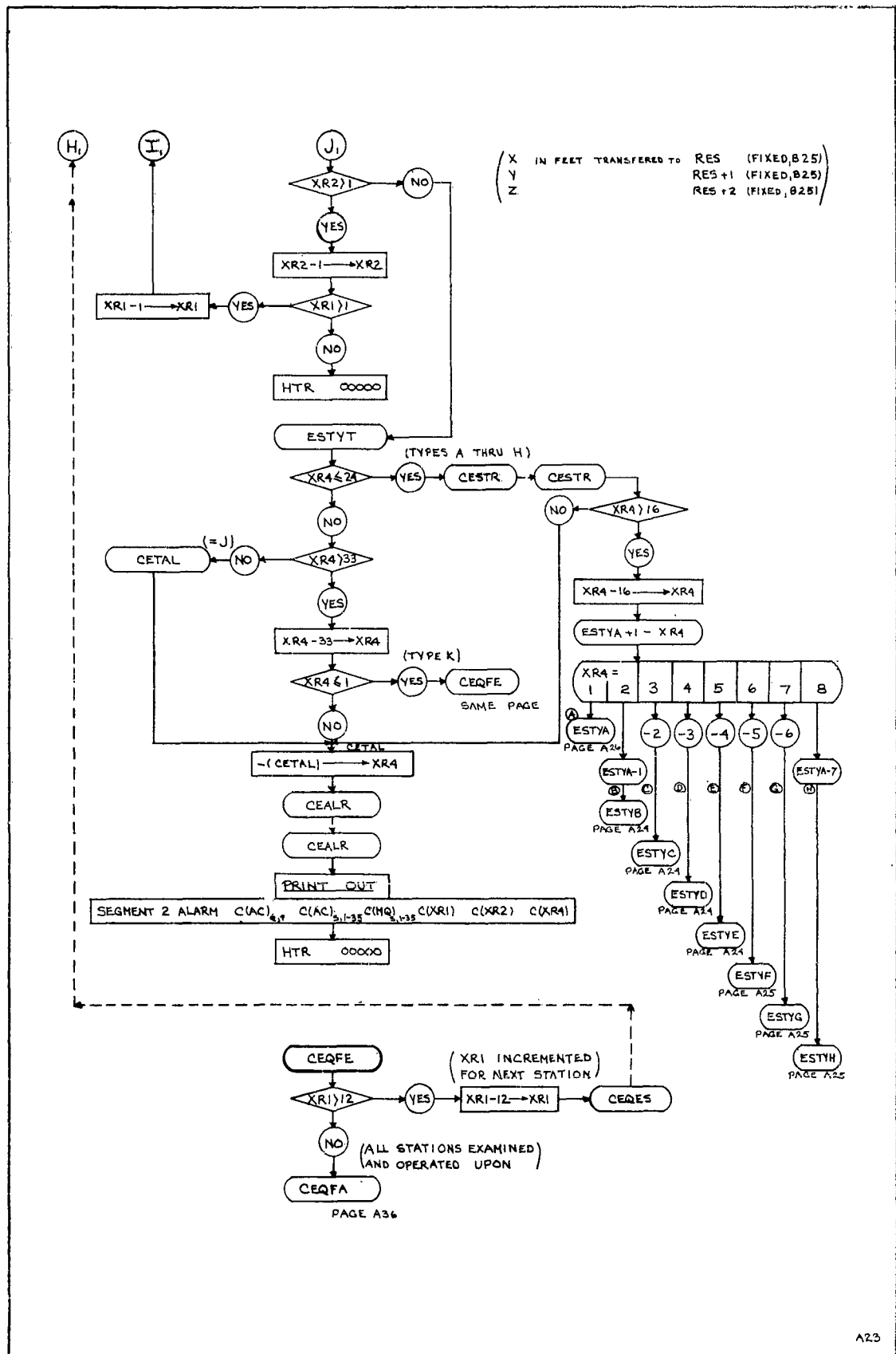
$$(Q = \frac{N(N-1)}{2} \text{ [NON ZERO]})$$

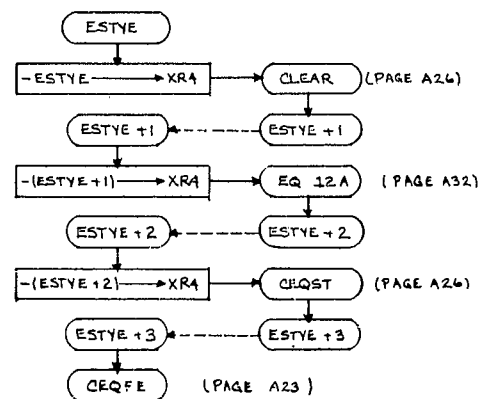
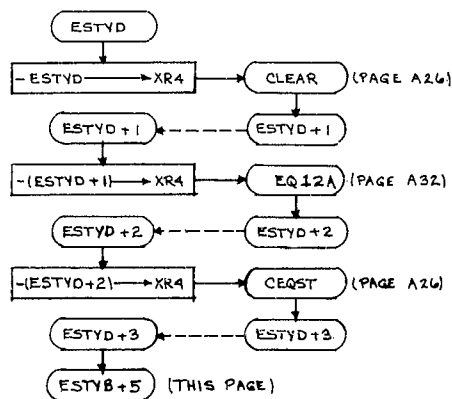
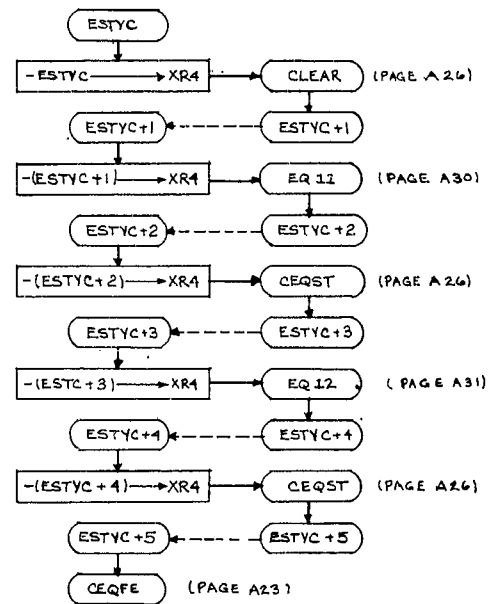
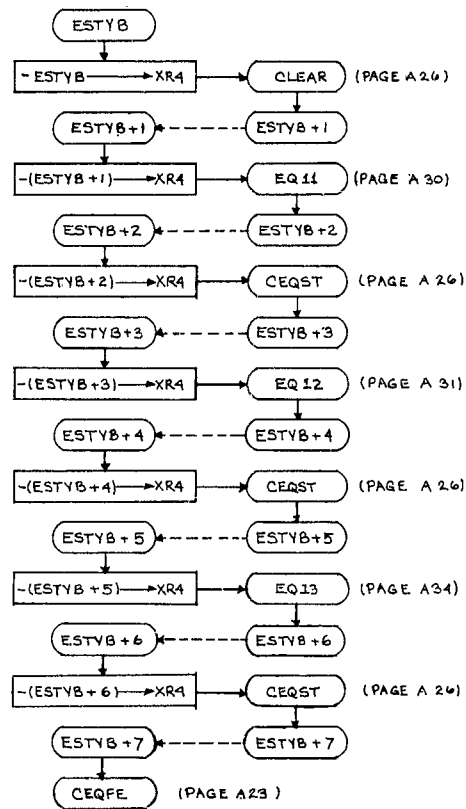
$$(= 36N + 36Q) = (\text{MAX. SIZE THIS JOB})$$

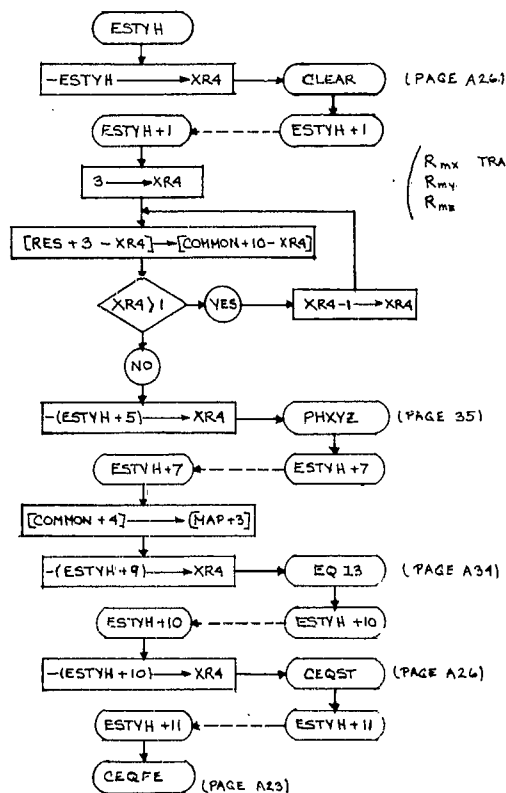
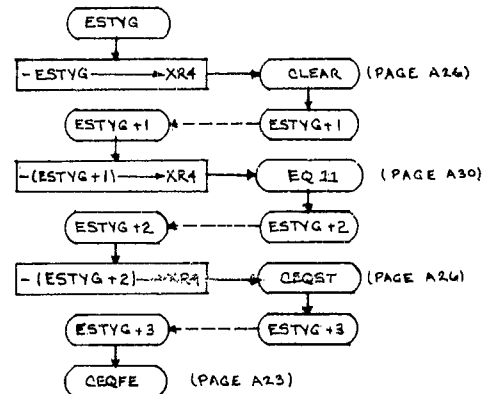
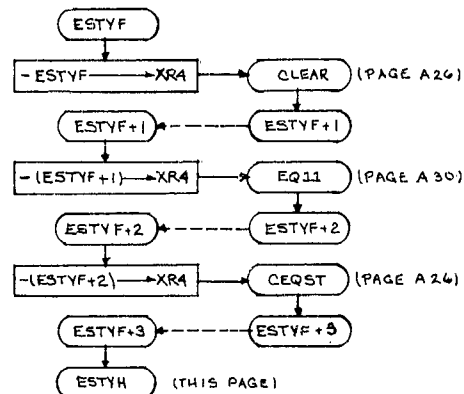










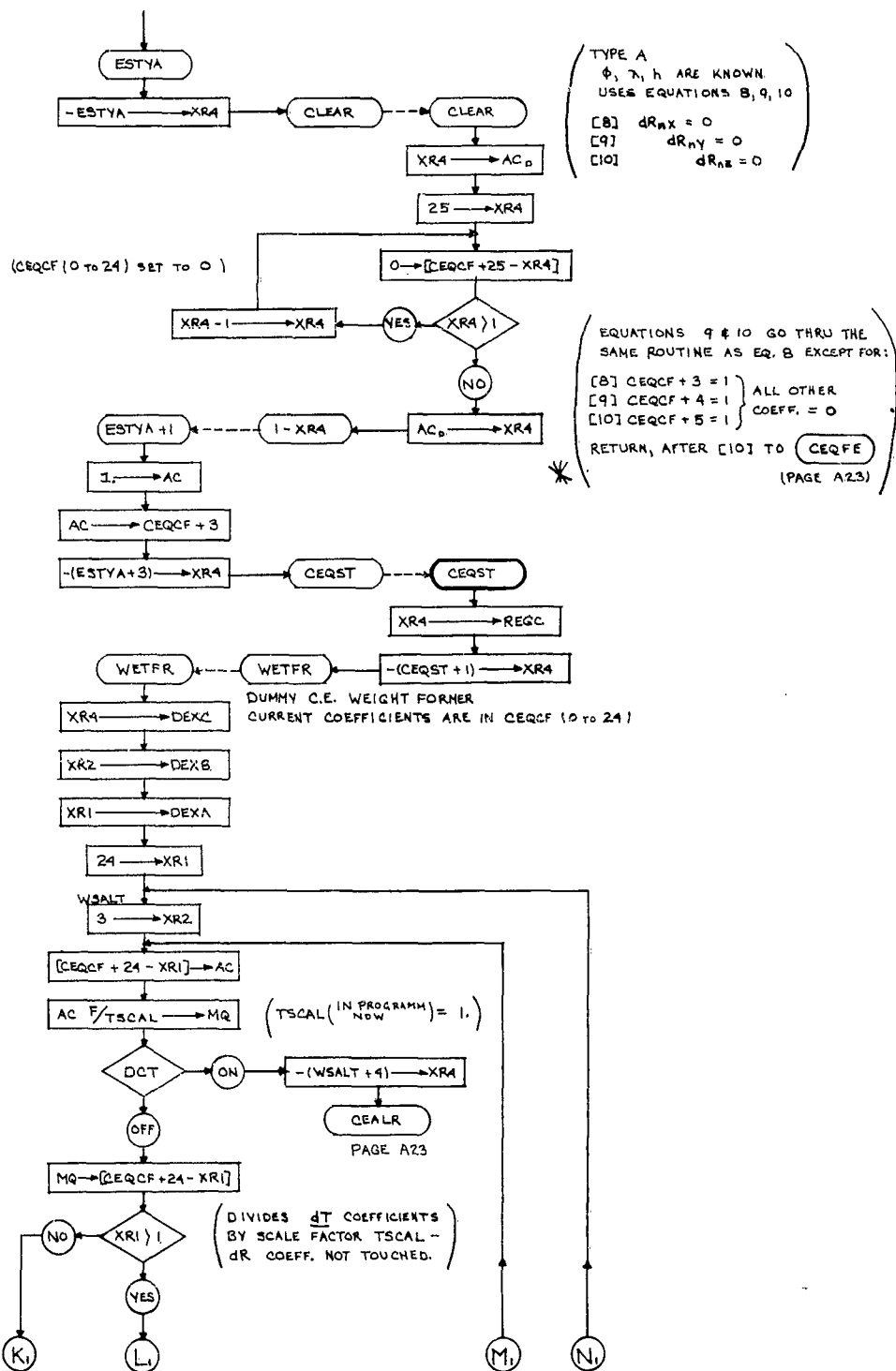


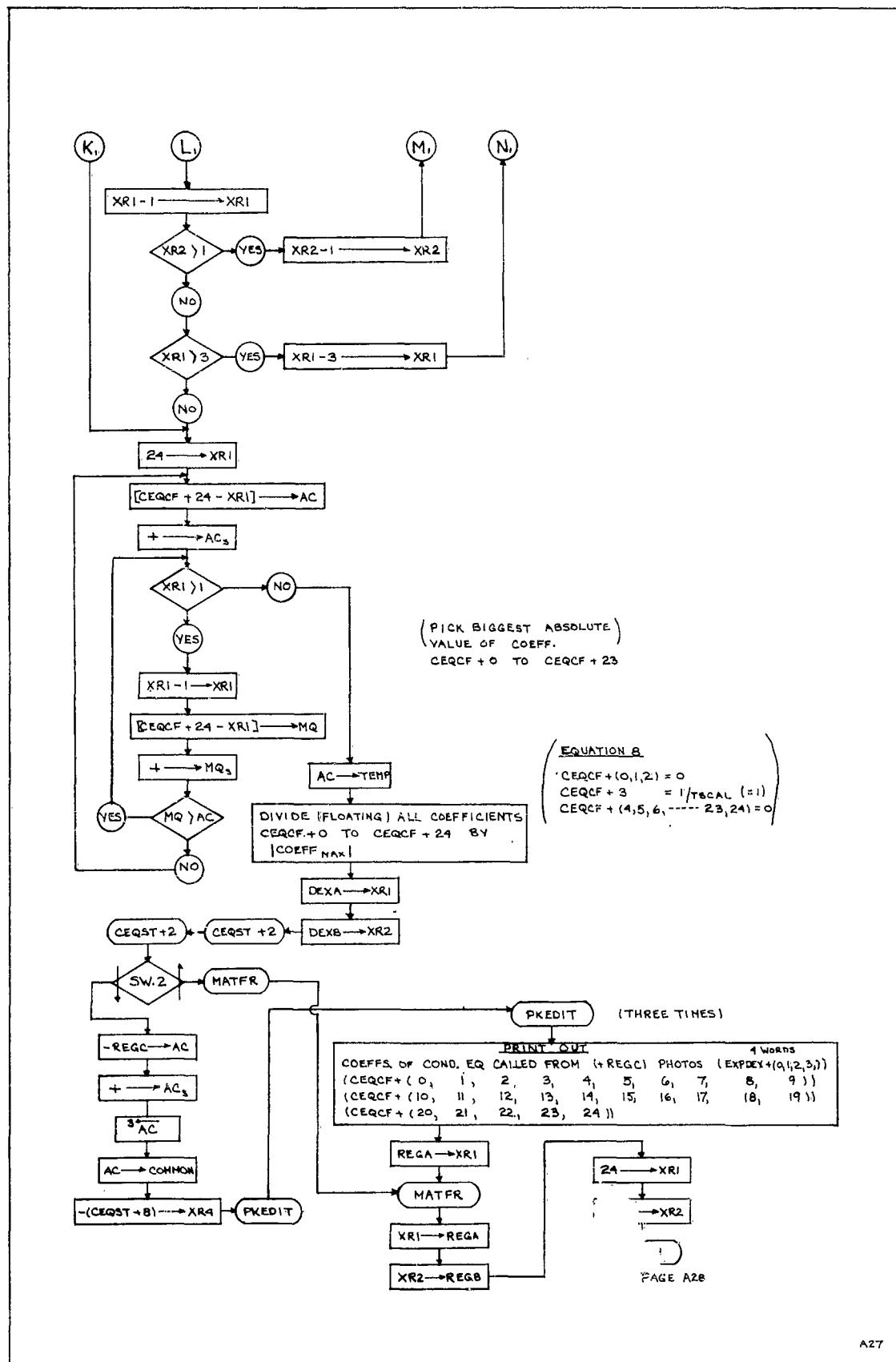
$\begin{matrix} R_{mx} & \text{TRANSFERRED TO COMMON + 7} \\ R_{my} & \text{" " COMMON + 8} \\ R_{mz} & \text{" " COMMON + 9} \end{matrix}$
 } FIXED, B25

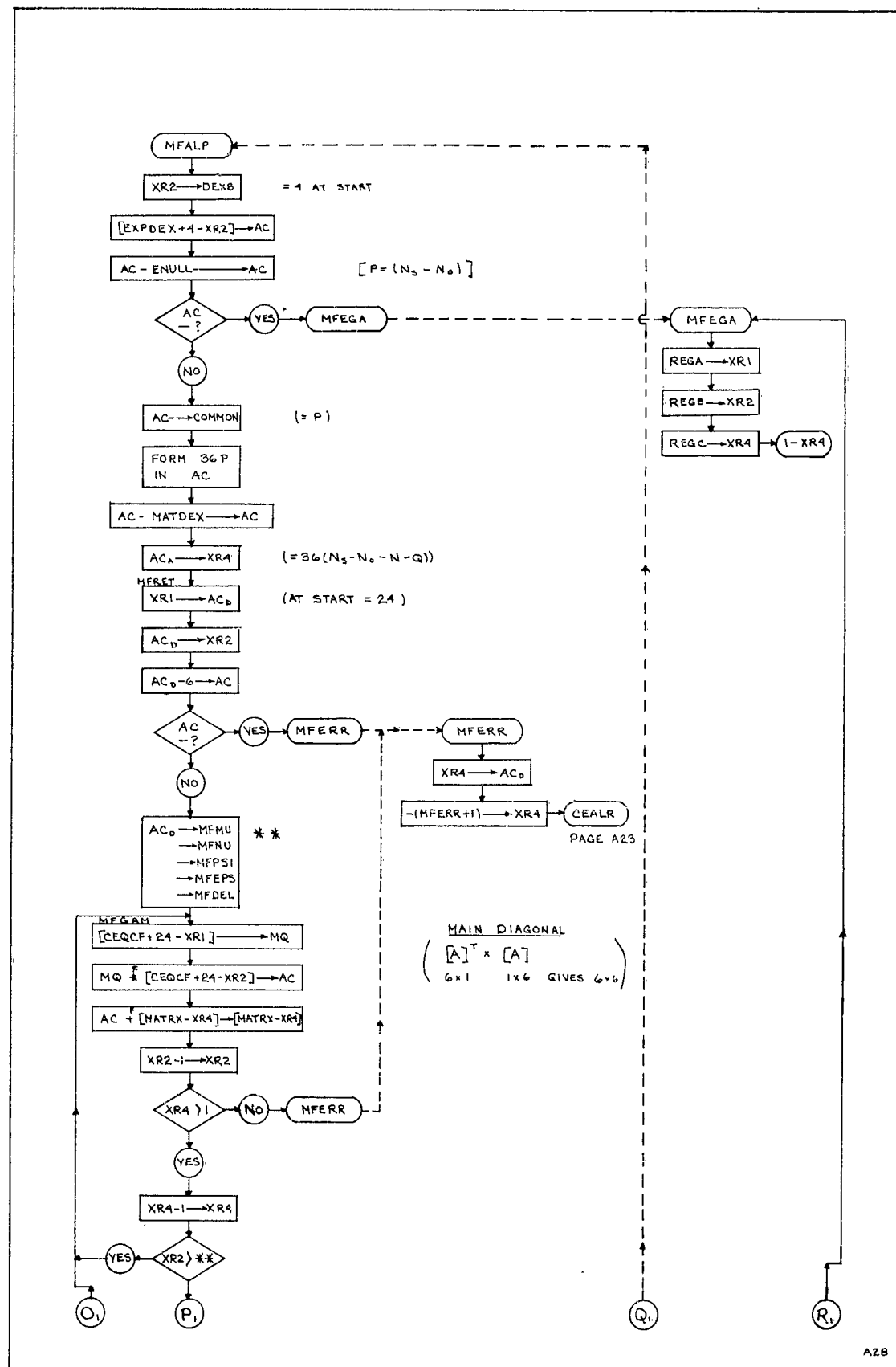
(COMPUTER SIN ϕ)

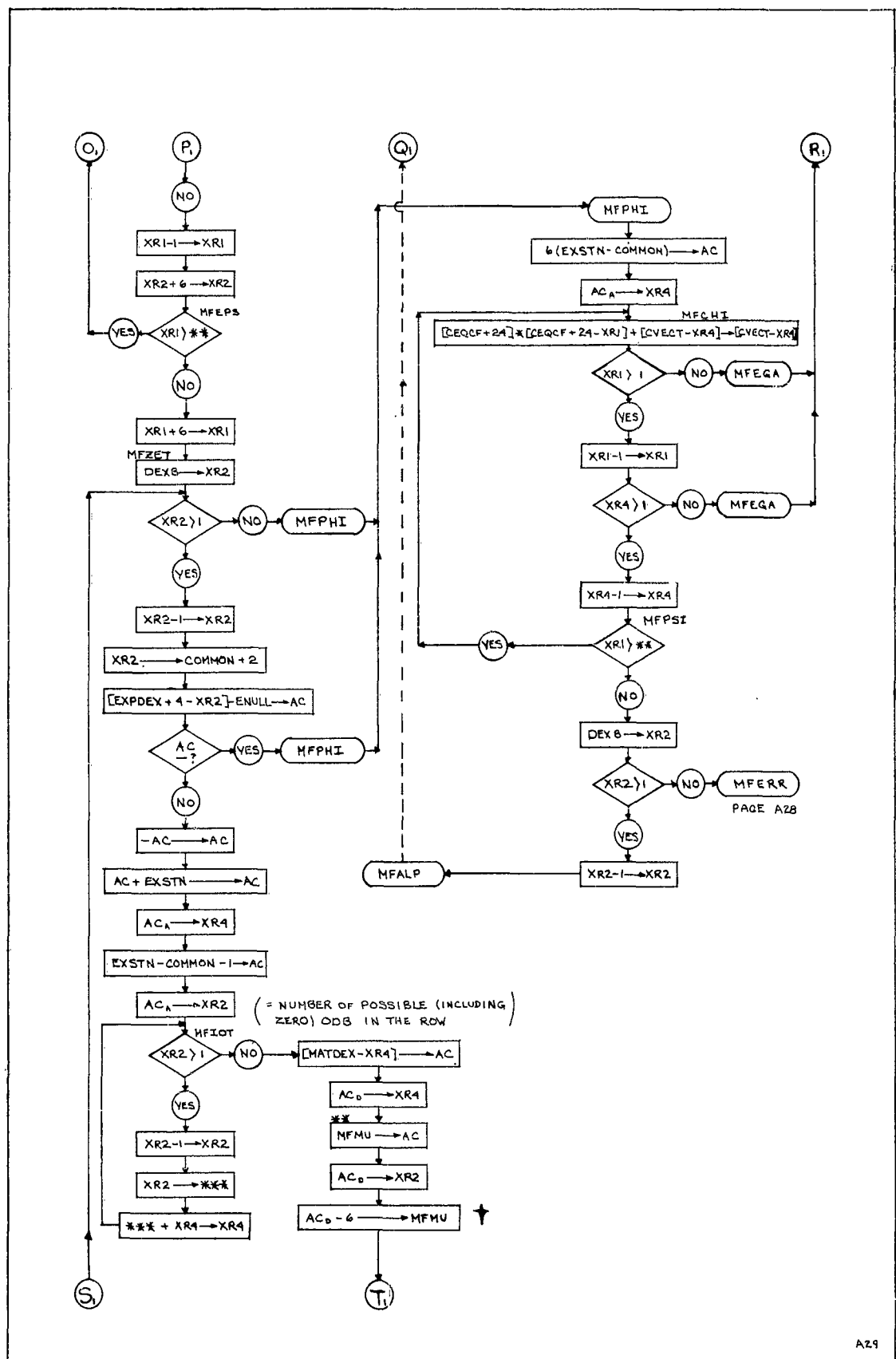
SUMMARY

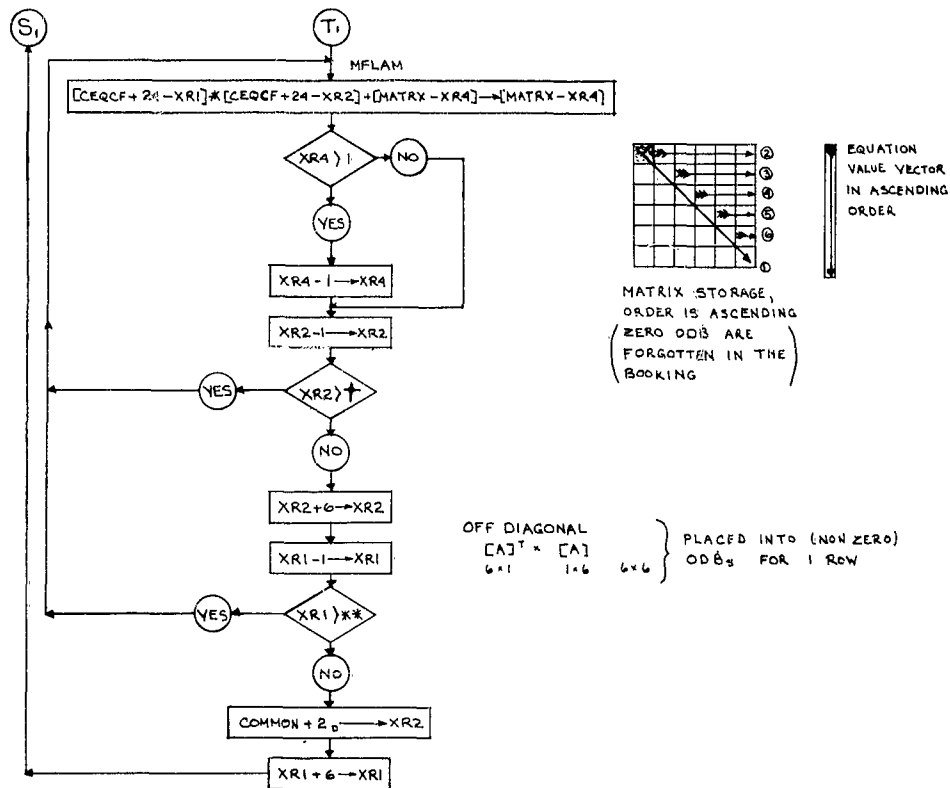
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B	ϕ, γ, h (UNEQUAL IN QUALITY)	11, 12, 13
C	ϕ, γ	11, 12
D	ϕ, h	12A, 13
E	ϕ	12A
F	γ, h	11, (PHXYZ) 13
G	γ	11
H	h	(PHXYZ) 13



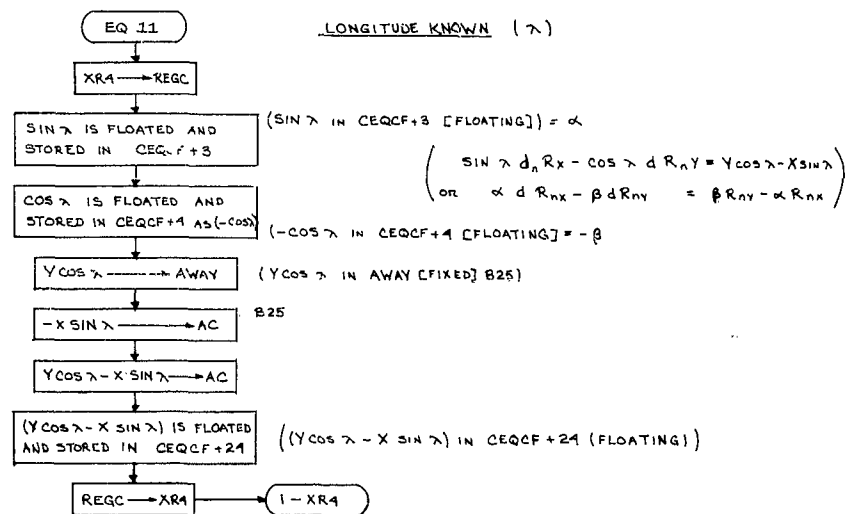




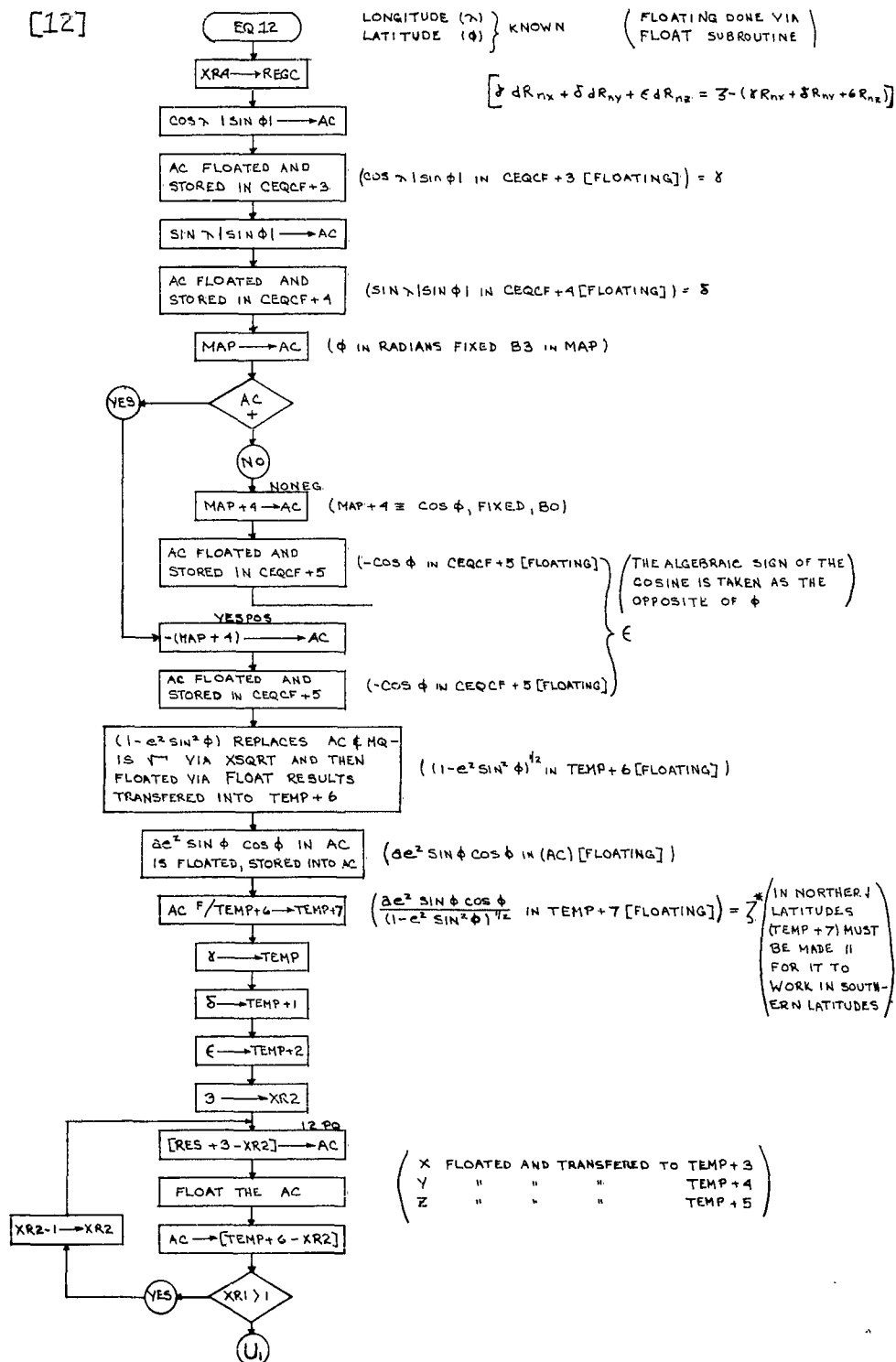


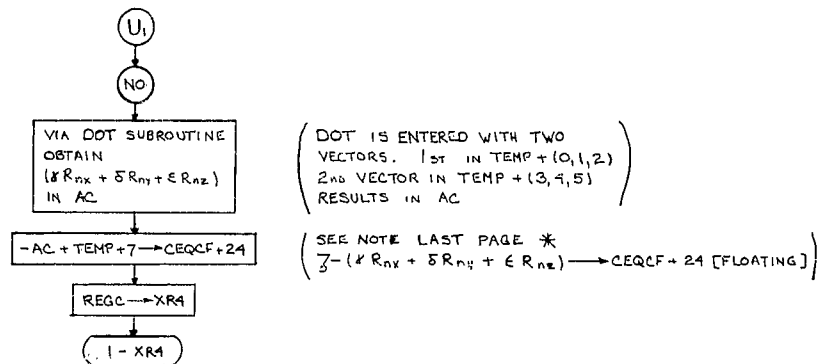


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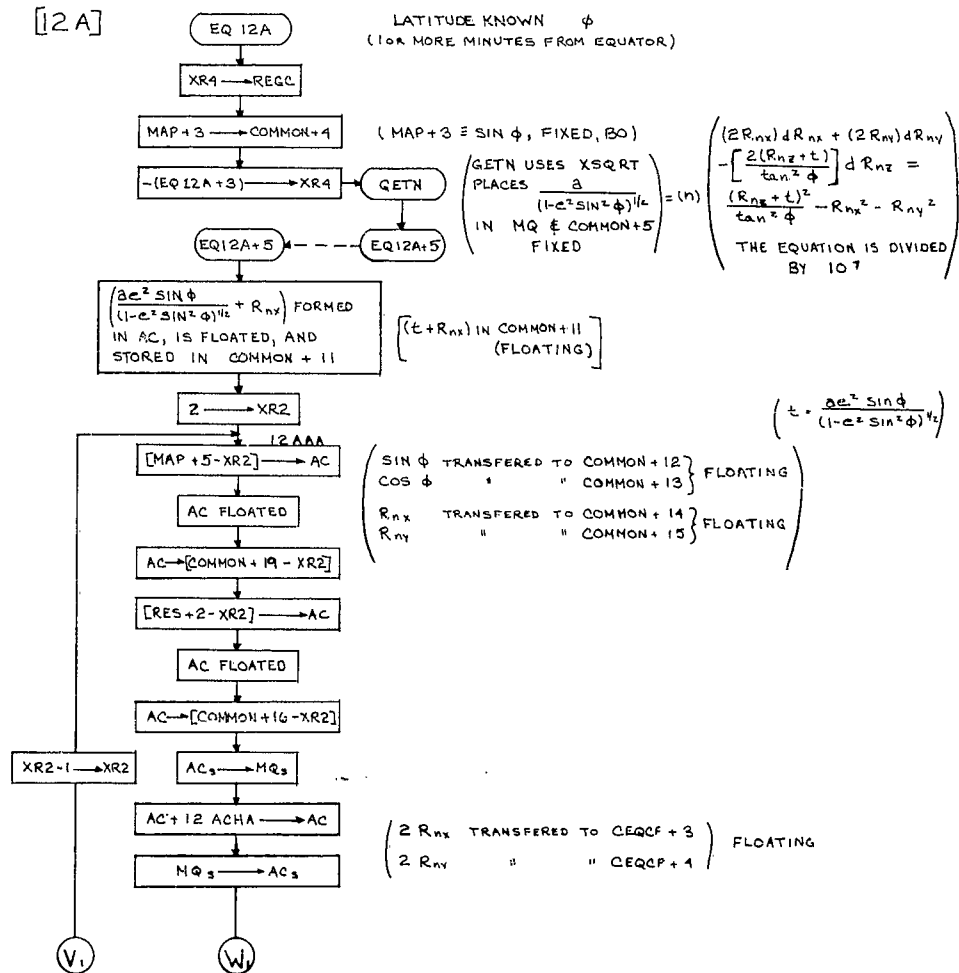


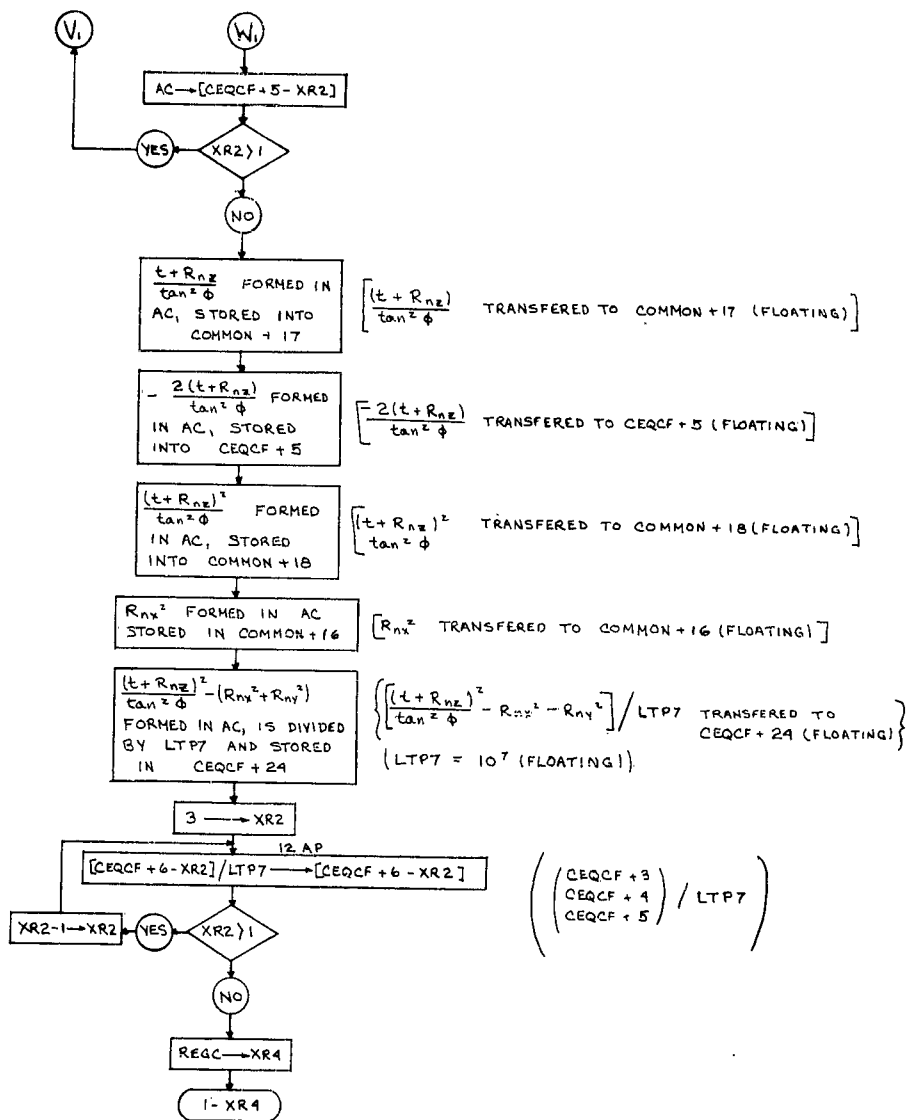
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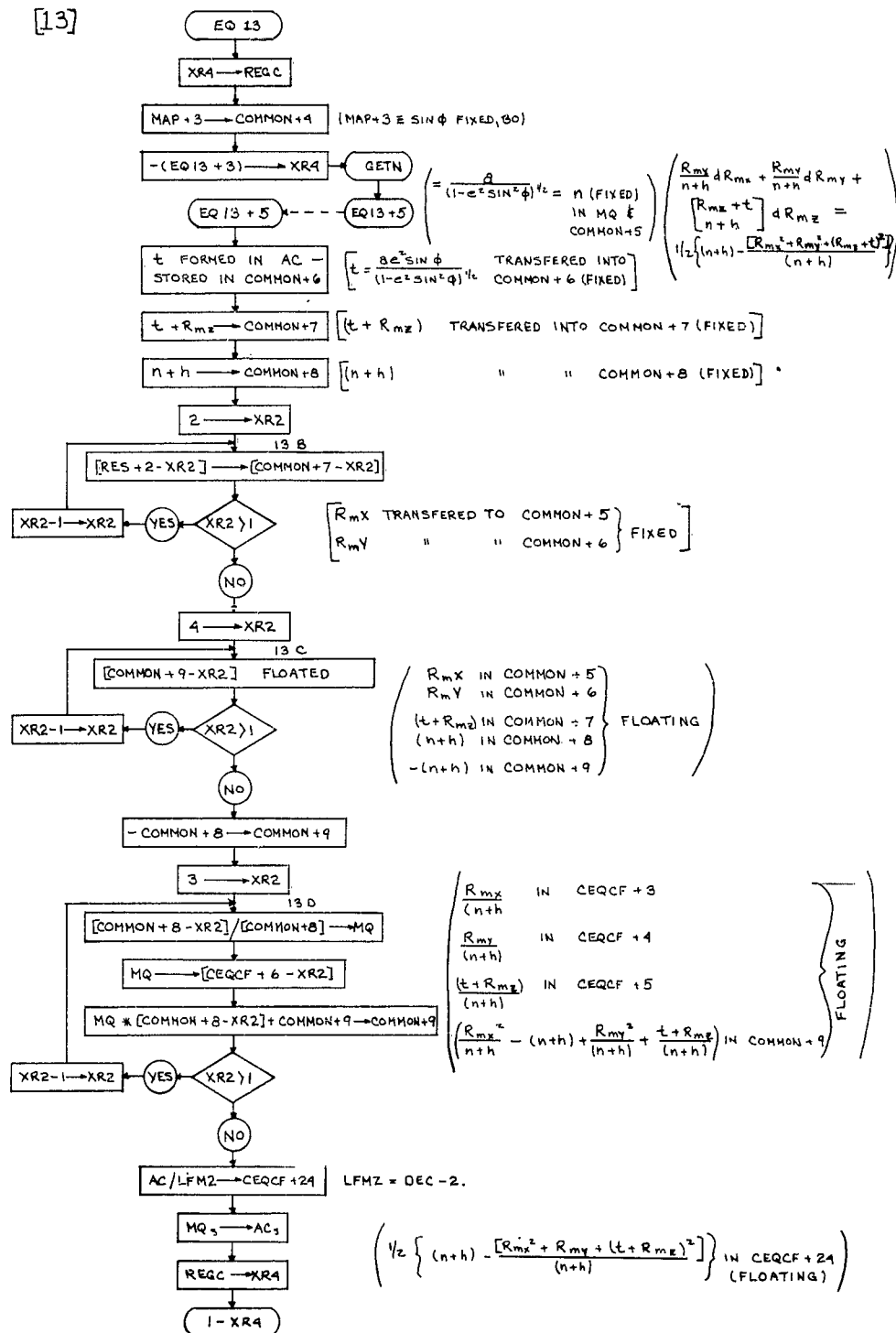


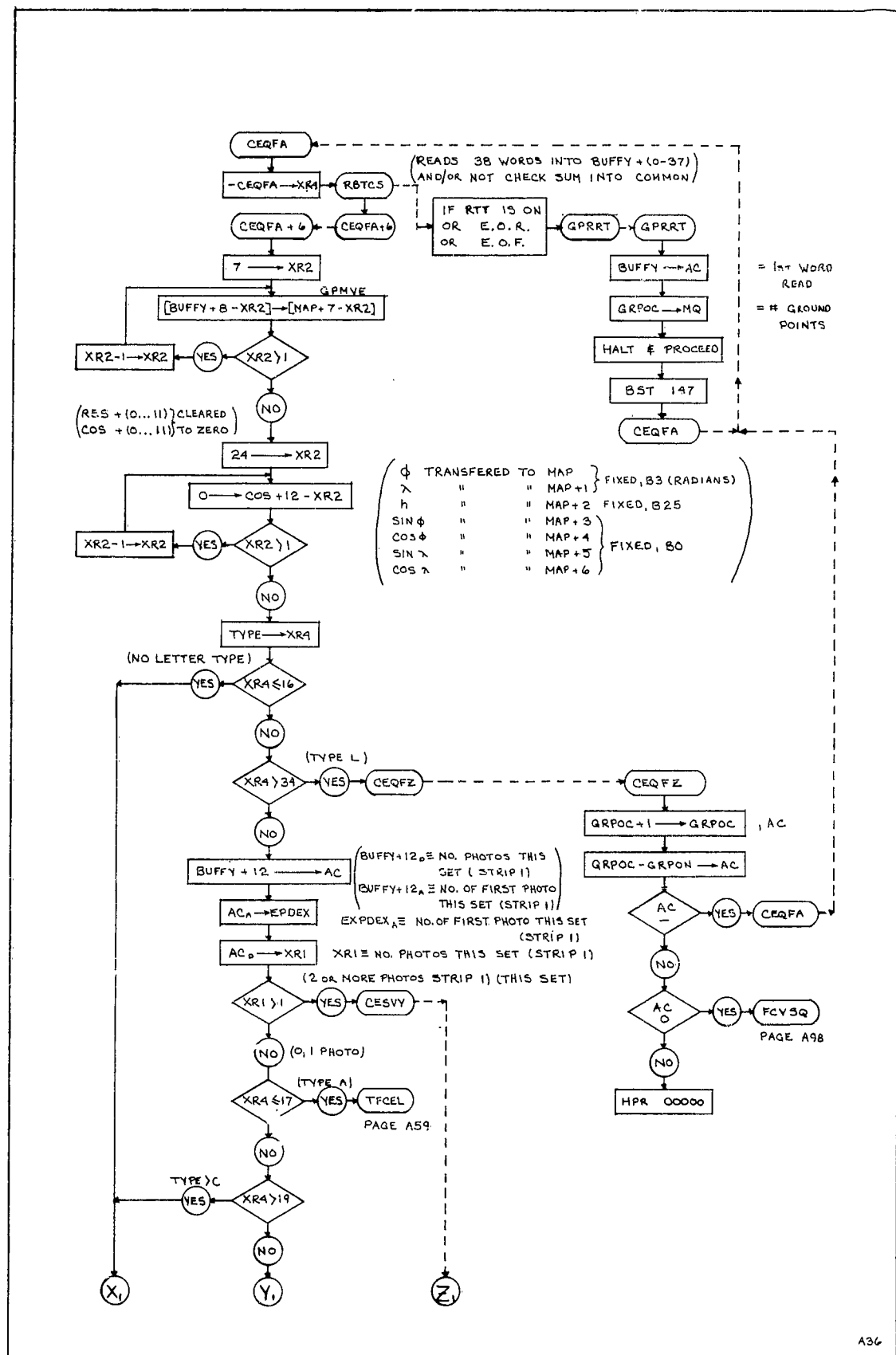
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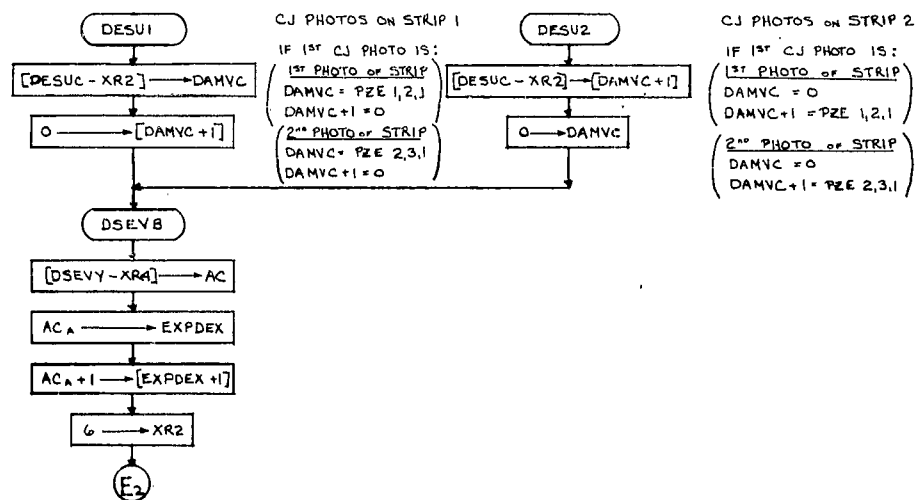
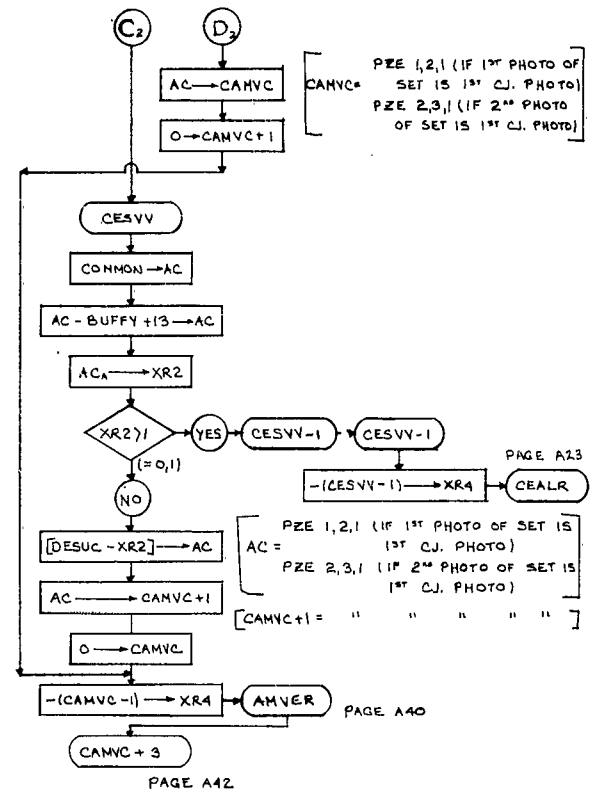
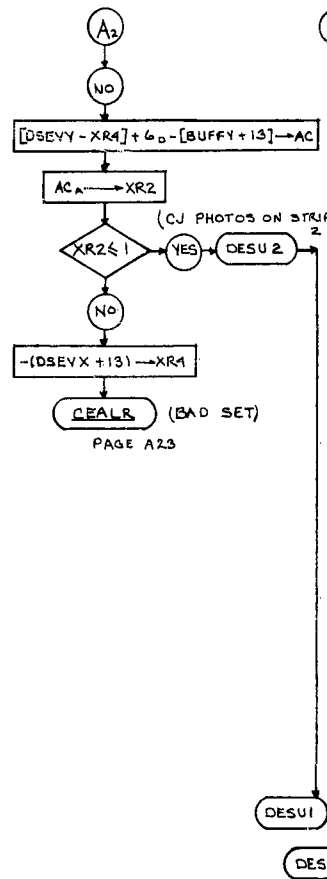


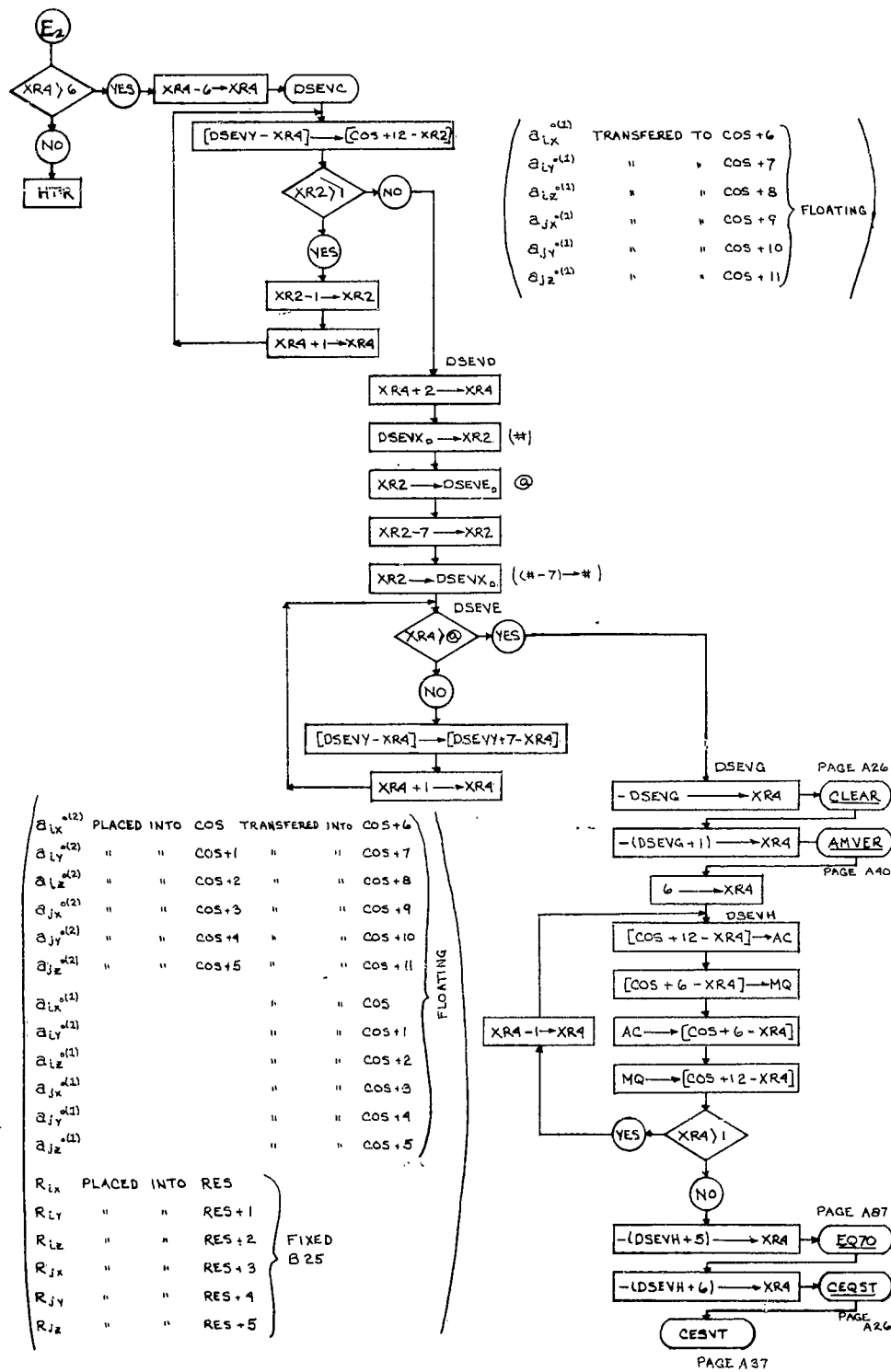
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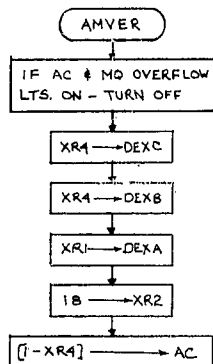




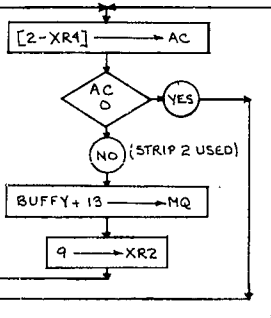
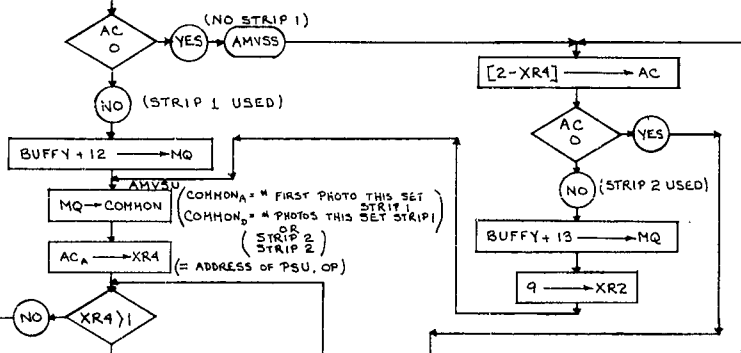








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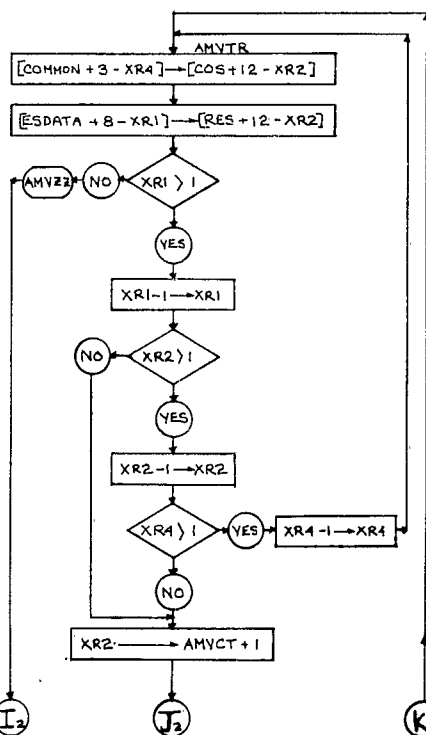


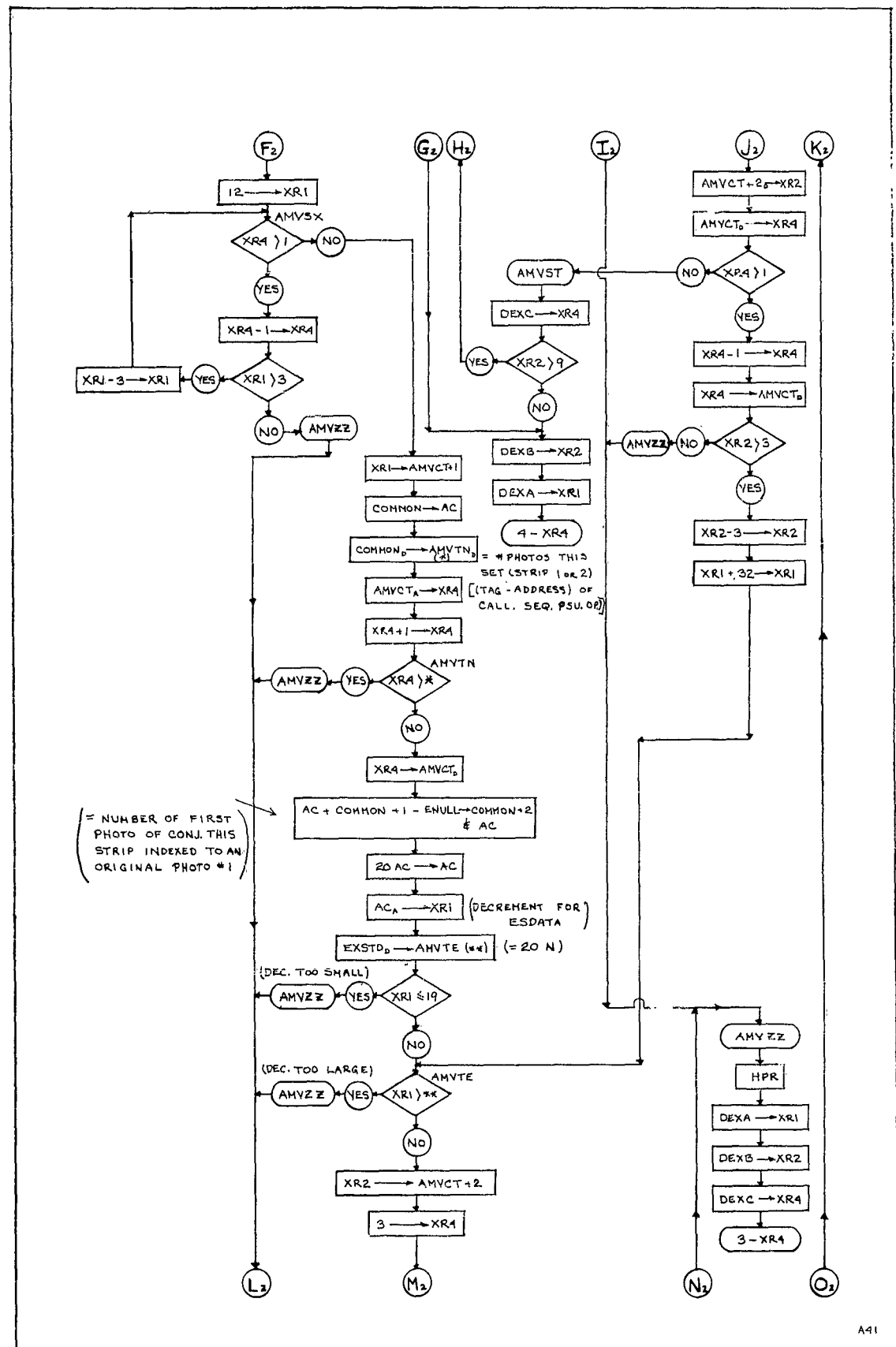
XR4 ORIGINAL

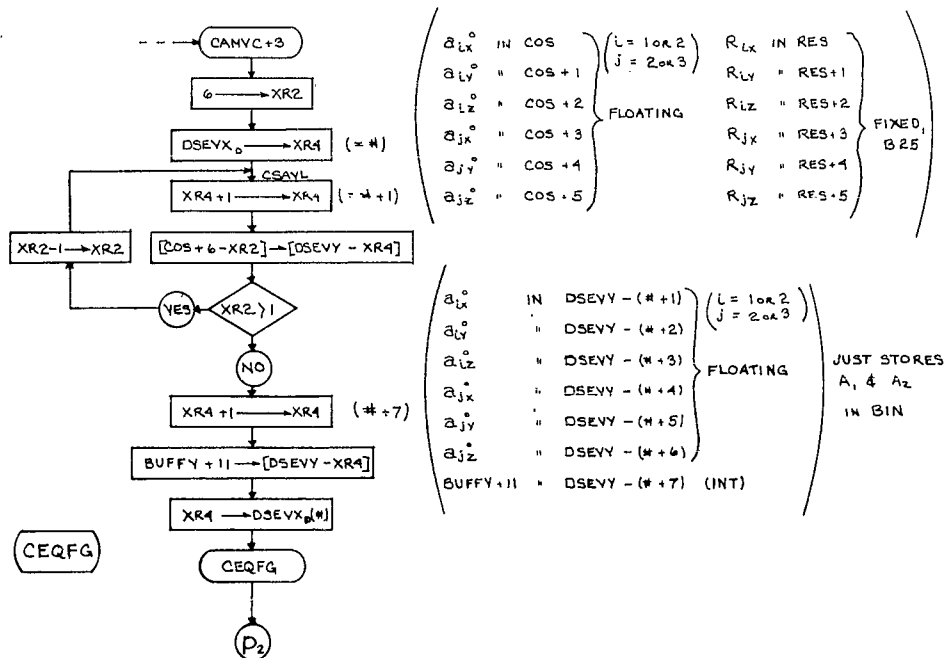
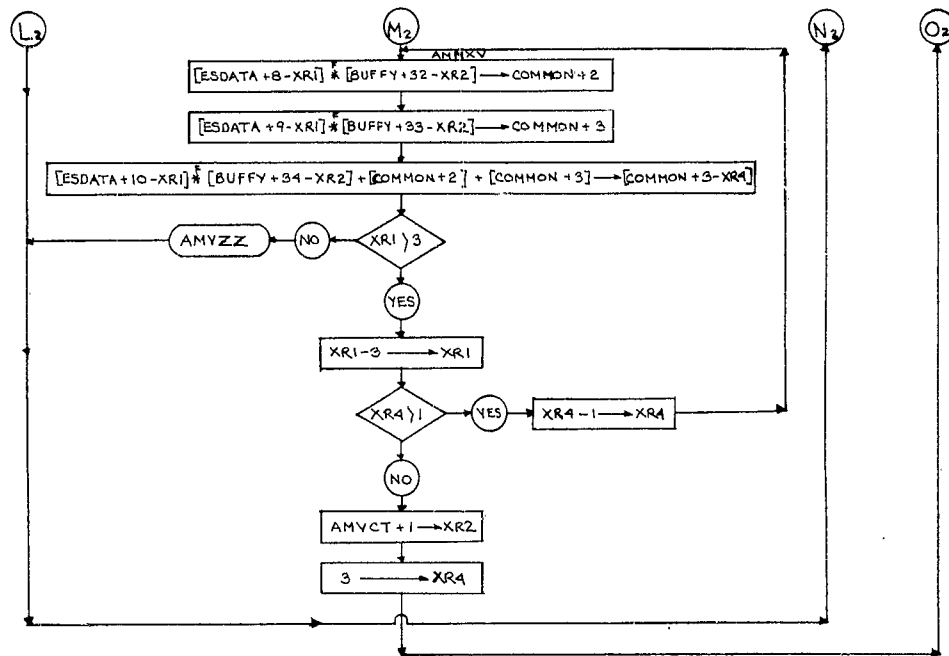
	1	2	3
1B	1B	15	12
9	9	6	3

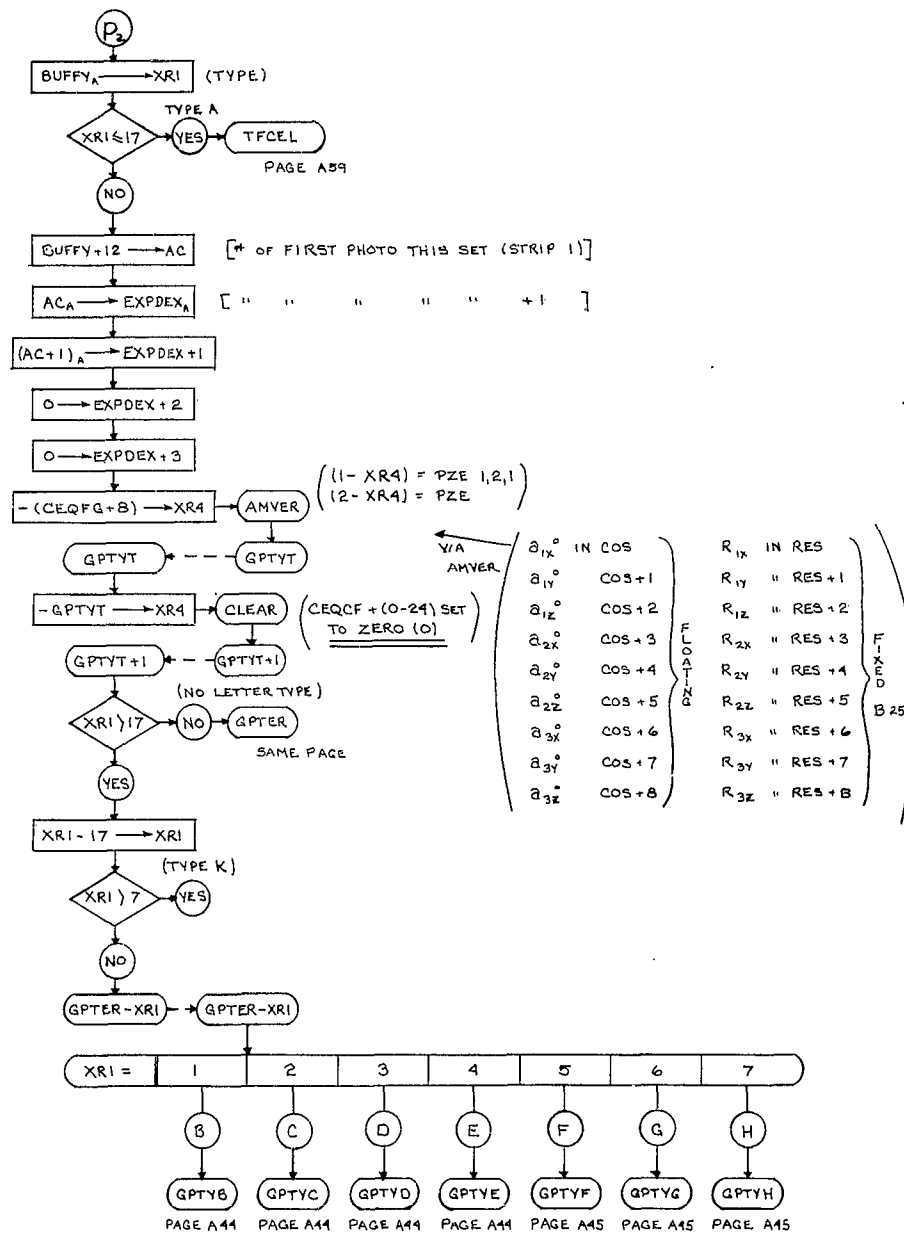
FINAL XR2

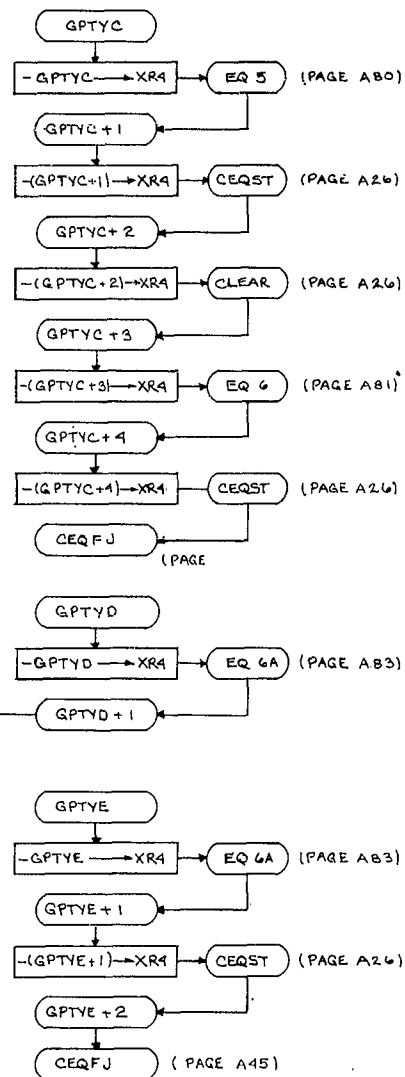
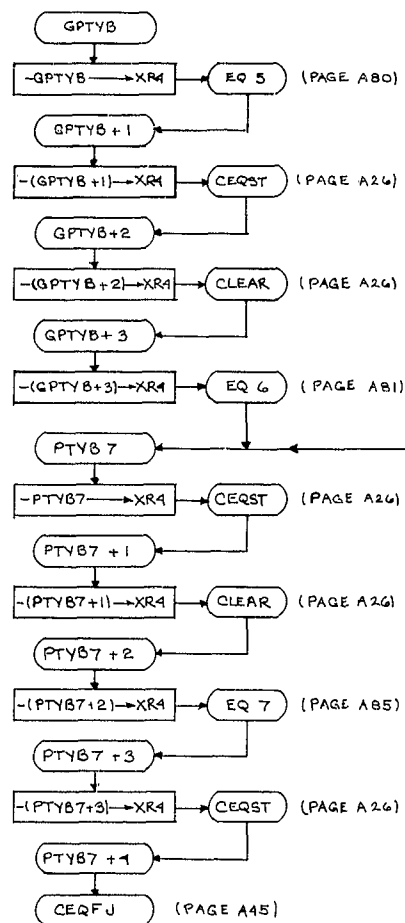
FINAL XR4 = 1

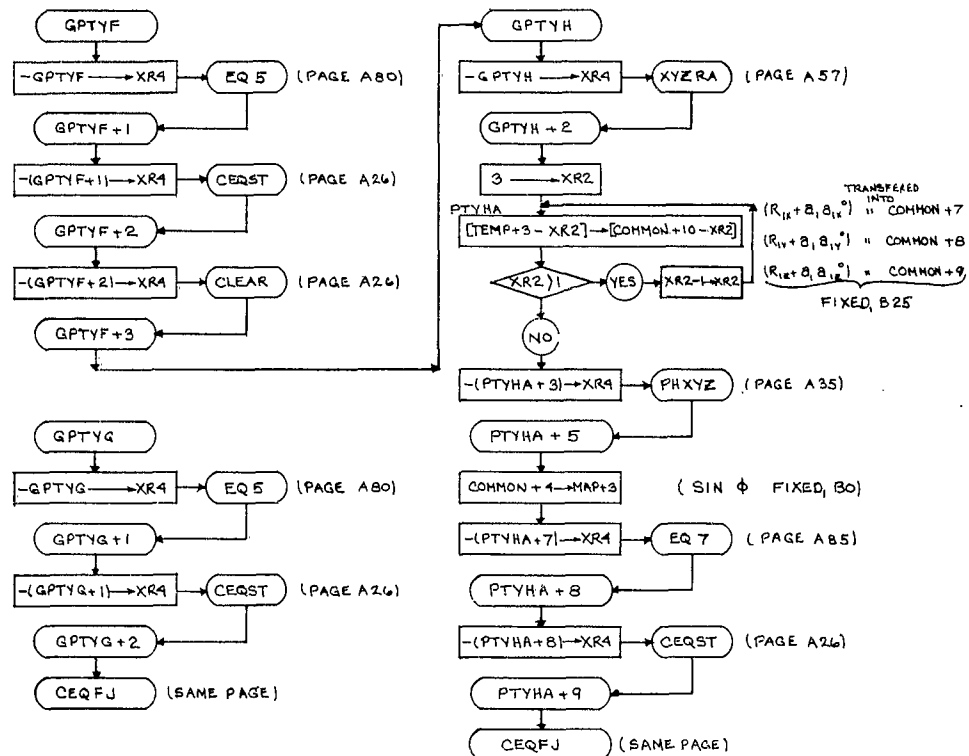




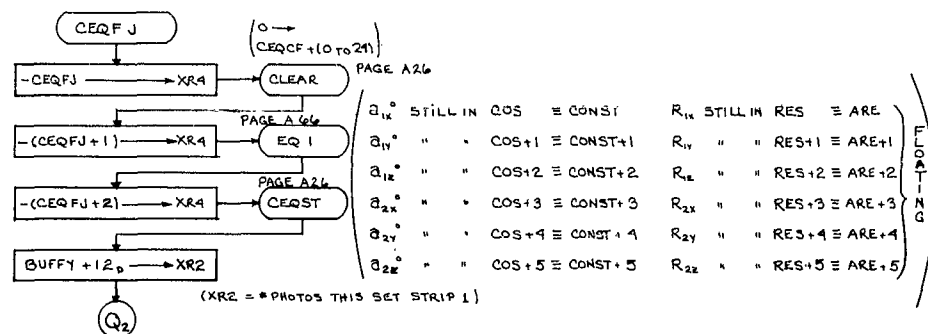


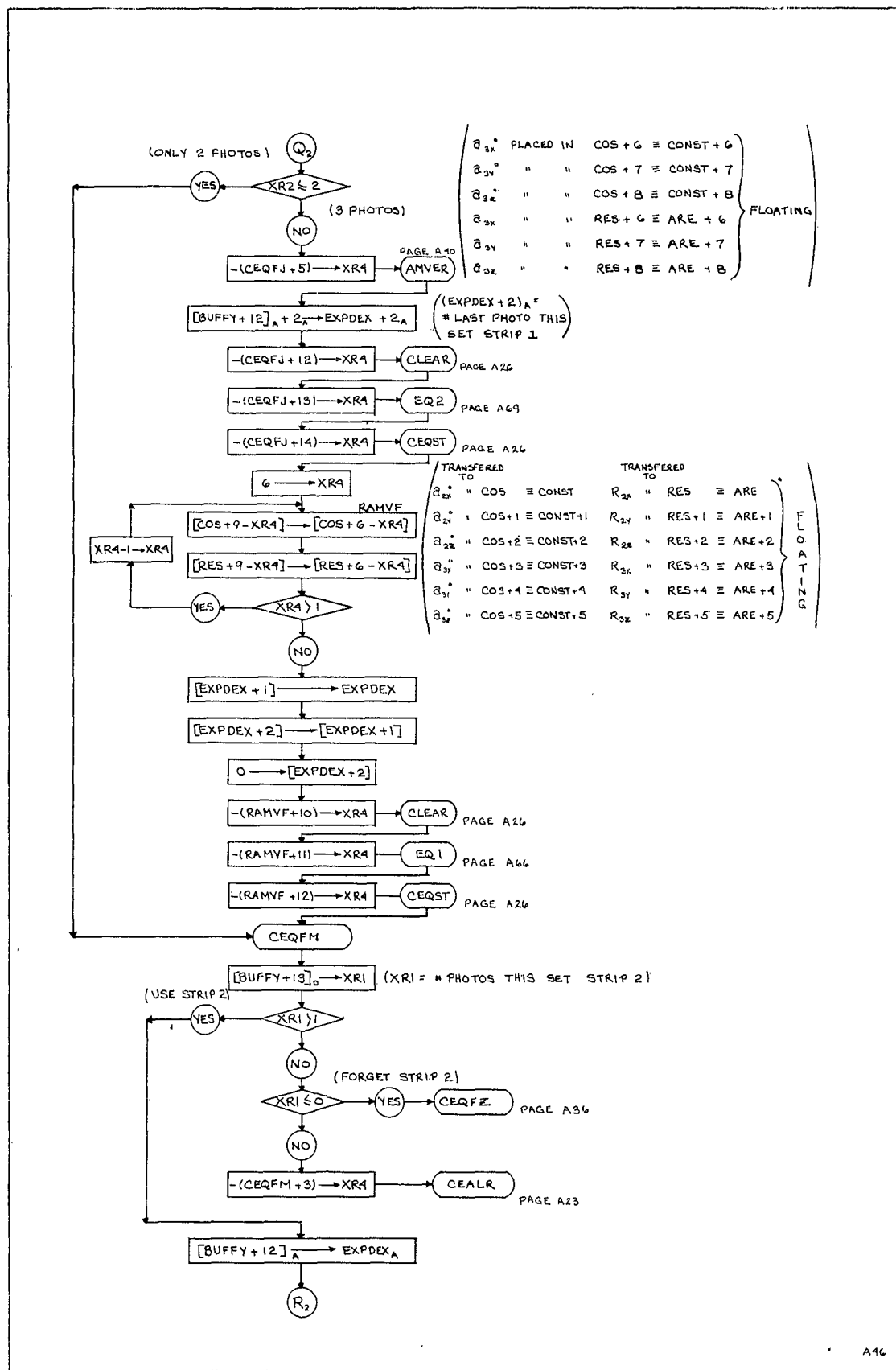


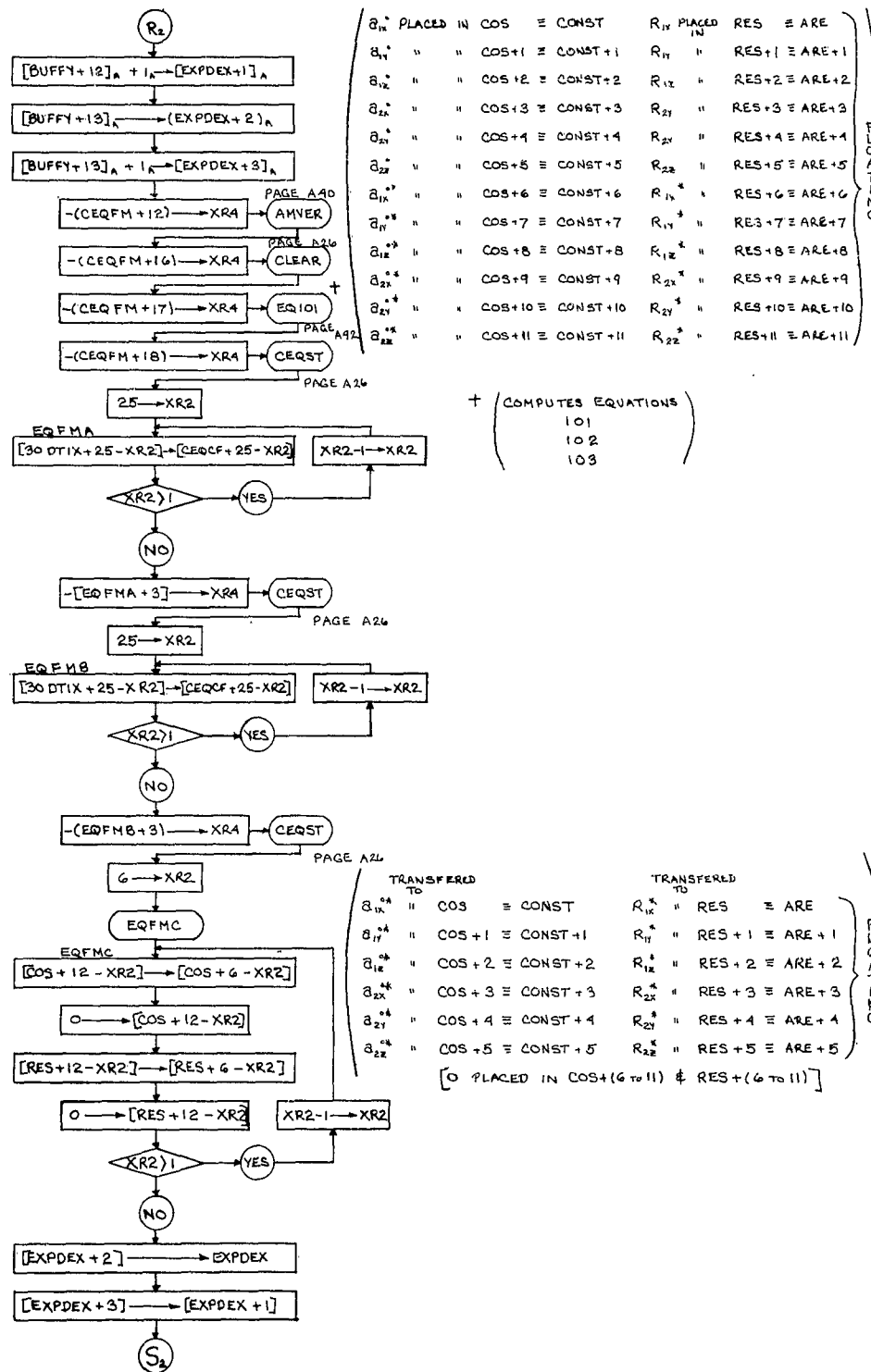


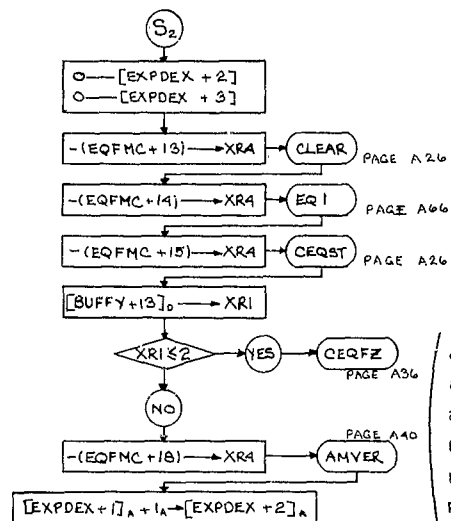


SUMMARY		
TYPE	KNOWN	EQUATIONS
B	ϕ, λ, h	5, 6, 7
C	ϕ, λ	5, 6
D	ϕ, h	6A, 7
E	ϕ	6A
F	λ, h	5, (XYZRA, PHXYZ) 7
G	λ	5
H	h	(XYZRA, PHXYZ) 7





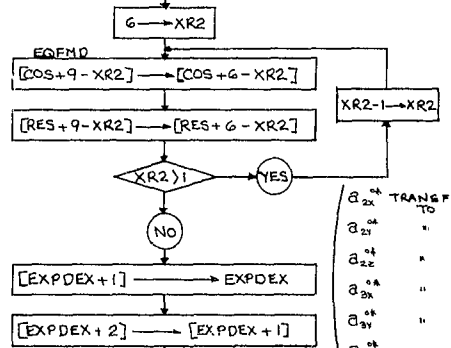
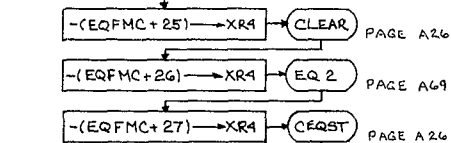




PLACED IN

B_{27}^{**}	$\text{COS} + 6 \equiv \text{CONST} + 6$
B_{27}^{**}	$\text{COS} + 7 \equiv \text{CONST} + 7$
B_{27}^{**}	$\text{COS} + 8 \equiv \text{CONST} + 8$
R_{31}^{**}	$\text{RES} + 6 \equiv \text{ARE} + 6$
R_{31}^{**}	$\text{RES} + 7 \equiv \text{ARE} + 7$
R_{32}^{**}	$\text{RES} + 8 \equiv \text{ARE} + 8$

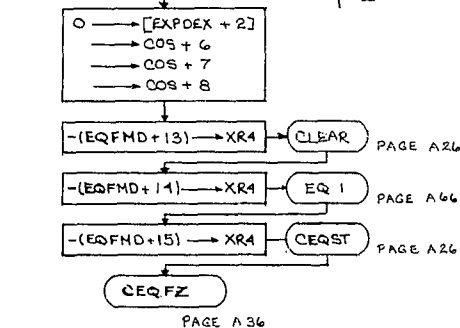
FLOATING



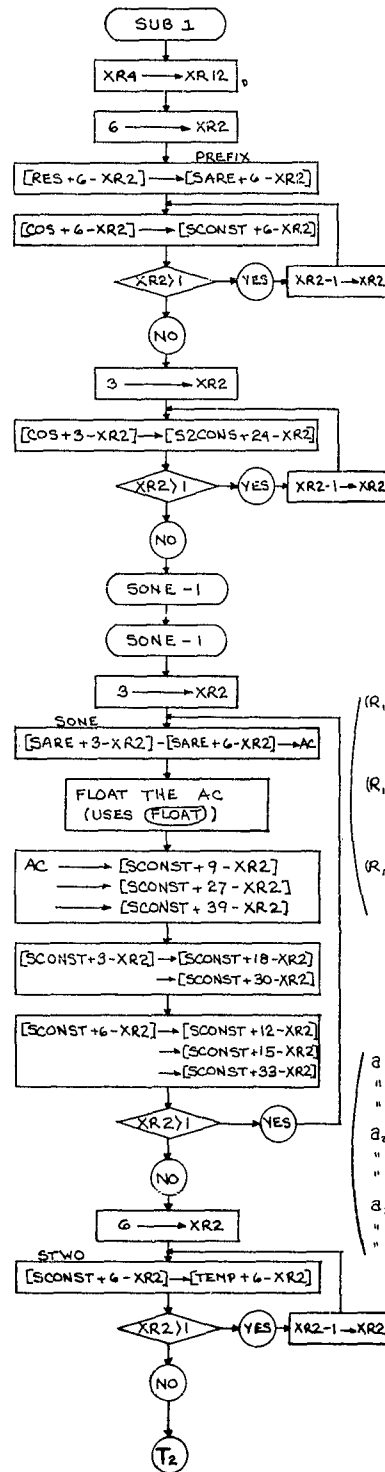
TRANSFERRED

B_{27}^{**}	COS	$\equiv$ CONST	R_{31}^{**}	RES	$\equiv$ ARE
B_{27}^{**}	COS + 1	$\equiv$ CONST + 1	R_{31}^{**}	RES + 1	$\equiv$ ARE + 1
B_{27}^{**}	COS + 2	$\equiv$ CONST + 2	R_{31}^{**}	RES + 2	$\equiv$ ARE + 2
B_{27}^{**}	COS + 3	$\equiv$ CONST + 3	R_{31}^{**}	RES + 3	$\equiv$ ARE + 3
B_{27}^{**}	COS + 4	$\equiv$ CONST + 4	R_{31}^{**}	RES + 4	$\equiv$ ARE + 4
B_{27}^{**}	COS + 5	$\equiv$ CONST + 5	R_{31}^{**}	RES + 5	$\equiv$ ARE + 5

FLOATING



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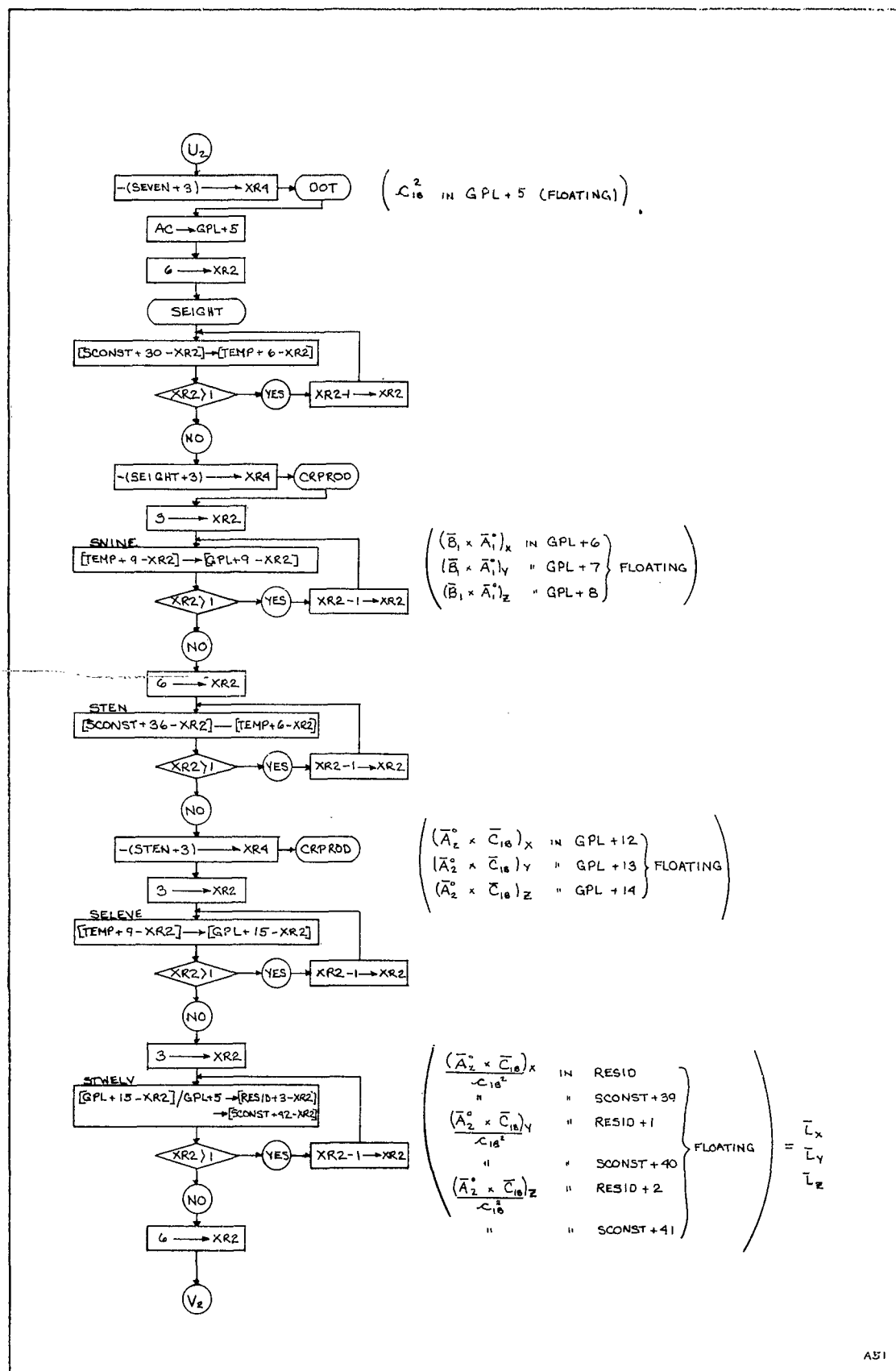
R _{ix}	TRANSFERRED TO	SARE	
R ₁₁	"	SARE + 1	FIXED, B25
R ₁₂	"	SARE + 2	
R ₂₁	"	SARE + 3	
R ₂₂	"	SARE + 4	
R ₂₃	"	SARE + 5	
θ ₁₁	"	S2CONST + 21	FLOATING
θ ₁₂	"	S2CONST + 22	
θ ₁₃	"	S2CONST + 23	

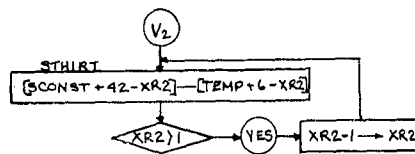
TRANSFERRED TO	
θ ₁₁	SCONST
θ ₁₂	SCONST + 1
θ ₁₃	SCONST + 2
θ ₂₁	SCONST + 3
θ ₂₂	SCONST + 4
θ ₂₃	SCONST + 5

(R ₁₁ - R ₂₁)	STORED IN	SCONST + 6	
"	"	SCONST + 24	FLOATING
"	"	SCONST + 36	
(R ₁₂ - R ₂₂)	"	SCONST + 7	
"	"	SCONST + 25	
"	"	SCONST + 37	
(R ₁₃ - R ₂₃)	"	SCONST + 8	FLOATING
"	"	SCONST + 26	
"	"	SCONST + 38	

θ ₁₁	PLACED INTO	SCONST + 15	
"	"	SCONST + 27	FLOATING
θ ₁₂	"	SCONST + 16	
"	"	SCONST + 28	
θ ₁₃	"	SCONST + 17	
"	"	SCONST + 29	

θ ₂₁	PLACED INTO	SCONST + 9	
"	"	SCONST + 12	FLOATING
"	"	SCONST + 30	
θ ₂₂	"	SCONST + 10	
"	"	SCONST + 13	
"	"	SCONST + 31	
θ ₂₃	"	SCONST + 11	FLOATING
"	"	SCONST + 14	
"	"	SCONST + 32	





DOT $\left(\bar{B}_1 \cdot \frac{(\bar{A}_1^0 \cdot \bar{C}_{10})}{C_{10}^2} \right) \text{ IN GPL+30 (FLOATING)} = \bar{a}_1$

AC → GPL+30

FORM $2a_1$
IN AC & STORE IN GPL+18

$(2a_1 \text{ IN GPL+18}) \text{ (FLOATING)}$

$(\text{GPL+18}) * \text{GPL} + (\text{GPL+1})$
→ SFOUT

$[2a_1(\bar{A}_1^0 \cdot \bar{A}_2^0) + (\bar{B}_1 \cdot \bar{A}_2^0)] \text{ IN SFOUT (FLOATING)}$

3 → XR2

SFOUT * [GPL+5-XR2] → AC
→ [COMMON+3-XR2]

-AC → AC

$(\text{AC} + [\text{GPL+9-XR2}]) / [\text{GPL+5}]$
→ [GPL+22-XR2]

$\{[\text{COMMON+3-XR2}] - [\text{GPL+12-XR2}] * \text{GPL}\} / [\text{GPL+5}]$
→ RESID+6-XR2

XR2>1? YES → XR2-1 → XR2

NO

[GPL+19] * SCONST → [RESID+6]

[GPL+19] * [SCONST+1] → SEIGHTE

[GPL+30] * [SCONST+2] → RESID+22

SEIGHTE - [RESID+22] → [RESID+7]

[SCONST+2] * [GPL+19] → SEIGHTE

[GPL+30] * [SCONST+1] → [RESID+21]

SEIGHTE + [RESID+21] → [RESID+8]

[GPL+20] * SCONST + [RESID+22] → [RESID+9]

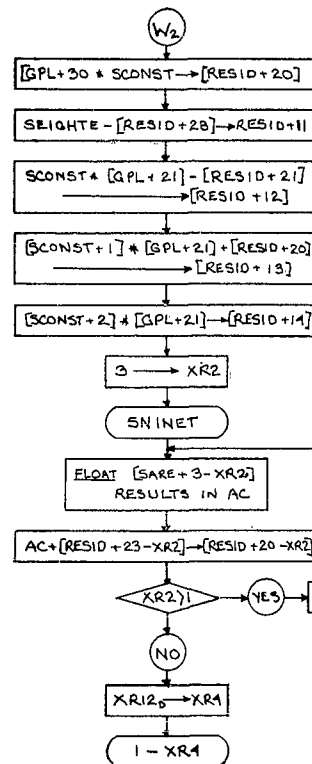
[SCONST+1] * [GPL+20] → [RESID+10]

[SCONST+2] * [GPL+20] → SEIGHTE

W2

$$\begin{aligned}
 & \left\{ \begin{aligned} & [2a_1(\bar{A}_1^0 \cdot \bar{A}_2^0) + (\bar{B}_1 \cdot \bar{A}_2^0)] C_{10x} \text{ IN COMMON+0} \\ & [2a_1(\bar{A}_1^0 \cdot \bar{A}_2^0) + (\bar{B}_1 \cdot \bar{A}_2^0)] C_{10y} \text{ " COMMON+1} \\ & [2a_1(\bar{A}_1^0 \cdot \bar{A}_2^0) + (\bar{B}_1 \cdot \bar{A}_2^0)] C_{10z} \text{ " COMMON+2} \end{aligned} \right\} \text{ FLOATING} \\
 & \left. \begin{aligned} & \frac{(\bar{B}_1 \cdot \bar{A}_1^0)_x - [2a_1(\bar{A}_1^0 \cdot \bar{A}_2^0) + (\bar{B}_1 \cdot \bar{A}_2^0)] C_{10x}}{C_{10}^2} \text{ IN GPL+19} = G_x \\ & \frac{(\bar{B}_1 \cdot \bar{A}_1^0)_y - [2a_1(\bar{A}_1^0 \cdot \bar{A}_2^0) + (\bar{B}_1 \cdot \bar{A}_2^0)] C_{10y}}{C_{10}^2} \text{ IN GPL+20} = G_y \\ & \frac{(\bar{B}_1 \cdot \bar{A}_1^0)_z - [2a_1(\bar{A}_1^0 \cdot \bar{A}_2^0) + (\bar{B}_1 \cdot \bar{A}_2^0)] C_{10z}}{C_{10}^2} \text{ IN GPL+21} = G_z \end{aligned} \right\} \text{ 20 BIT} \\
 & \left\{ \begin{aligned} & [2a_1(\bar{A}_1^0 \cdot \bar{A}_2^0) + (\bar{B}_1 \cdot \bar{A}_2^0)] C_{10x} - (\bar{B}_1 \cdot \bar{A}_2^0)_x (\bar{A}_1^0 \cdot \bar{A}_2^0) \text{ IN RESID+3} = P_x \\ & [2a_1(\bar{A}_1^0 \cdot \bar{A}_2^0) + (\bar{B}_1 \cdot \bar{A}_2^0)] C_{10y} - (\bar{B}_1 \cdot \bar{A}_2^0)_y (\bar{A}_1^0 \cdot \bar{A}_2^0) \text{ IN RESID+4} = P_y \\ & [2a_1(\bar{A}_1^0 \cdot \bar{A}_2^0) + (\bar{B}_1 \cdot \bar{A}_2^0)] C_{10z} - (\bar{B}_1 \cdot \bar{A}_2^0)_z (\bar{A}_1^0 \cdot \bar{A}_2^0) \text{ IN RESID+5} = P_z \end{aligned} \right\} \text{ FLOATING}
 \end{aligned}$$

$$\begin{aligned}
 & [(a_{1x}^0 G_x) \text{ IN RESID+6 (FLOATING)}] \\
 & [(a_{1y}^0 G_x) \text{ " SEIGHTE (FLOATING)}] \\
 & [(a_{1z}^0 G_x) \text{ " RESID+22 (FLOATING)}] \\
 & [(a_{1x}^0 G_x - a_{1z}^0) \text{ IN RESID+7 (FLOATING)}] \\
 & [(a_{1z}^0 G_x) \text{ REPLACES SEIGHTE (FLOATING)}] \\
 & [(a_{1y}^0 G_x) \text{ IN RESID+21 (FLOATING)}] \\
 & [(a_{1z}^0 G_x + a_{1y}^0) \text{ IN RESID+8 (FLOATING)}] \\
 & [(a_{1x}^0 G_y + a_{1z}^0) \text{ " RESID+9 (FLOATING)}] \\
 & [(a_{1y}^0 G_y) \text{ " RESID+10 (FLOATING)}] \\
 & [(a_{1z}^0 G_y) \text{ " SEIGHTE (FLOATING)}]
 \end{aligned}$$



$[(a, a_{ix})$ IN RESID + 20 (FLOATING)]
 $[(a_{iz} G_y - a, a_{ix})$ " RESID + 11 (FLOATING)]
 $[(a_{ix} G_z - a, a_{ix})$ " RESID + 12 (FLOATING)]
 $[(a_{ix} G_z + a, a_{ix})$ " RESID + 13 (FLOATING)]
 $[(a_{iz} G_z)$ " RESID + 14 (FLOATING)]

$(R_{ix} + a, a_{ix})$ IN RESID + 17
 $(R_{iy} + a, a_{iy})$ IN RESID + 18
 $(R_{iz} + a, a_{iz})$ IN RESID + 19

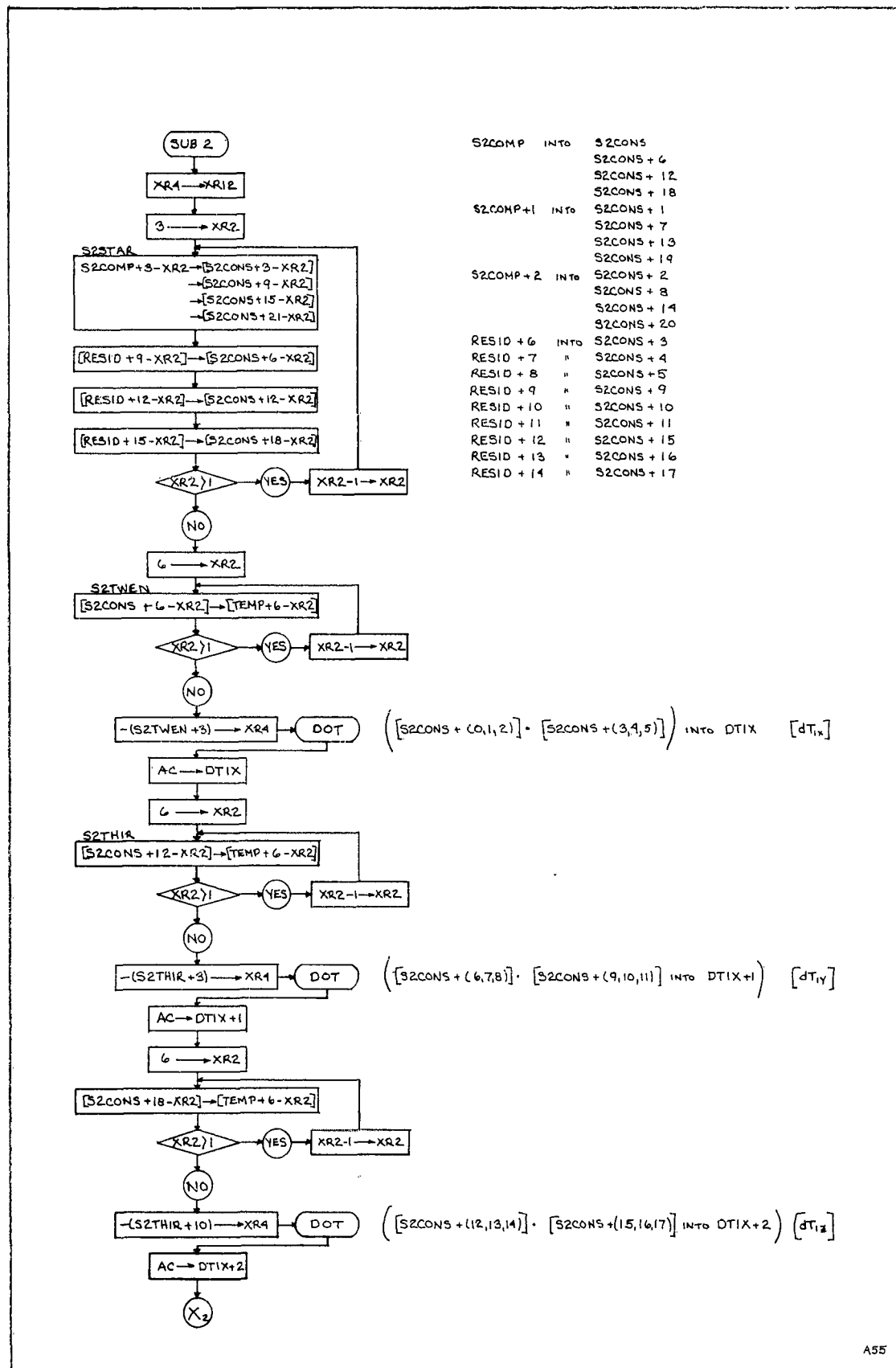
} FLOATING

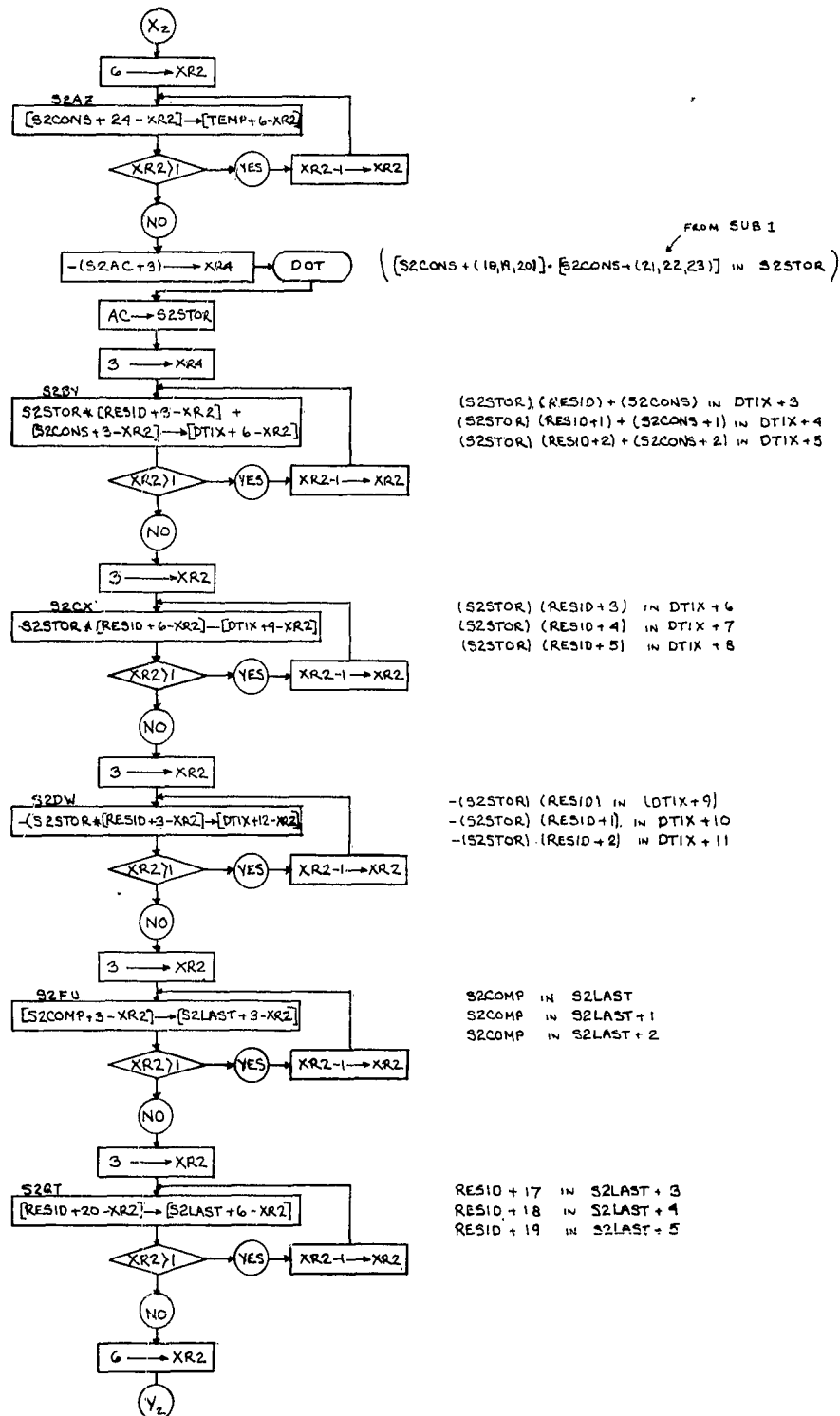
SUMMARY of SUB 1

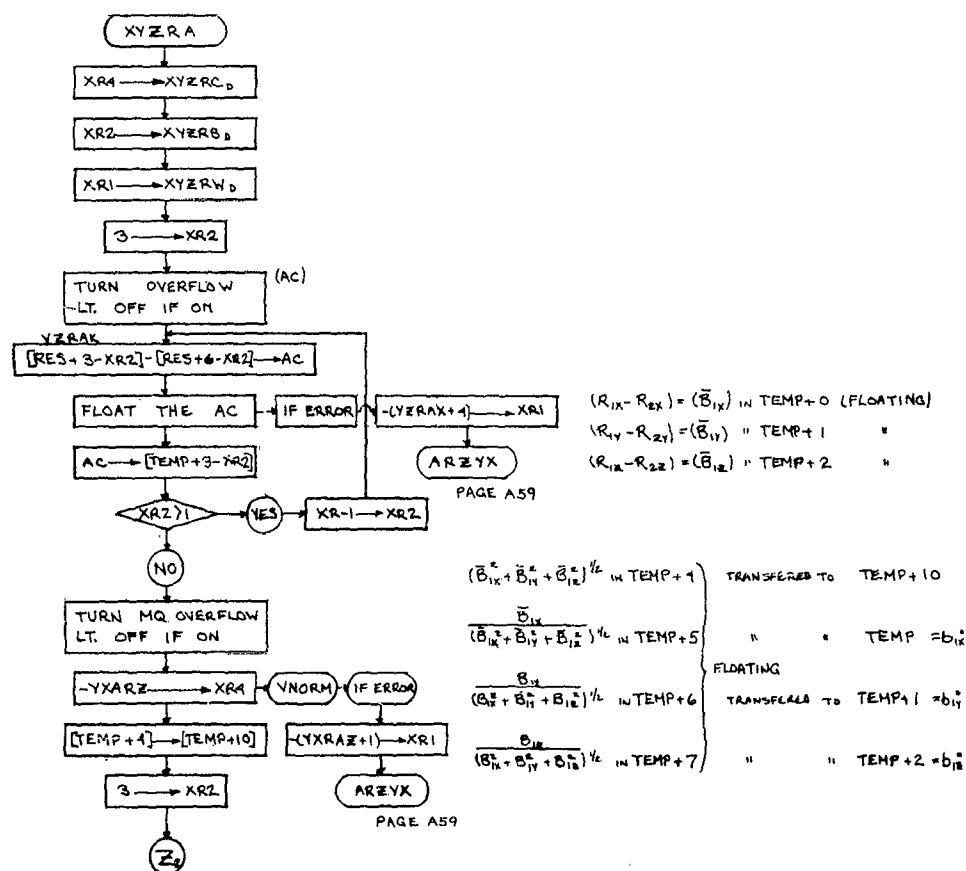
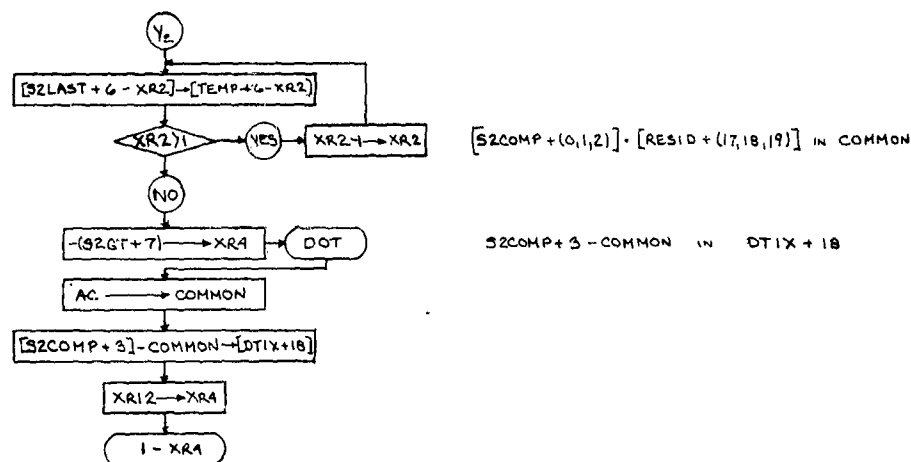
R_{1x}	IN	SARE	} FIXED, 0.25
R_{1y}	"	SARE + 1	
R_{1z}	"	SARE + 2	
R_{2x}	"	SARE + 3	
R_{2y}	"	SARE + 4	
R_{2z}	"	SARE + 5	

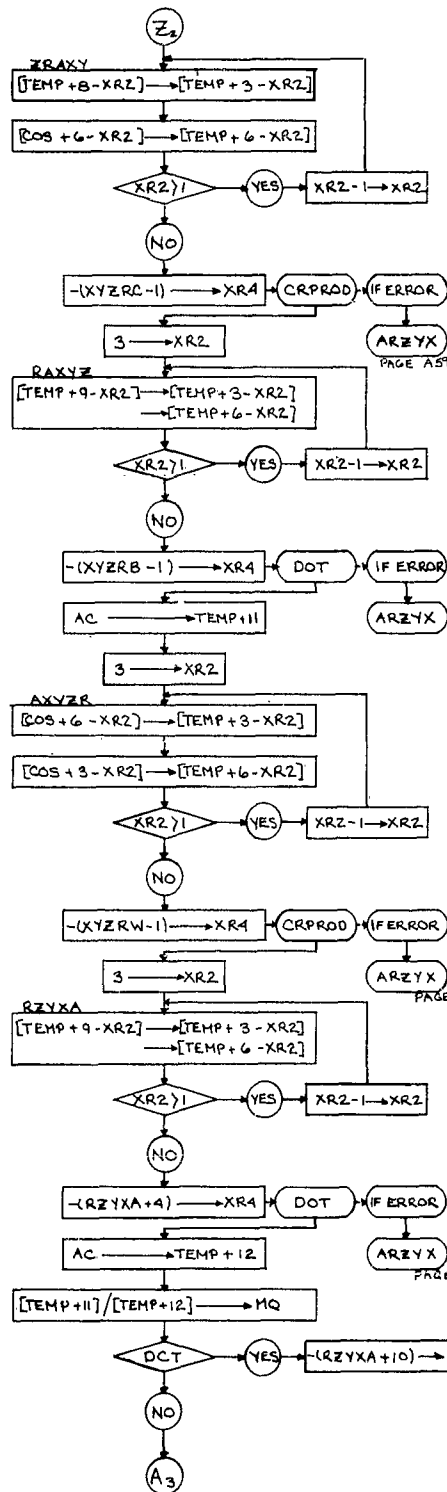
FLOATING

L_x	IN	RESID	a_{1x}	"	SZCONST + 21	$(\bar{A}_1, \bar{A}_2)$	IN	GPL
L_y	"	RESID + 1	a_{1y}	"	SZCONST + 22	$(\bar{B}_1, \bar{A}_2)$	"	GPL + 1
L_z	"	RESID + 2	a_{1z}	"	SZCONST + 23	C_{10x}	"	GPL + 2
P_x	"	RESID + 3	a_{1x}	"	SCONST	C_{10y}	"	GPL + 3
P_y	"	RESID + 4	a_{1y}	"	SCONST + 1	C_{10z}	"	GPL + 4
P_z	"	RESID + 5	a_{1z}	"	SCONST + 2	$-C_{10}$	"	GPL + 5
$(a_{1x} G_x)$	"	RESID + 6	a_{2x}	"	SCONST + 3	$(\bar{B}_1, \bar{A}_2)_x$	"	GPL + 6
$(a_{1y} G_y - a_{1z} G_z)$	"	RESID + 7	a_{2y}	"	SCONST + 4	$(\bar{B}_1, \bar{A}_2)_y$	"	GPL + 7
$(a_{1z} G_z + a_{1y} G_y)$	"	RESID + 8	a_{2z}	"	SCONST + 5	$(\bar{B}_1, \bar{A}_2)_z$	"	GPL + 8
$(a_{1x} G_y + a_{1z} G_z)$	"	RESID + 9	B_{1x}	"	SCONST + 6	$(\bar{B}_1, \bar{A}_2)_x$	"	GPL + 9
$(a_{1y} G_y)$	"	RESID + 10	B_{1y}	"	SCONST + 7	$(\bar{B}_1, \bar{A}_2)_y$	"	GPL + 10
$(a_{1z} G_y - a_{1y} G_x)$	"	RESID + 11	B_{1z}	"	SCONST + 8	$(\bar{B}_1, \bar{A}_2)_z$	"	GPL + 11
$(a_{1x} G_z - a_{1z} G_y)$	"	RESID + 12	B_{2x}	"	SCONST + 9	$(\bar{A}_2 \times \bar{C}_{10})_x$	"	GPL + 12
$(a_{1y} G_z + a_{1z} G_x)$	"	RESID + 13	B_{2y}	"	SCONST + 10	$(\bar{A}_2 \times \bar{C}_{10})_y$	"	GPL + 13
$(a_{1z} G_z)$	"	RESID + 14	B_{2z}	"	SCONST + 11	$(\bar{A}_2 \times \bar{C}_{10})_z$	"	GPL + 14
$(R_{1x} + a_{1x} G_x)$	"	RESID + 17	B_{2x}	"	SCONST + 12			
$(R_{1y} + a_{1y} G_y)$	"	RESID + 18	B_{2y}	"	SCONST + 13			
$(R_{1z} + a_{1z} G_z)$	"	RESID + 19	B_{2z}	"	SCONST + 14			
$(a_{1x} G_x)$	"	RESID + 20	B_{1x}	"	SCONST + 15			
$(a_{1y} G_y)$	"	RESID + 21	B_{1y}	"	SCONST + 16			
$(a_{1z} G_z)$	"	RESID + 22	B_{1z}	"	SCONST + 17			
			C_{10x}	"	SCONST + 18			
			C_{10y}	"	SCONST + 19			
			C_{10z}	"	SCONST + 20			
			C_{10x}	"	SCONST + 21			
			C_{10y}	"	SCONST + 22			
			C_{10z}	"	SCONST + 23			
			B_{1x}	"	SCONST + 24			
			B_{1y}	"	SCONST + 25			
			B_{1z}	"	SCONST + 26			
			B_{2x}	"	SCONST + 27			
			B_{2y}	"	SCONST + 28			
			B_{2z}	"	SCONST + 29			
			a_{2x}	"	SCONST + 30			
			a_{2y}	"	SCONST + 31			
			a_{2z}	"	SCONST + 32			
			C_{10x}	"	SCONST + 33			
			C_{10y}	"	SCONST + 34			
			C_{10z}	"	SCONST + 35			
			B_{1x}	"	SCONST + 36			
			B_{1y}	"	SCONST + 37			
			B_{1z}	"	SCONST + 38			
			L_x	"	SCONST + 39			
			L_y	"	SCONST + 40			
			L_z	"	SCONST + 41			









a_{2x} TRANSFERED TO TEMP+3
 a_{2y} " " TEMP+4 } FLOATING
 a_{2z} " " TEMP+5

C_{1Ax} IN TEMP+6 TRANSFERED TO {TEMP+0
 C_{1Ay} IN TEMP+7 " " {TEMP+3
 C_{1Az} IN TEMP+8 " " {TEMP+4
 {TEMP+5

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[C_{1A} IN TEMP+11 (FLOATING)]

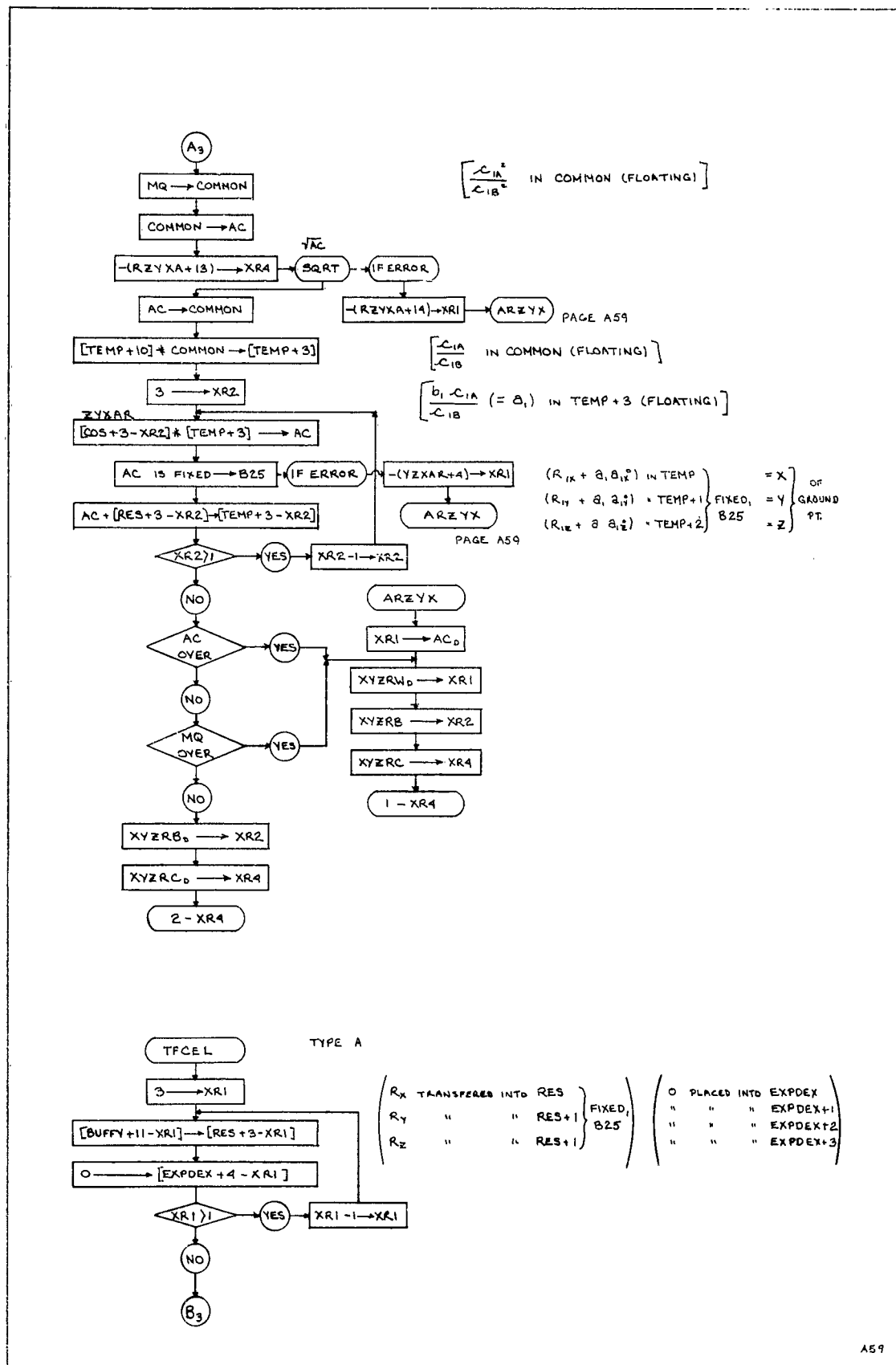
a_{2x} TRANSFERED INTO TEMP
 a_{2y} " " TEMP+1 } FLOATING
 a_{2z} " " TEMP+2
 a_{1x} " " TEMP+3
 a_{1y} " " TEMP+4
 a_{1z} " " TEMP+5

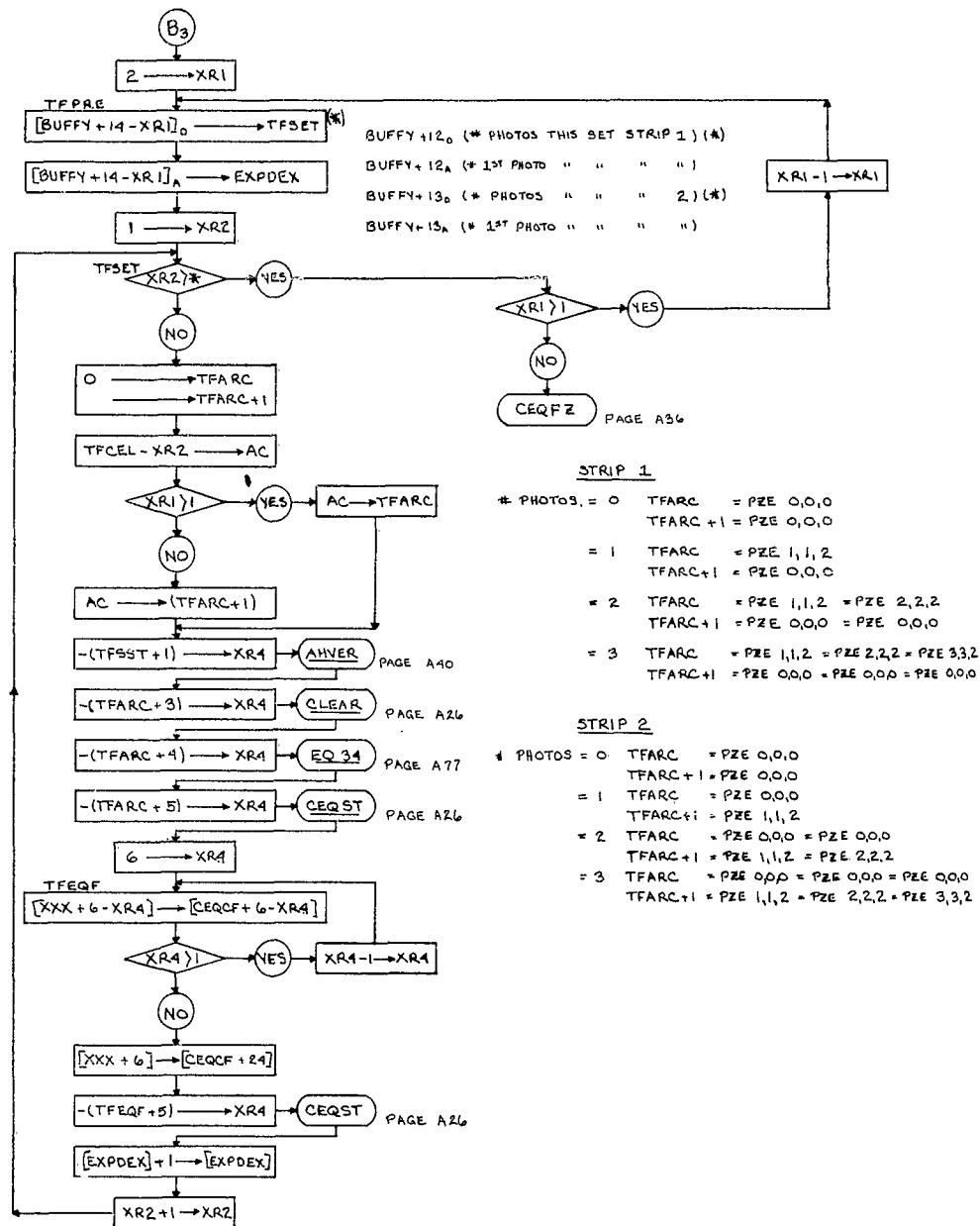
C_{1Bx} TRANSFERED INTO {TEMP
 C_{1By} " " {TEMP+3
 C_{1Bz} " " {TEMP+4
 {TEMP+5 } FLOATING

[C_{1B} IN TEMP+12 (FLOATING)]

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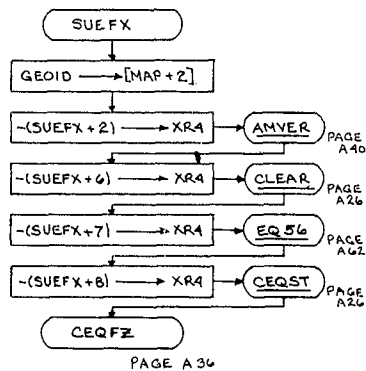


INITIALIZATION FOR ENTRY INTO EQ 34

a_{1x}^0	TRANSFERRED INTO	$\cos+3$	$\left. \begin{matrix} F \\ O \\ L \\ O \\ F \\ T \\ I \\ N \\ G \end{matrix} \right\}$	a_{2x}^0	TRANSFERRED INTO	$\cos+3$	$\left. \begin{matrix} F \\ O \\ L \\ O \\ F \\ T \\ I \\ N \\ G \end{matrix} \right\}$	a_{3x}^0	TRANSFERRED INTO	$\cos+3$	$\left. \begin{matrix} F \\ O \\ L \\ O \\ F \\ T \\ I \\ N \\ G \end{matrix} \right\}$
a_{1y}^0	"	"	$\cos+4$	a_{2y}^0	"	"	$\cos+4$	a_{3y}^0	"	"	$\cos+4$
a_{1z}^0	"	"	$\cos+5$	a_{2z}^0	"	"	$\cos+5$	a_{3z}^0	"	"	$\cos+5$
R_x	"	"	RES+0	R_x	"	"	RES	R_x	"	"	RES
R_y	"	"	RES+1	R_y	"	"	RES+1	R_y	"	"	RES+1
R_z	"	"	RES+2	R_z	"	"	RES+2	R_z	"	"	RES+2
R_{1x}	"	"	RES+3	R_{2x}	"	"	RES+3	R_{3x}	"	"	RES+3
R_{1y}	"	"	RES+4	R_{2y}	"	"	RES+4	R_{3y}	"	"	RES+4
R_{1z}	"	"	RES+5	R_{2z}	"	"	RES+5	R_{3z}	"	"	RES+5

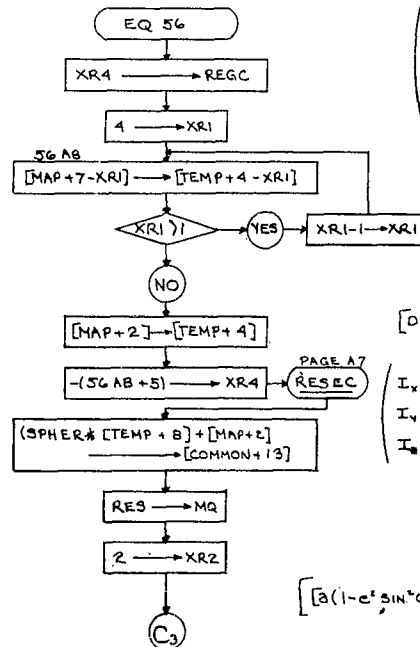
a_{1x}^{*k}	"	"	$\cos+3$	$\left. \begin{matrix} F \\ O \\ L \\ O \\ F \\ T \\ I \\ N \\ G \end{matrix} \right\}$	a_{2x}^{*k}	"	"	$\cos+3$	$\left. \begin{matrix} F \\ O \\ L \\ O \\ F \\ T \\ I \\ N \\ G \end{matrix} \right\}$	a_{3x}^{*k}	"	"	$\cos+3$	$\left. \begin{matrix} F \\ O \\ L \\ O \\ F \\ T \\ I \\ N \\ G \end{matrix} \right\}$
a_{1y}^{*k}	"	"	$\cos+4$		a_{2y}^{*k}	"	"	$\cos+4$		a_{3y}^{*k}	"	"	$\cos+4$	
a_{1z}^{*k}	"	"	$\cos+5$		a_{2z}^{*k}	"	"	$\cos+5$		a_{3z}^{*k}	"	"	$\cos+5$	
R_x	"	"	RES	$\left. \begin{matrix} F \\ I \\ X \\ E \\ D, \\ B \\ 2 \\ 5 \end{matrix} \right\}$	R_x	"	"	RES	$\left. \begin{matrix} F \\ I \\ X \\ E \\ D, \\ B \\ 2 \\ 5 \end{matrix} \right\}$	R_x	"	"	RES	$\left. \begin{matrix} F \\ I \\ X \\ E \\ D, \\ B \\ 2 \\ 5 \end{matrix} \right\}$
R_y	"	"	RES+1		R_y	"	"	RES+1		R_y	"	"	RES+1	
R_z	"	"	RES+2		R_z	"	"	RES+2		R_z	"	"	RES+2	
R_{1x}^{*k}	"	"	RES+3		R_{2x}^{*k}	"	"	RES+3		R_{3x}^{*k}	"	"	RES+3	
R_{1y}^{*k}	"	"	RES+4		R_{2y}^{*k}	"	"	RES+4		R_{3y}^{*k}	"	"	RES+4	
R_{1z}^{*k}	"	"	RES+5		R_{2z}^{*k}	"	"	RES+5		R_{3z}^{*k}	"	"	RES+5	

TYPE C 1 PHOTO STRIP 1 O PHOTOS STRIP 2



[DATUM PLACED INTO MAP+2]
(i.e. DATUM TAKES THE PLACE OF h)
(FIXED, 825) (= G)

B_{1x}	PLACED INTO	COS	} FLOATING
B_{1y}	"	COS+1	
B_{1z}	"	COS+2	
R_{1x}	"	RES	} FIXED, 825
R_{1y}	"	RES+1	
R_{1z}	"	RES+2	



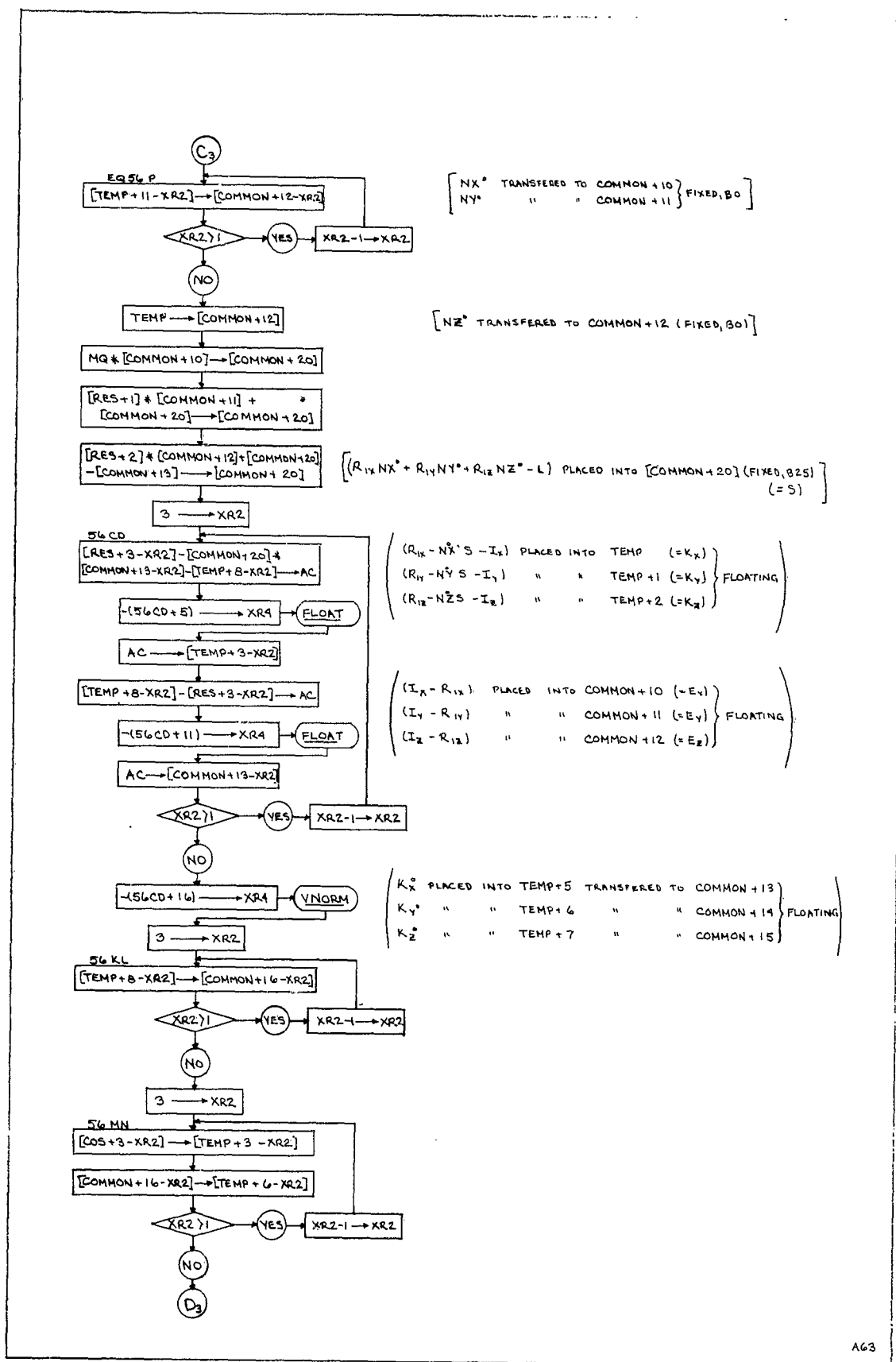
[SIN ϕ TRANSFERRED TO TEMP
COS ϕ " " TEMP+1
SIN γ " " TEMP+2
COS γ " " TEMP+3] (= NZ°)
FIXED, 80

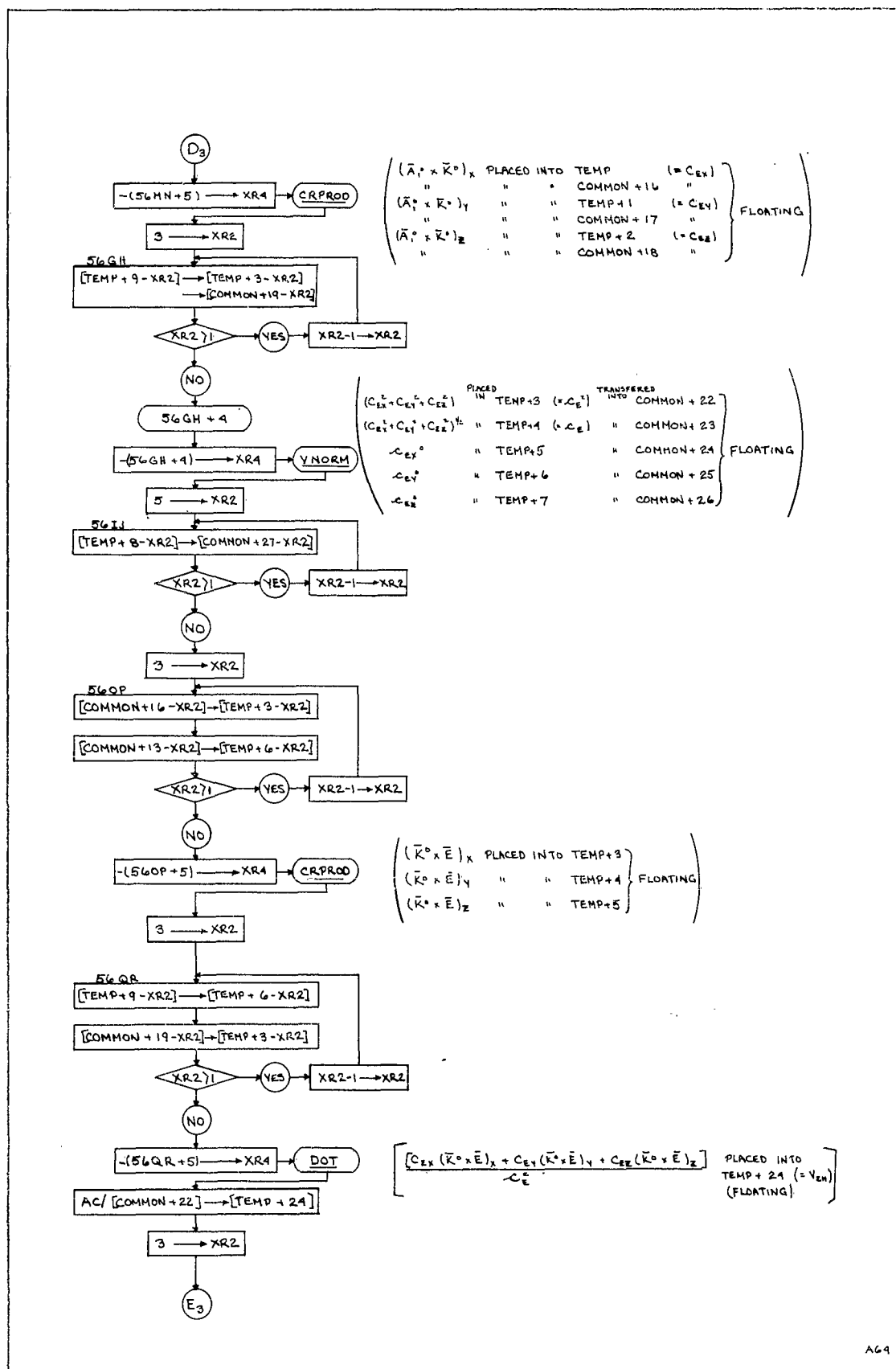
[DATUM TRANSFERRED TO TEMP+4 (FIXED, 825)]

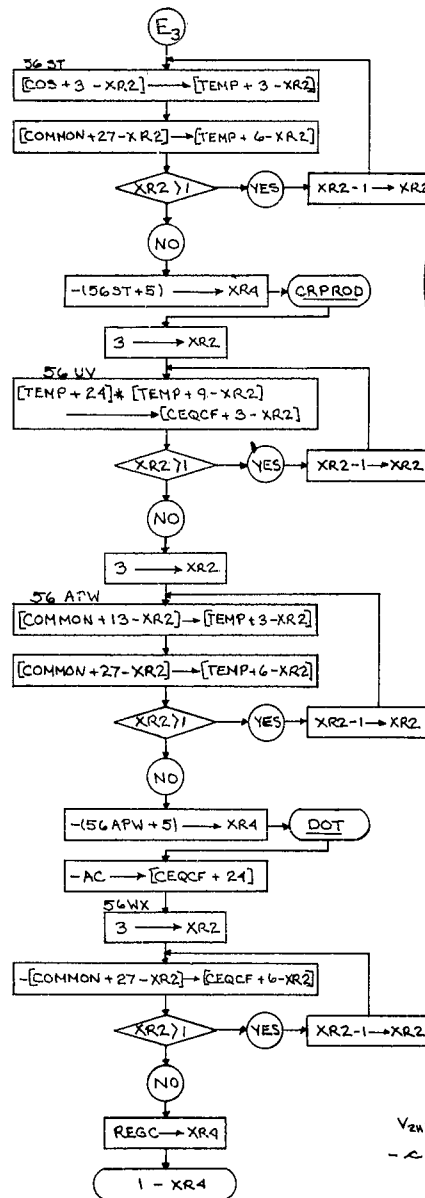
I_x	PLACED INTO TEMP+5	} FIXED, 825	$(1-e^{\sin^2 \phi})^{1/2}$	PLACED IN TEMP+8	} F
I_y	" " TEMP+6		$(\cos \phi \cos \gamma)$	" " TEMP+9	
I_z	" " TEMP+7		$(\cos \phi \sin \gamma)$	" " TEMP+10	

(= NX°)
(= NY°)

[$a(1-e^{\sin^2 \phi})^{1/2} G$] PLACED IN COMMON+13 (FIXED, 825) (= L)







$$\left. \begin{array}{l} (\bar{A}_i^* \times \bar{C}_e^*)_x \text{ PLACED INTO TEMP+6} \\ (\bar{A}_i^* \times \bar{C}_e^*)_y \text{ " " TEMP+7} \\ (\bar{A}_i^* \times \bar{C}_e^*)_z \text{ " " TEMP+8} \end{array} \right\} \text{ FLOATING}$$

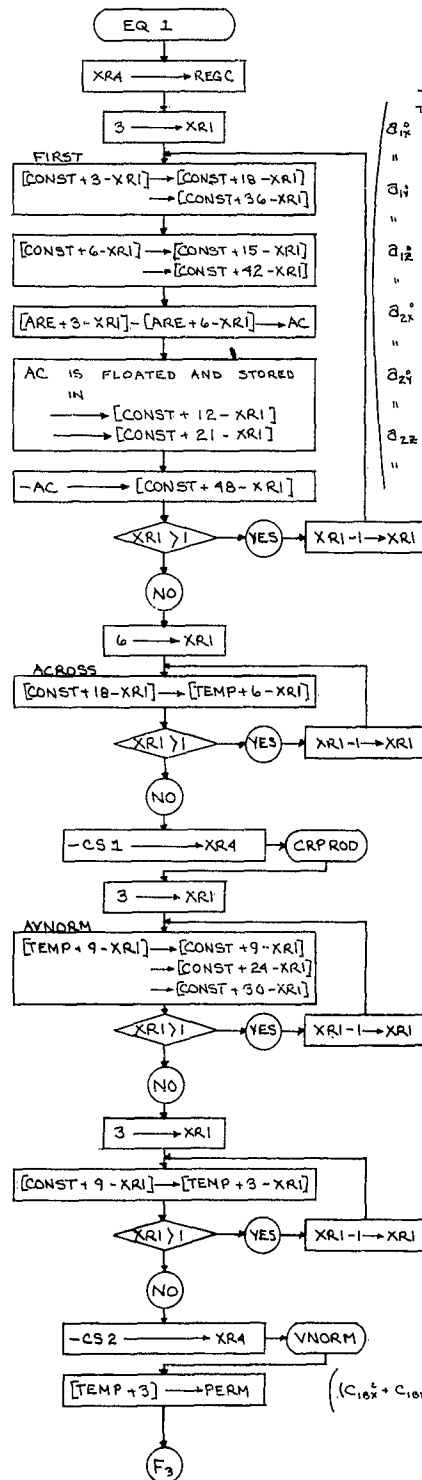
$$\left. \begin{array}{l} V_{2H} (\bar{A}_i^* \times \bar{C}_e^*)_x \text{ PLACED INTO CEQCF} \\ V_{2H} (\bar{A}_i^* \times \bar{C}_e^*)_y \text{ " " CEQCF+1} \\ V_{2H} (\bar{A}_i^* \times \bar{C}_e^*)_z \text{ " " CEQCF+2} \end{array} \right\} \text{ FLOATING}$$

$$[-E_x \mathcal{L}_{E_x}^0 - E_y \mathcal{L}_{E_y}^0 - E_z \mathcal{L}_{E_z}^0] \text{ PLACED INTO CEQCF+24 (FLOATING)}$$

$$\left. \begin{array}{l} -\mathcal{L}_{E_x}^0 \text{ PLACED INTO CEQCF+3} \\ -\mathcal{L}_{E_y}^0 \text{ " " CEQCF+4} \\ -\mathcal{L}_{E_z}^0 \text{ " " CEQCF+5} \end{array} \right\} \text{ FLOATING}$$

$$\begin{aligned} & V_{2H} (\bar{A}_i^* \times \bar{C}_e^*)_x dT_{Nx} + V_{2H} (\bar{A}_i^* \times \bar{C}_e^*)_y dT_{Ny} + V_{2H} (\bar{A}_i^* \times \bar{C}_e^*)_z dT_{Nz} \\ & - \mathcal{L}_{E_x}^0 dR_{Nx} - \mathcal{L}_{E_y}^0 dR_{Ny} - \mathcal{L}_{E_z}^0 dR_{Nz} \\ & = (-E_x \mathcal{L}_{E_x}^0 - E_y \mathcal{L}_{E_y}^0 - E_z \mathcal{L}_{E_z}^0) \end{aligned}$$

$$\left. \begin{array}{l} V_{2H} (\bar{A}_i^* \times \bar{C}_e^*)_x \text{ PLACED INTO CEQCF} \\ V_{2H} (\bar{A}_i^* \times \bar{C}_e^*)_y \text{ " " CEQCF+1} \\ V_{2H} (\bar{A}_i^* \times \bar{C}_e^*)_z \text{ " " CEQCF+2} \\ -\mathcal{L}_{E_x}^0 \text{ " " CEQCF+3} \\ -\mathcal{L}_{E_y}^0 \text{ " " CEQCF+4} \\ -\mathcal{L}_{E_z}^0 \text{ " " CEQCF+5} \\ (-E_x \mathcal{L}_{E_x}^0 - E_y \mathcal{L}_{E_y}^0 - E_z \mathcal{L}_{E_z}^0) \text{ " " CEQCF+24} \end{array} \right\} \text{ FLOATING}$$

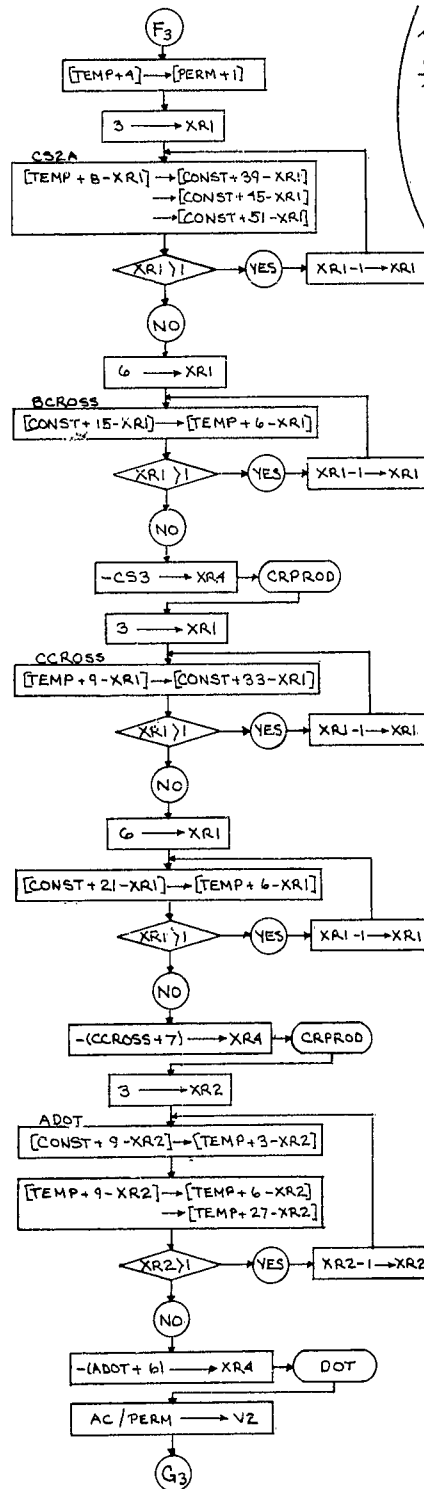


EQUATION 1 IS EMPLOYED FOR 4 PHOTO. PAIRS (1,2 STRIP 1)
THE COMMENTS IN THE FOLLOWING DIAGRAM (2,3 " 2)
ARE FOR (1,2 STRIP 1), HOWEVER, THE OTHER (1,2 STRIP 1)
PAIRS WOULD FOLLOW THE SAME PATTERN (2,3 " 2)

TRANSFERRED TO	CONST	PLACED INTO	CONST	RESULT
$\bar{a}_{1x}$	15	$(R_{1x}-R_{2x})$	9	$(=\bar{b}_{1x})$
"	33	"	18	"
$\bar{a}_{1y}$	16	$(R_{1y}-R_{2y})$	10	$(=\bar{b}_{1y})$
"	34	"	19	"
$\bar{a}_{1z}$	17	$(R_{1z}-R_{2z})$	11	$(=\bar{b}_{1z})$
"	35	"	20	"
$\bar{a}_{2x}$	12	$-(R_{1x}-R_{2x})$	45	$(=-\bar{b}_{1x})$
"	39	$-(R_{1y}-R_{2y})$	46	$(=-\bar{b}_{1y})$
$\bar{a}_{2y}$	13	$-(R_{1z}-R_{2z})$	47	$(=-\bar{b}_{1z})$
"	40	"	"	"
$\bar{a}_{2z}$	14	"	"	"
"	41	"	"	"

$(\bar{a}_z \times \bar{a}_1)_x$	IN TEMP+6	TRANSFERRED TO	CONST+6	$= (C_{107})$
"	"	"	21	"
$(\bar{a}_z \times \bar{a}_1)_y$	TEMP+7	"	27	$= (C_{107})$
"	"	"	22	"
$(\bar{a}_z \times \bar{a}_1)_z$	TEMP+8	"	28	$= (C_{102})$
"	"	"	23	"
"	"	"	29	"

$(C_{107}^2 + C_{107}^2 + C_{102}^2)$ PLACED INTO TEMP+3 $(=C_{10}^2)$ TRANSFERRED TO PERM (FLOATING)



C_{18} PLACED INTO TEMP+4 TRANSFERRED TO PERM+1
 $\frac{C_{18x}}{C_{18}}$ " " TEMP+5 (= C_{18x}) " " CONST+36
 $\frac{C_{18y}}{C_{18}}$ " " TEMP+6 (= C_{18y}) " " CONST+42
 $\frac{C_{18z}}{C_{18}}$ " " TEMP+7 (= C_{18z}) " " CONST+48
 " " " " " " CONST+37
 " " " " " " CONST+43
 " " " " " " CONST+49
 " " " " " " CONST+38
 " " " " " " CONST+44
 " " " " " " CONST+50

FLOATING

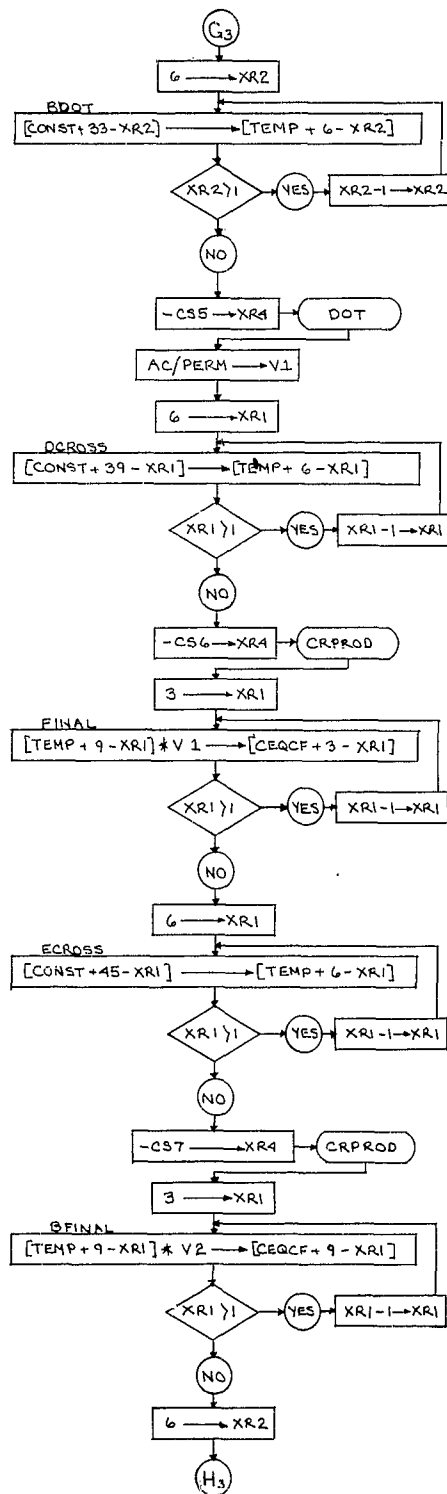
$(\bar{B}_1 \times \bar{A}_1)_x$ PLACED INTO TEMP+6 TRANSFERRED TO CONST+30
 $(\bar{B}_1 \times \bar{A}_1)_y$ " " TEMP+7 " " CONST+31
 $(\bar{B}_1 \times \bar{A}_1)_z$ " " TEMP+8 " " CONST+32

FLOATING

$(\bar{A}_1 \times \bar{B}_1)_x$ PLACED INTO TEMP+6 TRANSFERRED TO TEMP+3
 $(\bar{A}_1 \times \bar{B}_1)_y$ " " " " " " CONST+24
 $(\bar{A}_1 \times \bar{B}_1)_z$ " " " " " " TEMP+4
 $(\bar{A}_1 \times \bar{B}_1)_x$ " " " " " " CONST+25
 $(\bar{A}_1 \times \bar{B}_1)_y$ " " " " " " TEMP+5
 $(\bar{A}_1 \times \bar{B}_1)_z$ " " " " " " CONST+26

FLOATING

$\frac{\bar{C}_{18} \cdot (\bar{A}_1 \times \bar{B}_1)}{C_{18}}$ PLACED INTO V2 (FLOATING) (= V_2)



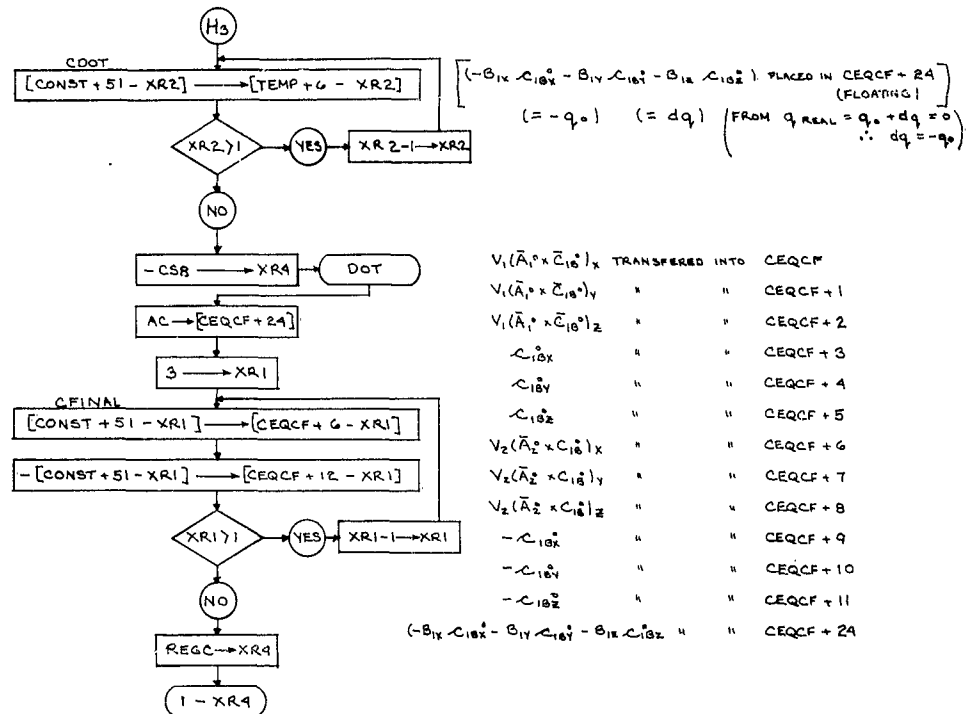
$\left[\frac{\bar{C}_{10} \cdot (\bar{G}_1 \times \bar{A}_2^*)}{-\bar{C}_{10}} \right]$ PLACED INTO V1 (= V1) (FLOATING)

$(A^* \times \bar{C}_{10}^*)_x$ PLACED INTO TEMP+6
 $(A^* \times \bar{C}_{10}^*)_y$ " " TEMP+7 } FLOATING
 $(A^* \times \bar{C}_{10}^*)_z$ " " TEMP+8

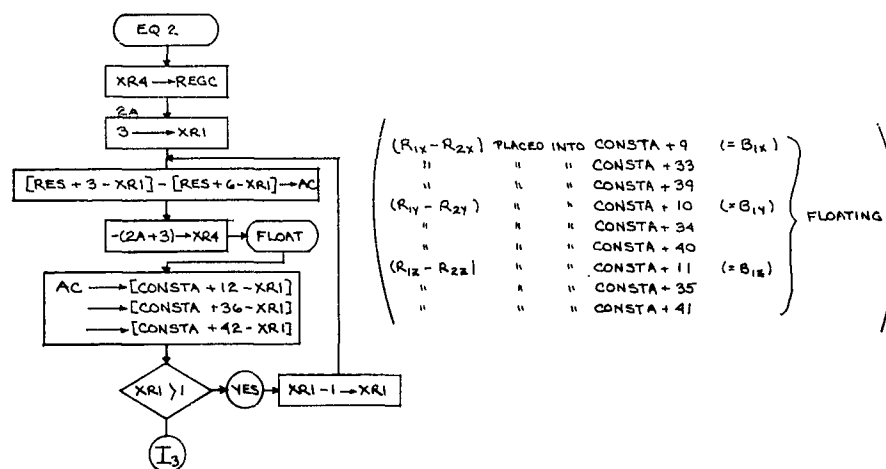
$V_1(\bar{A}_1^* \times \bar{C}_{10}^*)_x$ PLACED INTO CEQCF
 $V_1(\bar{A}_1^* \times \bar{C}_{10}^*)_y$ " " CEQCF+1 } FLOATING
 $V_1(\bar{A}_1^* \times \bar{C}_{10}^*)_z$ " " CEQCF+2

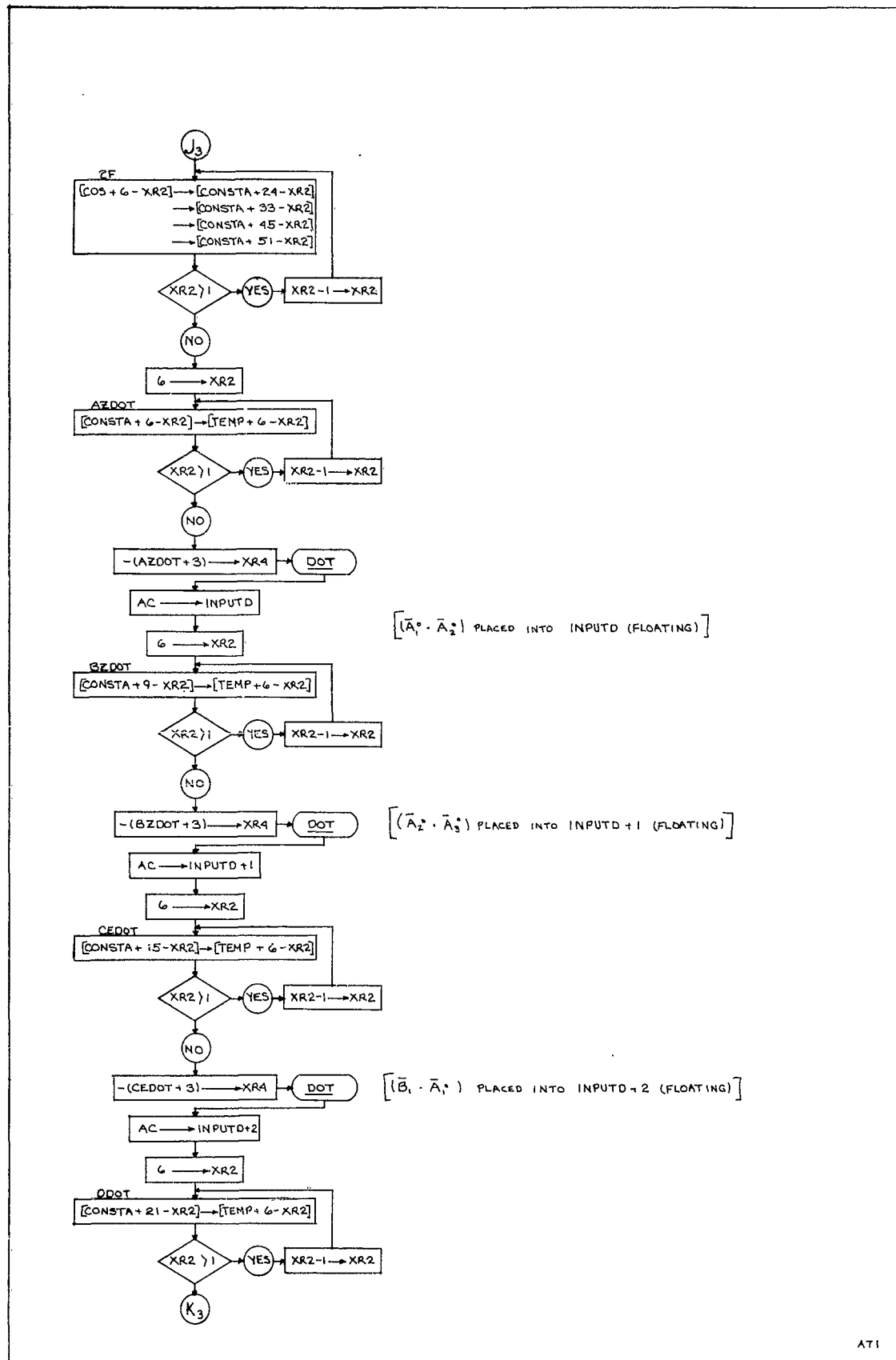
$(\bar{A}_2^* \times \bar{C}_{10}^*)_x$ PLACED INTO TEMP+6
 $(\bar{A}_2^* \times \bar{C}_{10}^*)_y$ " " TEMP+7 } FLOATING
 $(\bar{A}_2^* \times \bar{C}_{10}^*)_z$ " " TEMP+8

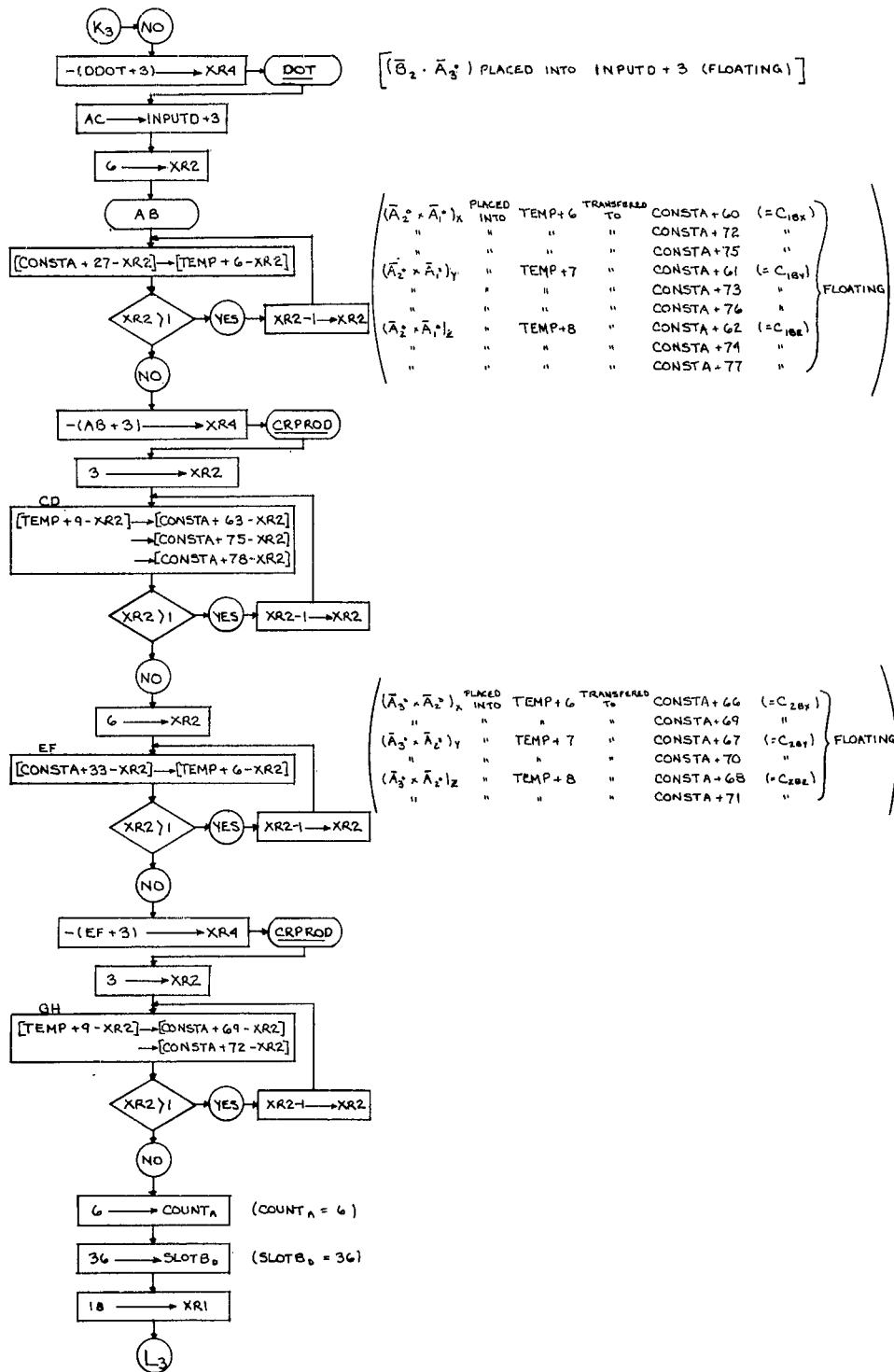
$V_2(\bar{A}_2^* \times \bar{C}_{10}^*)_x$ PLACED INTO CEQCF+6
 $V_2(\bar{A}_2^* \times \bar{C}_{10}^*)_y$ " " CEQCF+7 } FLOATING
 $V_2(\bar{A}_2^* \times \bar{C}_{10}^*)_z$ " " CEQCF+8

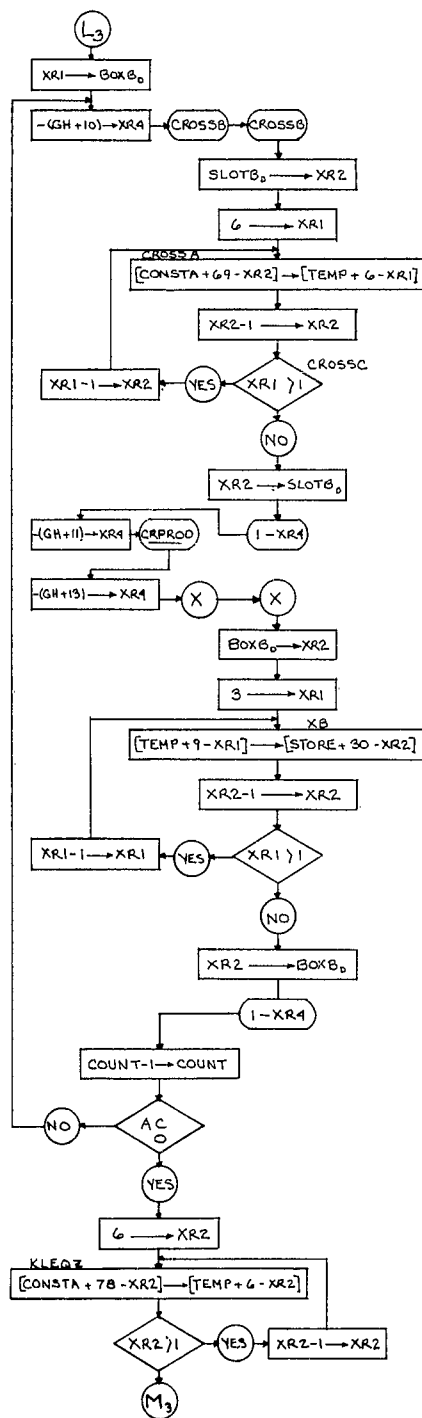


$$\begin{aligned}
 & V_1(\bar{A}_1 \times \bar{C}_{10})_x dT_{1x} + V_1(\bar{A}_1 \times \bar{C}_{10})_y dT_{1y} + V_1(\bar{A}_1 \times \bar{C}_{10})_z dT_{1z} + C_{10x} dR_{1x} + C_{10y} dR_{1y} + C_{10z} dR_{1z} \\
 & + V_2(\bar{A}_2 \times \bar{C}_{10})_x dT_{2x} + V_2(\bar{A}_2 \times \bar{C}_{10})_y dT_{2y} + V_2(\bar{A}_2 \times \bar{C}_{10})_z dT_{2z} - C_{10x} dR_{2x} - C_{10y} dR_{2y} - C_{10z} dR_{2z} \\
 & = dq = -q_0 = (-B_{1x} C_{10x} - B_{1y} C_{10y} - B_{1z} C_{10z})
 \end{aligned}$$



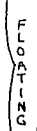


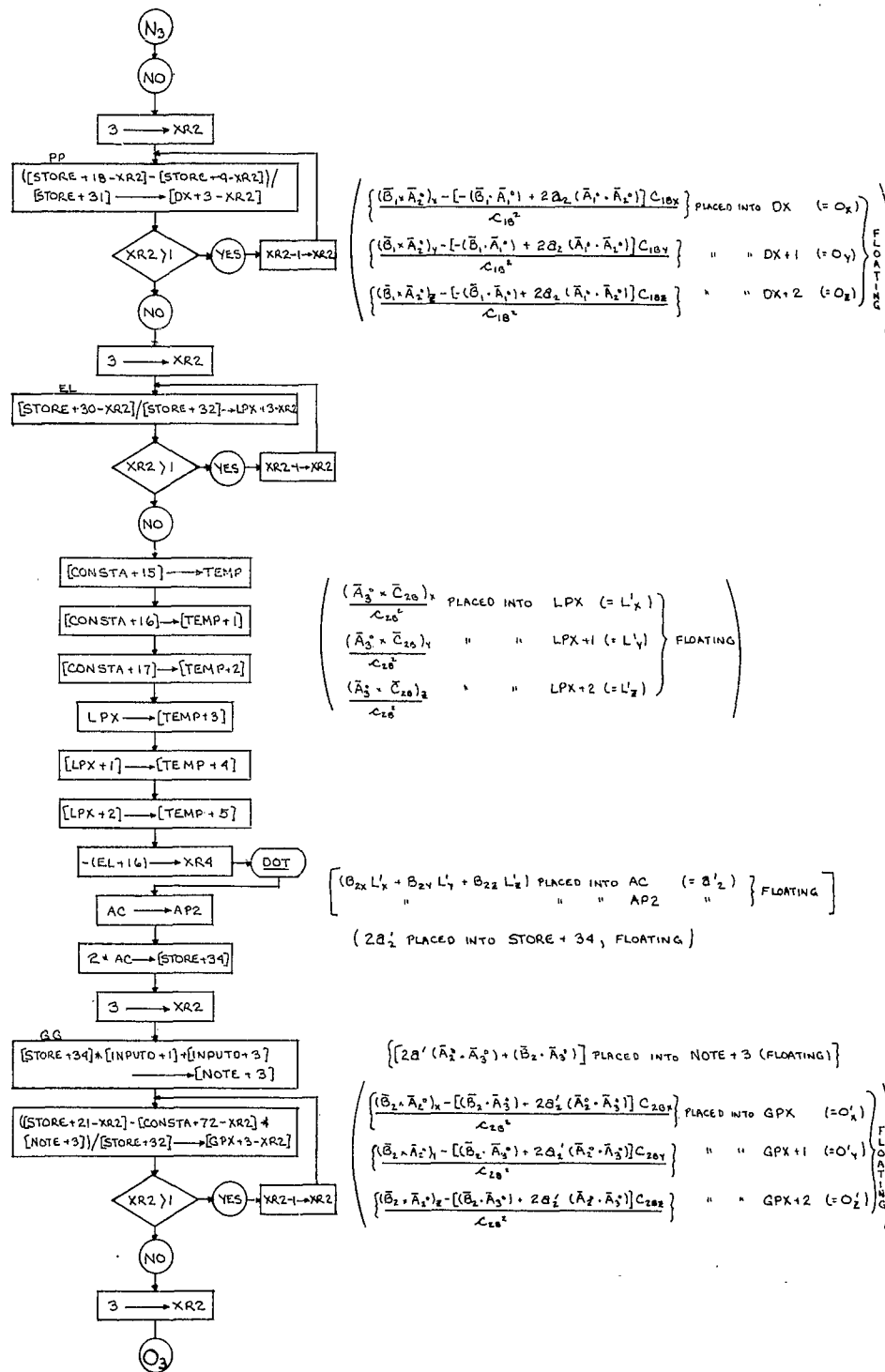


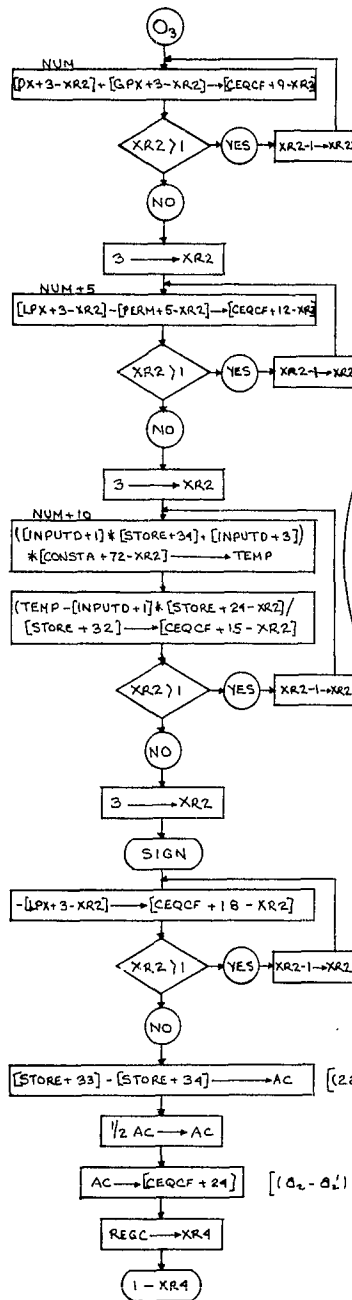


$(\bar{B}_i \times \bar{A}_i)_x$	PLACED INTO	TEMP + 6	TRANSFERRED TO	STORE + 12
$(\bar{B}_1 \times \bar{A}_1)_1$	"	TEMP + 7	"	STORE + 13
$(\bar{B}_1 \times \bar{A}_1)_2$	"	TEMP + 8	"	STORE + 14
$(\bar{B}_1 \times \bar{A}_1)_3$	"	TEMP + 6	"	STORE + 15
$(\bar{B}_1 \times \bar{A}_1)_4$	"	TEMP + 7	"	STORE + 16
$(\bar{B}_1 \times \bar{A}_1)_5$	"	TEMP + 8	"	STORE + 17
$(\bar{B}_2 \times \bar{A}_2)_1$	"	TEMP + 6	"	STORE + 18
$(\bar{B}_2 \times \bar{A}_2)_2$	"	TEMP + 7	"	STORE + 19
$(\bar{B}_2 \times \bar{A}_2)_3$	"	TEMP + 8	"	STORE + 20
$(\bar{B}_2 \times \bar{A}_2)_4$	"	TEMP + 6	"	STORE + 21
$(\bar{B}_2 \times \bar{A}_2)_5$	"	TEMP + 7	"	STORE + 22
$(\bar{B}_2 \times \bar{A}_2)_6$	"	TEMP + 8	"	STORE + 23
$(\bar{A}_1 \times \bar{C}_{10})_x$	"	TEMP + 6	"	STORE + 24
$(\bar{A}_1 \times \bar{C}_{10})_1$	"	TEMP + 7	"	STORE + 25
$(\bar{A}_1 \times \bar{C}_{10})_2$	"	TEMP + 8	"	STORE + 26
$(\bar{A}_2 \times \bar{C}_{20})_x$	"	TEMP + 6	"	STORE + 27
$(\bar{A}_2 \times \bar{C}_{20})_1$	"	TEMP + 7	"	STORE + 28
$(\bar{A}_2 \times \bar{C}_{20})_2$	"	TEMP + 8	"	STORE + 29

FLOATING







$$\left(\begin{array}{l} (O_x - O'_x) \text{ PLACED INTO CEQCF + 6} \\ (O_y - O'_y) \text{ " " CEQCF + 7} \\ (O_z - O'_z) \text{ " " CEQCF + 8} \end{array} \right) \text{ FLOATING}$$

$$\left(\begin{array}{l} (L'_x - Q_x) \text{ PLACED INTO CEQCF + 9} \\ (L'_y - Q_y) \text{ " " CEQCF + 10} \\ (L'_z - Q_z) \text{ " " CEQCF + 11} \end{array} \right) \text{ FLOATING}$$

$$\left(\begin{array}{l} \left\{ \frac{[(\bar{B}_2 \cdot \bar{A}_3^*) + 2\bar{B}_2'(\bar{A}_2' \cdot \bar{A}_3^*)] C_{20x} - (\bar{B}_2 \times \bar{A}_3^*)_x (\bar{A}_2' \cdot \bar{A}_3^*)}{C_{20}^*} \right\} \text{ PLACED INTO CEQCF + 12} \\ \left\{ \frac{[(\bar{B}_2 \cdot \bar{A}_3^*) + 2\bar{B}_2'(\bar{A}_2' \cdot \bar{A}_3^*)] C_{20y} - (\bar{B}_2 \times \bar{A}_3^*)_y (\bar{A}_2' \cdot \bar{A}_3^*)}{C_{20}^*} \right\} \text{ " CEQCF + 13} \\ \left\{ \frac{[(\bar{B}_2 \cdot \bar{A}_3^*) + 2\bar{B}_2'(\bar{A}_2' \cdot \bar{A}_3^*)] C_{20z} - (\bar{B}_2 \times \bar{A}_3^*)_z (\bar{A}_2' \cdot \bar{A}_3^*)}{C_{20}^*} \right\} \text{ " CEQCF + 14} \end{array} \right) \text{ FLOATING}$$

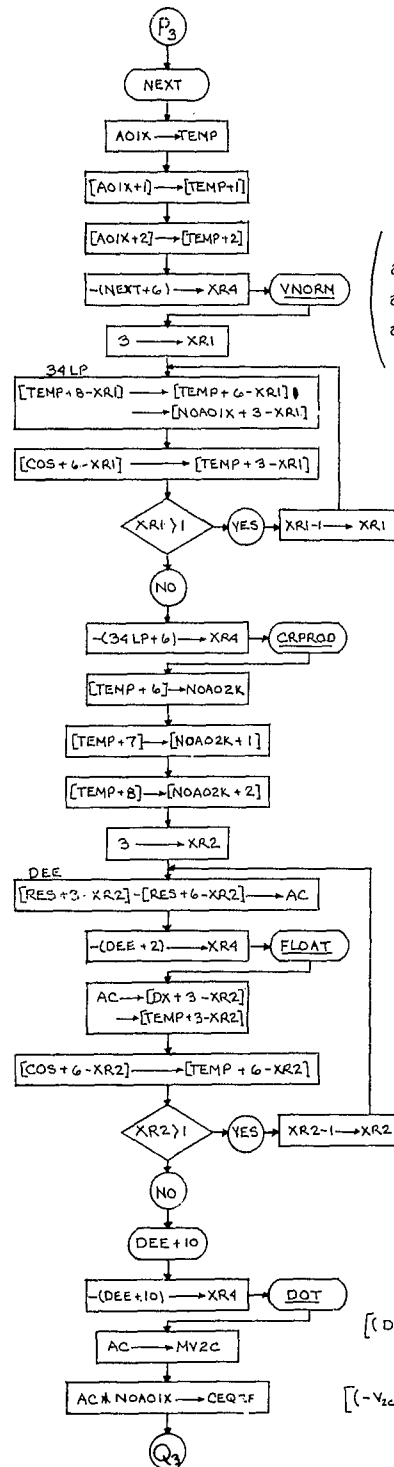
$(=P'_x)$
 $(=P'_y)$
 $(=P'_z)$

$$\left(\begin{array}{l} -L'_x \text{ TRANSFERED INTO CEQCF + 15} \\ -L'_y \text{ " " CEQCF + 16} \\ -L'_z \text{ " " CEQCF + 17} \end{array} \right) \text{ FLOATING}$$

S_x	IN CEQCF
S_y	" CEQCF + 1
S_z	" CEQCF + 2
Q_x	" CEQCF + 3
Q_y	" CEQCF + 4
Q_z	" CEQCF + 5
$(O_x - O'_x)$	" CEQCF + 6
$(O_y - O'_y)$	" CEQCF + 7
$(O_z - O'_z)$	" CEQCF + 8
$(L'_x - Q_x)$	" CEQCF + 9
$(L'_y - Q_y)$	" CEQCF + 10
$(L'_z - Q_z)$	" CEQCF + 11
P'_x	" CEQCF + 12
P'_y	" CEQCF + 13
P'_z	" CEQCF + 14
$-L'_x$	" CEQCF + 15
$-L'_y$	" CEQCF + 16
$-L'_z$	" CEQCF + 17
$(\bar{A}_2 - \bar{A}_2')$	" CEQCF + 24

$$S_x dT_{1x} + S_y dT_{1y} + S_z dT_{1z} + Q_x dR_{1x} + Q_y dR_{1y} + Q_z dR_{1z} \\ + (O_x - O'_x) dT_{2x} + (O_y - O'_y) dT_{2y} + (O_z - O'_z) dT_{2z} + (L'_x - Q_x) dR_{2x} + (L'_y - Q_y) dR_{2y} + (L'_z - Q_z) dR_{2z} \\ + P'_x dT_{3x} + P'_y dT_{3y} + P'_z dT_{3z} + (-L'_x) dR_{3x} + (-L'_y) dR_{3y} + (-L'_z) dR_{3z}$$

$$= \bar{a}_2 - \bar{a}_2'$$



$\begin{matrix} \delta_{01x}^* & \text{PLACED INTO TEMP+5} & \text{TRANSFERRED TO } \{ \text{TEMP+5} \} \\ \delta_{01y}^* & \text{" " TEMP+6} & \text{" " } \{ \text{TEMP+4} \} \\ \delta_{01z}^* & \text{" " TEMP+7} & \text{" " } \{ \text{TEMP+5} \} \end{matrix}$

$\begin{matrix} \delta_{nx}^* & \text{TRANSFERRED TO TEMP} \\ \delta_{ny}^* & \text{" " TEMP+1} \\ \delta_{nz}^* & \text{" " TEMP+2} \end{matrix}$

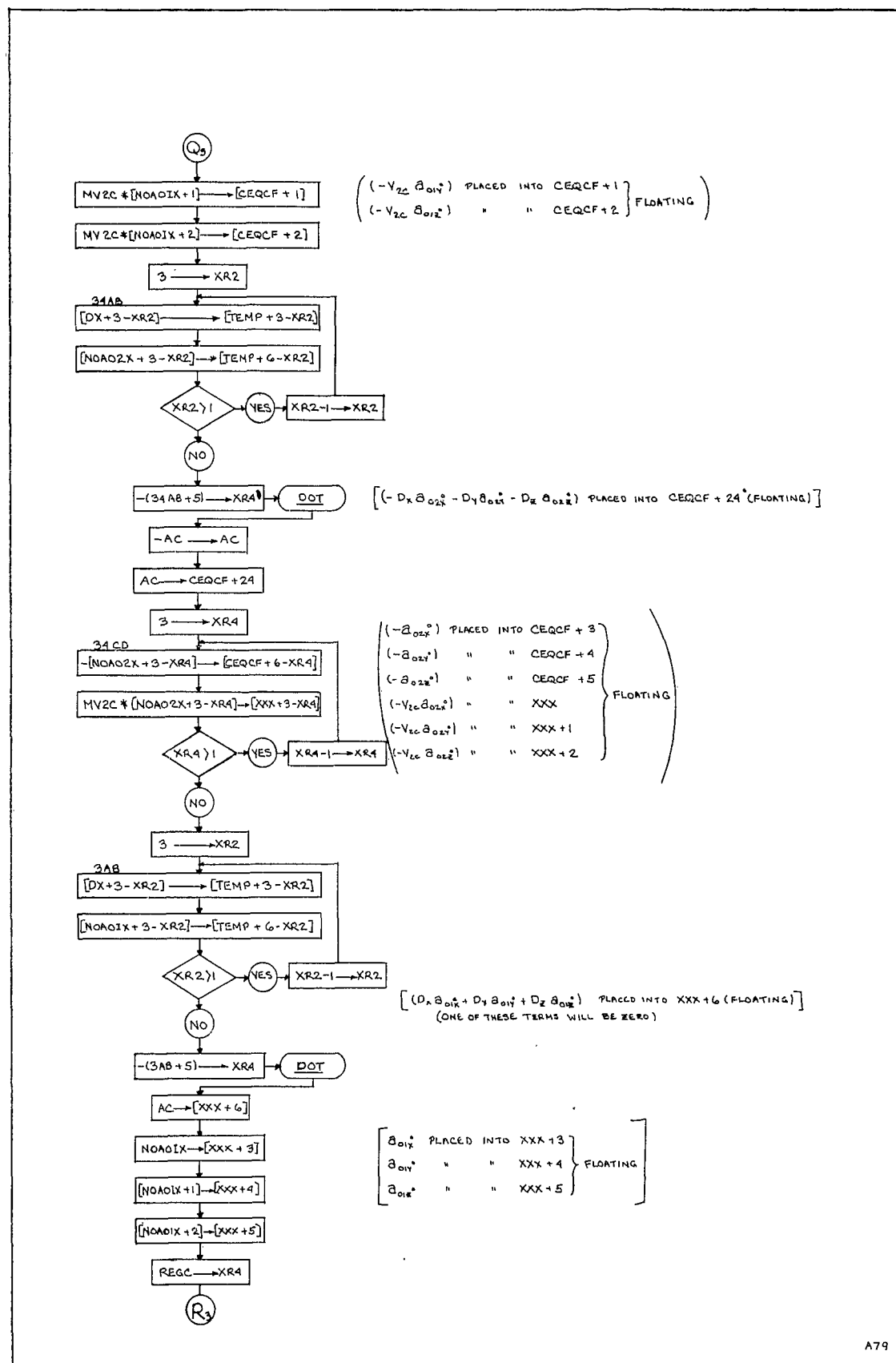
$\begin{matrix} (\bar{A}_n^* \times \bar{A}_{01}^*)_x & \text{PLACED INTO NOAO2K} & (= \delta_{02x}^*) \\ (\bar{A}_n^* \times \bar{A}_{01}^*)_y & \text{" " NOAO2K+1} & (= \delta_{02y}^*) \\ (\bar{A}_n^* \times \bar{A}_{01}^*)_z & \text{" " NOAO2K+2} & (= \delta_{02z}^*) \end{matrix}$

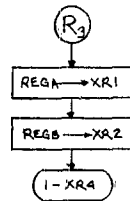
$\begin{matrix} (R_x - R_{nx}) & \text{PLACED INTO DX} & (= D_x) \\ (R_y - R_{ny}) & \text{" " DX+1} & (= D_y) \\ (R_z - R_{nz}) & \text{" " DX+2} & (= D_z) \end{matrix}$

$\begin{matrix} \delta_{nx}^* & \text{TRANSFERRED TO TEMP+3} \\ \delta_{ny}^* & \text{" " TEMP+4} \\ \delta_{nz}^* & \text{" " TEMP+5} \end{matrix}$

$[(D_x \delta_{nx}^* + D_y \delta_{ny}^* + D_z \delta_{nz}^*) \text{ PLACED INTO MV2C (FLOATING) } (= -V_{2c})]$

$[(-V_{2c} \delta_{01x}^*) \text{ PLACED INTO CEQCF (FLOATING)}]$





SUMMARY EQ 3

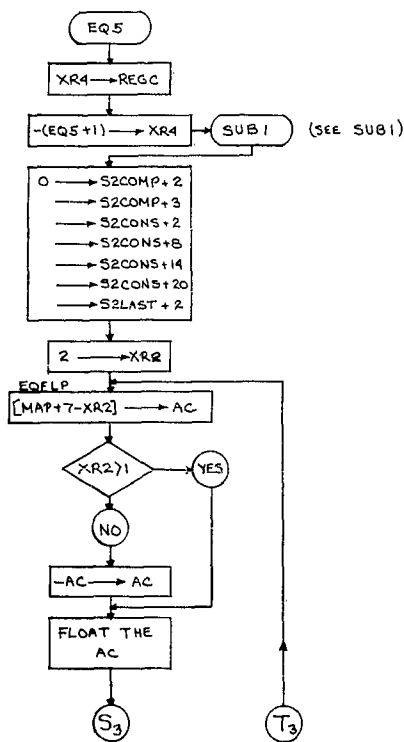
$(-V_{2C} \theta_{01X})$	IN	CEQCF	} FLOATING
$(-V_{2C} \theta_{01Y})$	"	CEQCF+1	
$(-V_{2C} \theta_{01Z})$	"	CEQCF+2	
$(-\theta_{02X})$	"	CEQCF+3	
$(-\theta_{02Y})$	"	CEQCF+4	
$(-\theta_{02Z})$	"	CEQCF+5	
$(-D_X \theta_{01X} - D_Y \theta_{01Y} - D_Z \theta_{01Z})$	"	CEQCF+24	

$$\begin{aligned}
 & (-V_{2C} \theta_{01X}) dT_{HX} + (-V_{2C} \theta_{01Y}) dT_{HY} \\
 & + (-V_{2C} \theta_{01Z}) dT_{HZ} - \theta_{02X} dR_{HX} \\
 & - \theta_{02Y} dR_{HY} - \theta_{02Z} dR_{HZ} \\
 & = [-D_X \theta_{01X} - D_Y \theta_{01Y} - D_Z \theta_{01Z}]
 \end{aligned}$$

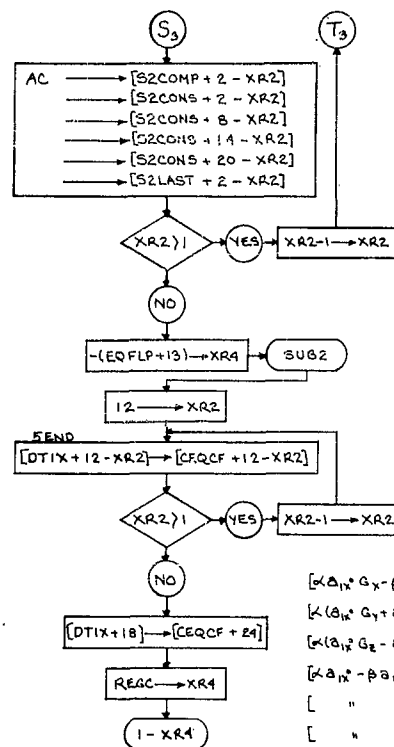
SUMMARY EQ 4

$(-V_{2C} \theta_{02X})$	IN	XXX	TRANSFERRED LATER TO	CEQCF
$(-V_{2C} \theta_{02Y})$	"	XXX+1	"	CEQCF+1
$(-V_{2C} \theta_{02Z})$	"	XXX+2	"	CEQCF+2
θ_{01X}	"	XXX+3	"	CEQCF+3
θ_{01Y}	"	XXX+4	"	CEQCF+4
θ_{01Z}	"	XXX+5	"	CEQCF+5
$[D_X \theta_{01X} + D_Y \theta_{01Y} + D_Z \theta_{01Z}]$	"	XXX+6	"	CEQCF+24

$$\begin{aligned}
 & (-V_{2C} \theta_{02X}) dT_{HX} + (-V_{2C} \theta_{02Y}) dT_{HY} + (-V_{2C} \theta_{02Z}) dT_{HZ} \\
 & + \theta_{01X} dR_{HX} + \theta_{01Y} dR_{HY} + \theta_{01Z} dR_{HZ} \\
 & = D_X \theta_{01X} + D_Y \theta_{01Y} + D_Z \theta_{01Z}
 \end{aligned}$$



7 KNOWN



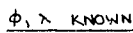
$\sin \lambda \rightarrow$ S2COMP
 S2CONS
 S2CONS+6
 S2CONS+12
 S2CONS+18
 S2LAST
 $-\cos \lambda \rightarrow$ S2COMP+1
 S2CONS+1
 S2CONS+7
 S2CONS+13
 S2CONS+19
 S2LAST+1

FLOATING

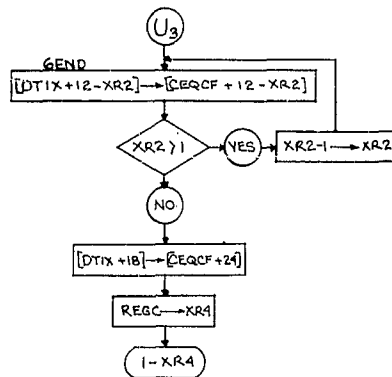
IN DTIX TRANSFERRED TO CEQCF

$[\alpha a_{1x} G_x - \beta(a_{1y} G_x - a_{1z} a_{1x}^*)]$	" DTIX+1 "	" CEQCF+1 "	$\alpha = \sin \lambda$ $\beta = \cos \lambda$
$[\alpha(a_{1x} G_y + a_{1z} a_{1y}^*) - \beta(a_{1y} G_y)]$	" DTIX+2 "	" CEQCF+2 "	
$[\alpha(a_{1x} G_z - a_{1y} a_{1z}^*) - \beta(a_{1y} G_z + a_{1z} a_{1y}^*)]$	" DTIX+3 "	" CEQCF+3 "	FLOATING
$[\alpha a_{1x}^2 - \beta a_{1y}^2]$	" DTIX+4 "	" CEQCF+4 "	
$[L_x + \alpha]$	" DTIX+5 "	" CEQCF+5 "	
$[L_y - \beta]$	" DTIX+6 "	" CEQCF+6 "	
$[L_z]$	" DTIX+7 "	" CEQCF+7 "	
$[P_x]$	" DTIX+8 "	" CEQCF+8 "	
$[P_y]$	" DTIX+9 "	" CEQCF+9 "	
$[P_z]$	" DTIX+10 "	" CEQCF+10 "	
$[-L_x]$	" DTIX+11 "	" CEQCF+11 "	
$[-L_y]$	" S2LAST "	" "	
$[-L_z]$	" S2LAST+1 "	" "	
α	" S2LAST+2 "	" "	
$-\beta$	" S2LAST+3 "	" "	
0	" S2LAST+4 "	" "	
$(R_{1x} + a_{1x} a_{1x}^*)$	" S2LAST+5 "	" "	
$(R_{1y} + a_{1y} a_{1y}^*)$	" COMMON "	" "	
$(R_{1z} + a_{1z} a_{1z}^*)$	" DTIX+18 "	" CEQCF+24 "	

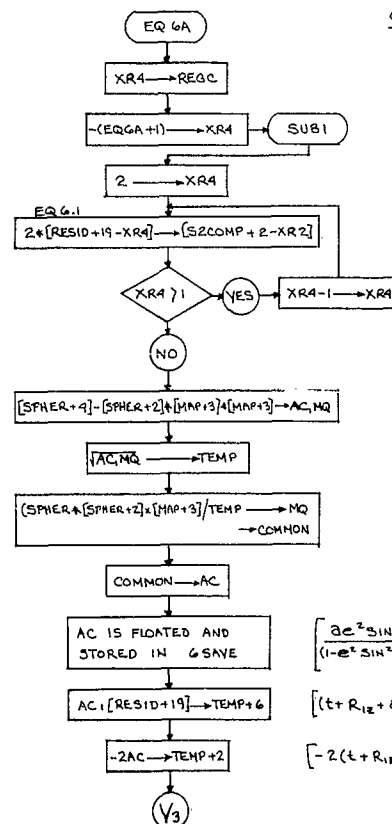
$$\begin{aligned}
 & [\alpha a_{1x} G_x - \beta(a_{1y} G_x - a_{1z} a_{1x}^*)] dT_{1x} + [\alpha(a_{1x} G_y + a_{1z} a_{1y}^*) - \beta(a_{1y} G_y)] dT_{1y} + [\alpha(a_{1x} G_z - a_{1y} a_{1z}^*) - \beta(a_{1y} G_z + a_{1z} a_{1y}^*)] dT_{1z} \\
 & + [\alpha a_{1x}^2 - \beta a_{1y}^2] dR_{1x} + [\alpha a_{1x}^2 - \beta a_{1y}^2] dR_{1y} + [\alpha a_{1x}^2 - \beta a_{1y}^2] dR_{1z} \\
 & + [\alpha a_{1x}^2 - \beta a_{1y}^2] dT_{2x} + [\alpha a_{1x}^2 - \beta a_{1y}^2] dT_{2y} + [\alpha a_{1x}^2 - \beta a_{1y}^2] dT_{2z} \\
 & + [\alpha a_{1x}^2 - \beta a_{1y}^2] dR_{2x} + [\alpha a_{1x}^2 - \beta a_{1y}^2] dR_{2y} + [\alpha a_{1x}^2 - \beta a_{1y}^2] dR_{2z} \\
 & = [\beta(R_{1y} + a_{1y} a_{1y}^*) - \alpha(R_{1x} + a_{1x} a_{1x}^*)]
 \end{aligned}$$



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$$\begin{aligned}
 & \left[\delta a_{1x} G_x + \delta(a_{1x} G_x - a_{1x}^2) + \epsilon(a_{1x} G_x - a_{1x}^2) \right] dT_{1x} + \left[\delta(a_{1x} G_y + a_{1x}^2) + \epsilon(a_{1x} G_y - a_{1x}^2) \right] dT_{1y} + \left[\delta(a_{1x} G_z - a_{1x}^2) + \epsilon(a_{1x} G_z - a_{1x}^2) \right] dT_{1z} \\
 & + \left[\delta(a_{1y}^2 + \delta a_{1y}^2 + \epsilon a_{1y}^2) L_y + \delta \right] dR_{1x} + \left[\delta(a_{1y}^2 + \delta a_{1y}^2 + \epsilon a_{1y}^2) L_y + \delta \right] dR_{1y} + \left[\delta(a_{1y}^2 + \delta a_{1y}^2 + \epsilon a_{1y}^2) L_y + \delta \right] dR_{1z} \\
 & + \left[\delta(a_{1z}^2 + \delta a_{1z}^2 + \epsilon a_{1z}^2) P_z \right] dT_{2x} + \left[\delta(a_{1z}^2 + \delta a_{1z}^2 + \epsilon a_{1z}^2) P_z \right] dT_{2y} + \left[\delta(a_{1z}^2 + \delta a_{1z}^2 + \epsilon a_{1z}^2) P_z \right] dT_{2z} \\
 & + \left[\delta(a_{1x}^2 + \delta a_{1x}^2 + \epsilon a_{1x}^2) (-L_x) \right] dR_{2x} + \left[\delta(a_{1x}^2 + \delta a_{1x}^2 + \epsilon a_{1x}^2) (-L_x) \right] dR_{2y} + \left[\delta(a_{1x}^2 + \delta a_{1x}^2 + \epsilon a_{1x}^2) (-L_x) \right] dR_{2z} \\
 & = \left[\delta(R_{1x} + a_{1x}^2) + \delta(R_{1y} + a_{1y}^2) + \epsilon(R_{1x} + a_{1x}^2) \right]
 \end{aligned}$$

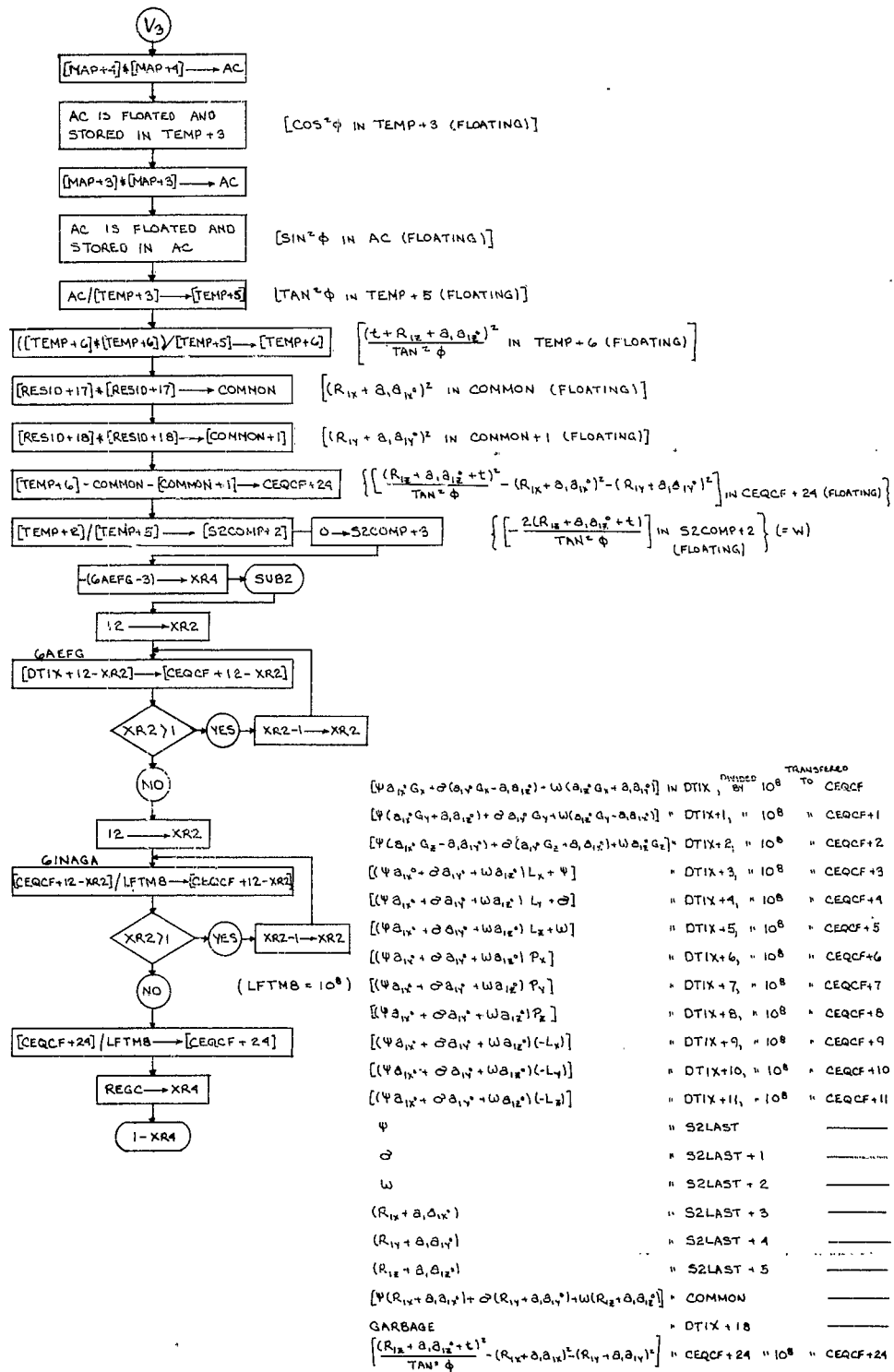


ϕ KNOWN

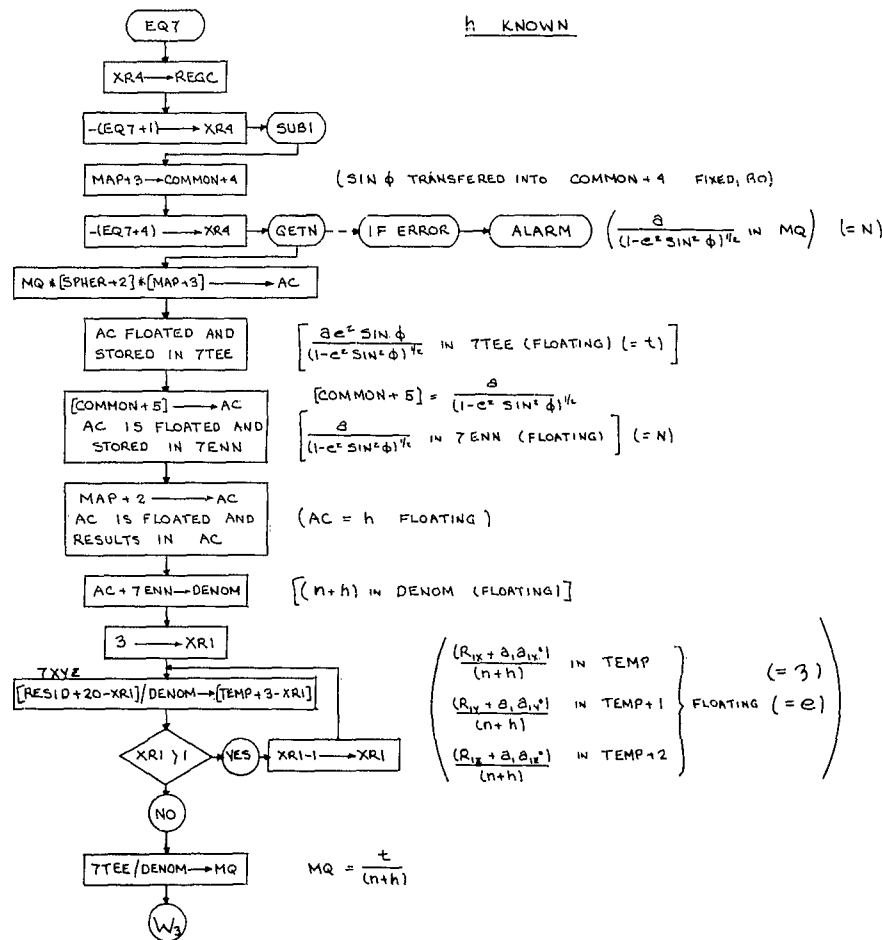
$$\begin{aligned}
 & 2(R_{1x} + a_{1x}^2) \text{ IN S2COMP } \left. \begin{array}{l} \text{FLOATING } (= \psi) \\ \text{FLOATING } (= \sigma) \end{array} \right\} \\
 & 2(R_{1y} + a_{1y}^2) \text{ IN S2COMP+1 }
 \end{aligned}$$

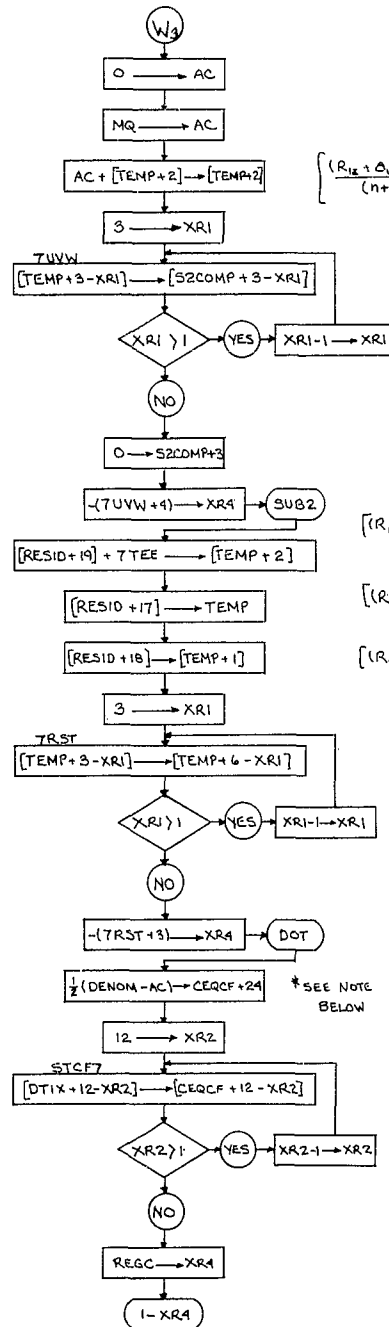
$(1 - e^2 \sin^2 \phi)^{1/2}$ (FIXED) IN TEMP

$$\begin{aligned}
 & \left[\frac{ae^2 \sin \phi}{(1 - e^2 \sin^2 \phi)^{1/2}} \text{ IN GSAVE (FLOATING) } (= t) \right] \\
 & \left[(t + R_{1x} + a_{1x}^2) \text{ IN TEMP+6 (FLOATING)} \right] \\
 & \left[-2(t + R_{1x} + a_{1x}^2) \text{ TEMP+2 (FLOATING)} \right]
 \end{aligned}$$



$$\begin{aligned}
& [\psi \delta_{1x} u_x + \phi (\delta_{1x} G_y - \delta_{1x} G_x) + \omega (\delta_{1x} G_y + \delta_{1x} G_x)] dT_{1x} \\
& + [\psi (\delta_{1x} G_y + \delta_{1x} G_x) + \phi \delta_{1x} G_y + \omega (\delta_{1x} G_y - \delta_{1x} G_x)] dT_{1y} \\
& + [\psi (\delta_{1x} G_x - \delta_{1x} G_y) + \phi (\delta_{1x} G_x + \delta_{1x} G_y) + \omega \delta_{1x} G_x] dT_{1z} \\
& + [(1 + \delta_{1x} + \phi \delta_{1x} + \omega \delta_{1x}) L_x + \psi] dR_{1x} \\
& + [(1 + \delta_{1x} + \phi \delta_{1x} + \omega \delta_{1x}) L_y + \psi] dR_{1y} \\
& + [(1 + \delta_{1x} + \phi \delta_{1x} + \omega \delta_{1x}) L_z + \psi] dR_{1z} \\
& + [(1 + \delta_{1x} + \phi \delta_{1x} + \omega \delta_{1x}) P_x] dT_{2x} \\
& + [(1 + \delta_{1x} + \phi \delta_{1x} + \omega \delta_{1x}) P_y] dT_{2y} \\
& + [(1 + \delta_{1x} + \phi \delta_{1x} + \omega \delta_{1x}) P_z] dT_{2z} \\
& + [(1 + \delta_{1x} + \phi \delta_{1x} + \omega \delta_{1x}) (-L_x)] dR_{2x} \\
& + [(1 + \delta_{1x} + \phi \delta_{1x} + \omega \delta_{1x}) (-L_y)] dR_{2y} \\
& + [(1 + \delta_{1x} + \phi \delta_{1x} + \omega \delta_{1x}) (-L_z)] dR_{2z} \\
& = \left[\frac{(R_{1x} + \delta_{1x} G_x + \psi)^2}{\tan^2 \phi} - (R_{1x} + \delta_{1x} G_x)^2 - (R_{1y} + \delta_{1x} G_y)^2 \right]
\end{aligned}$$





$\left[\frac{(R_{12} + a_{12} + t)}{(n+h)} \right]$ REPLACES TEMP + 2 (FLOATING) (= L1)

$\left\{ \begin{array}{l} 3 \text{ TRANSFERRED TO S2COMP} \\ 0 \text{ " " S2COMP+1} \\ < \text{ " " S2COMP+2} \end{array} \right\}$ FLOATING

$(R_{12} + a_{12} + t)$ IN TEMP+2 AND TRANSFERRED INTO TEMP+5

$(R_{12} + a_{12})$ IN TEMP " " TEMP+3

$(R_{12} + a_{12})$ IN TEMP+1 " " TEMP+4

TRANSFERRED TO CEQCF

$[3(a_{12}G_2) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX	CEQCF
$[3(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX+1	CEQCF+1
$[3(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX+2	CEQCF+2
$[3(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX+3	CEQCF+3
$[3(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX+4	CEQCF+4
$[3(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX+5	CEQCF+5
$[3(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX+6	CEQCF+6
$[3(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX+7	CEQCF+7
$[3(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX+8	CEQCF+8
$[3(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX+9	CEQCF+9
$[3(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX+10	CEQCF+10
$[3(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX+11	CEQCF+11
3	S2LAST	
0	S2LAST+1	
<	S2LAST+2	
$(R_{12} + a_{12})$	S2LAST+3	
$(R_{12} + a_{12})$	S2LAST+4	
$(R_{12} + a_{12})$	S2LAST+5	
$[3(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	COMMON	
$[-(a_{12}G_2 + a_{12}t) + \theta(a_{12}G_2 + a_{12}t) + (a_{12}G_2 + a_{12}t)]$	DTIX+18	
$\frac{1}{2} \left[(n+h) - \frac{[(R_{12} + a_{12})^2 + (R_{12} + a_{12}) + (R_{12} + a_{12}) + t]}{(n+h)} \right]$	CEQCF+24	

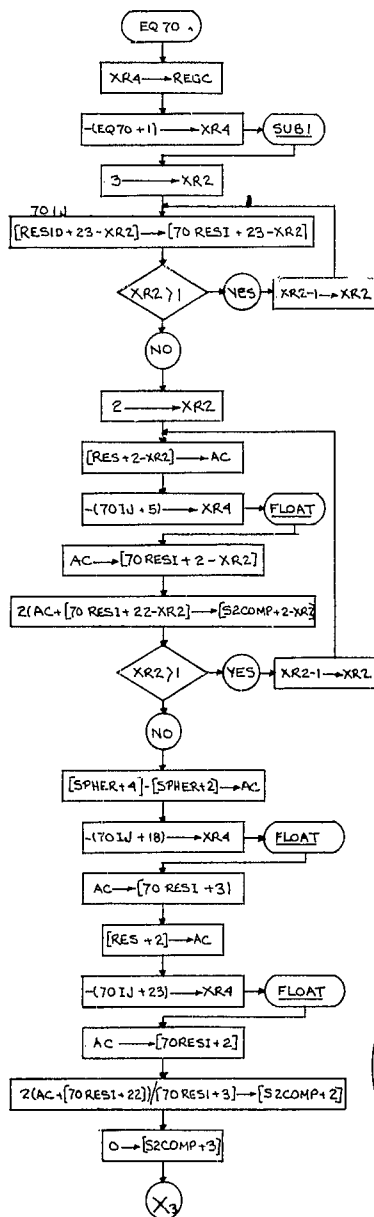
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$\left[\frac{1}{2} \left\{ (n+h) - \frac{[(R_{12} + a_{12})^2 + (R_{12} + a_{12}) + (R_{12} + a_{12}) + t]}{(n+h)} \right\} \right]$

IN CEQCF + 24

$$\begin{aligned}
& [(3 a_{1x} G_x) + (a_{1y} G_x - a_{1z} G_z) + (a_{1z} G_x + a_{1y} G_z)] dT_{1x} + [(3 a_{1y} G_y + a_{1z} G_z) + (a_{1z} G_y - a_{1x} G_x)] dT_{1y} + [(3 a_{1z} G_z - a_{1x} G_x) + (a_{1x} G_z + a_{1y} G_y)] dT_{1z} \\
& + [(3 a_{1x} G_x + a_{1y} G_y + a_{1z} G_z) L_y + 3] dR_{1x} + [(3 a_{1y} G_y + a_{1z} G_z) L_y + 3] dR_{1y} + [(3 a_{1z} G_z - a_{1x} G_x) L_z + 3] dR_{1z} \\
& + [(3 a_{1x} G_x + a_{1y} G_y + a_{1z} G_z) P_x] dT_{2x} + [(3 a_{1y} G_y + a_{1z} G_z) P_y] dT_{2y} + [(3 a_{1z} G_z - a_{1x} G_x) P_z] dT_{2z} \\
& + [(3 a_{1x} G_x + a_{1y} G_y + a_{1z} G_z) (-L_x)] dR_{2x} + [(3 a_{1y} G_y + a_{1z} G_z) (-L_y)] dR_{2y} + [(3 a_{1z} G_z - a_{1x} G_x) (-L_z)] dR_{2z} \\
& = \frac{1}{2} \left\{ (n+h) - \frac{[(R_{1x} + a_{1z} G_z)^2 + (R_{1y} + a_{1z} G_z)^2 + (R_{1z} + a_{1z} G_z)^2]}{(n+h)} \right\}
\end{aligned}$$



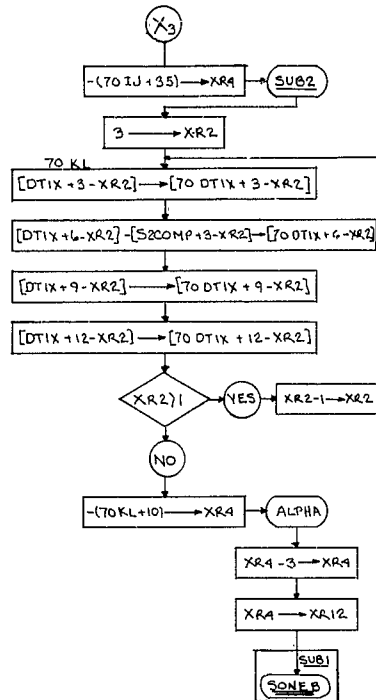
$L_x^{(1)}$	PLACED INTO	RESID
$L_y^{(1)}$	"	RESID + 1
$L_z^{(1)}$	"	RESID + 2
$P_x^{(1)}$	"	RESID + 3
$P_y^{(1)}$	"	RESID + 4
$P_z^{(1)}$	"	RESID + 5
$(a_{1x} G_x)^{(1)}$	"	RESID + 6
$(a_{1y} G_y - a_{1z} G_z)^{(1)}$	"	RESID + 7
$(a_{1z} G_x + a_{1y} G_z)^{(1)}$	"	RESID + 8
$(a_{1x} G_y + a_{1z} G_z)^{(1)}$	"	RESID + 9
$(a_{1y} G_y)^{(1)}$	"	RESID + 10
$(a_{1z} G_y - a_{1x} G_x)^{(1)}$	"	RESID + 11
$(a_{1x} G_z - a_{1y} G_z)^{(1)}$	"	RESID + 12
$(a_{1y} G_z - a_{1x} G_x)^{(1)}$	"	RESID + 13
$(a_{1z} G_z)^{(1)}$	"	RESID + 14
$(R_{1x} + a_{1z} G_z)^{(1)}$	"	RESID + 17
$(R_{1y} + a_{1z} G_z)^{(1)}$	"	RESID + 18
$(R_{1z} + a_{1z} G_z)^{(1)}$	"	RESID + 19
$(a_{1x} G_x)^{(1)}$	"	RESID + 20
$(a_{1y} G_y)^{(1)}$	"	RESID + 21
$(a_{1z} G_z)^{(1)}$	"	RESID + 22

$(a_{1x} G_x)^{(1)}$ TRANSFERRED TO 70 RESI + 20
 $(a_{1y} G_y)^{(1)}$ " " 70 RESI + 21
 $(a_{1z} G_z)^{(1)}$ " " 70 RESI + 22

R_{1x} PLACED INTO 70 RESI
 R_{1y} " " 70 RESI + 1 } FLOATING
 $2(R_{1x} + a_{1z} G_z)^{(1)}$ PLACED INTO S2COMP
 $2(R_{1y} + a_{1z} G_z)^{(1)}$ " " S2COMP + 1 } FLOATING

$(1 - e^c)$ PLACED INTO 70 RESI + 3 (FLOATING!)

R_{1z} PLACED INTO 70 RESI + 2
 $(2R_{1z} + a_{1z} G_z)^{(1)}$ " " S2COMP + 2 } FLOATING
 $(1 - e^c)$ " " S2COMP + 3 } FLOATING



PLACED INTO DTIX

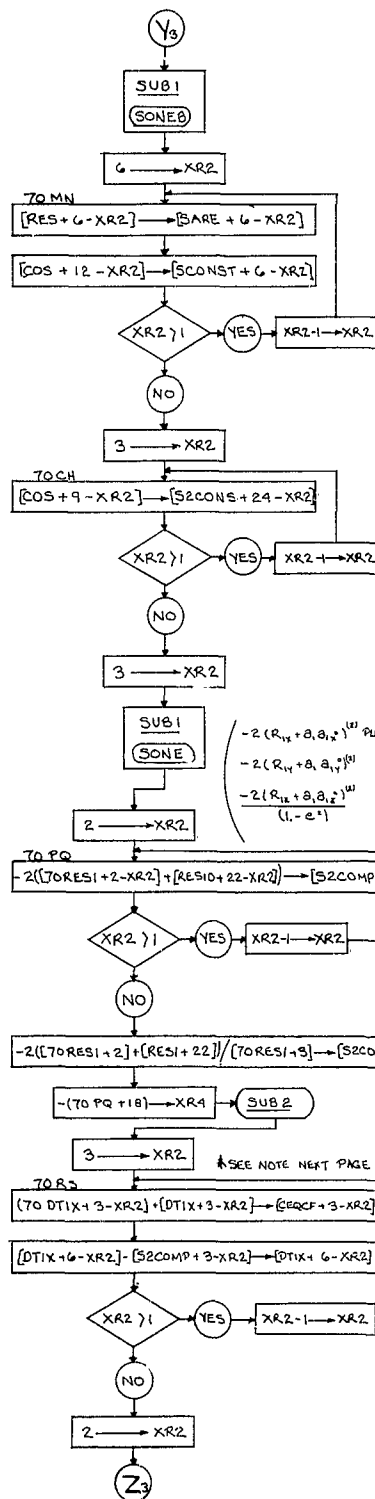
$[(\partial_{1x} G_x \gamma_x + (\partial_{1y} G_x - \partial_{1z} G_z) \gamma_y + (\partial_{1z} G_x + \partial_{1y} G_z) \gamma_z)]^{(1)}$	DTIX
$[(\partial_{1x} G_y + \partial_{1z} G_z) \gamma_x + (\partial_{1y} G_y \gamma_y + (\partial_{1z} G_y - \partial_{1y} G_z) \gamma_z)]^{(1)}$	DTIX + 1
$[(\partial_{1x} G_z - \partial_{1y} G_z) \gamma_x + (\partial_{1y} G_z + \partial_{1x} G_z) \gamma_y + (\partial_{1z} G_z) \gamma_z]^{(1)}$	DTIX + 2
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_x + 2(R_{1x} + \partial_{1x} \gamma_x)\}^{(1)}$	DTIX + 3
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_y + 2(R_{1y} + \partial_{1y} \gamma_y)\}^{(1)}$	DTIX + 4
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_z + 2(R_{1z} + \partial_{1z} \gamma_z)\}^{(1)}$	DTIX + 5
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_x + 2(R_{1x} + \partial_{1x} \gamma_x)\}^{(1)}$	DTIX + 6
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_y + 2(R_{1y} + \partial_{1y} \gamma_y)\}^{(1)}$	DTIX + 7
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_z + 2(R_{1z} + \partial_{1z} \gamma_z)\}^{(1)}$	DTIX + 8
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_x + 2(R_{1x} + \partial_{1x} \gamma_x)\}^{(1)}$	DTIX + 9
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_y + 2(R_{1y} + \partial_{1y} \gamma_y)\}^{(1)}$	DTIX + 10
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_z + 2(R_{1z} + \partial_{1z} \gamma_z)\}^{(1)}$	DTIX + 11
$-[2(R_{1x} + \partial_{1x} \gamma_x)^2 + 2(R_{1y} + \partial_{1y} \gamma_y)^2 + 2(R_{1z} + \partial_{1z} \gamma_z)^2]^{(1)}$	DTIX + 12

FLATTENING

TRANSFERRED INTO 70 DTIX + 0

$[(\partial_{1x} G_x \gamma_x + (\partial_{1y} G_x - \partial_{1z} G_z) \gamma_y + (\partial_{1z} G_x + \partial_{1y} G_z) \gamma_z)]^{(1)}$	70 DTIX + 0
$[(\partial_{1x} G_y + \partial_{1z} G_z) \gamma_x + (\partial_{1y} G_y \gamma_y + (\partial_{1z} G_y - \partial_{1y} G_z) \gamma_z)]^{(1)}$	70 DTIX + 1
$[(\partial_{1x} G_z - \partial_{1y} G_z) \gamma_x + (\partial_{1y} G_z + \partial_{1x} G_z) \gamma_y + (\partial_{1z} G_z) \gamma_z]^{(1)}$	70 DTIX + 2
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_x + 2(R_{1x} + \partial_{1x} \gamma_x)\}^{(1)}$	70 DTIX + 3
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_y + 2(R_{1y} + \partial_{1y} \gamma_y)\}^{(1)}$	70 DTIX + 4
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_z + 2(R_{1z} + \partial_{1z} \gamma_z)\}^{(1)}$	70 DTIX + 5
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_x + 2(R_{1x} + \partial_{1x} \gamma_x)\}^{(1)}$	70 DTIX + 6
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_y + 2(R_{1y} + \partial_{1y} \gamma_y)\}^{(1)}$	70 DTIX + 7
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_z + 2(R_{1z} + \partial_{1z} \gamma_z)\}^{(1)}$	70 DTIX + 8
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_x + 2(R_{1x} + \partial_{1x} \gamma_x)\}^{(1)}$	70 DTIX + 9
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_y + 2(R_{1y} + \partial_{1y} \gamma_y)\}^{(1)}$	70 DTIX + 10
$\{(\partial_{1x} \gamma_x + \partial_{1y} \gamma_y + \partial_{1z} \gamma_z) L_z + 2(R_{1z} + \partial_{1z} \gamma_z)\}^{(1)}$	70 DTIX + 11

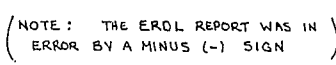
FLATTENING

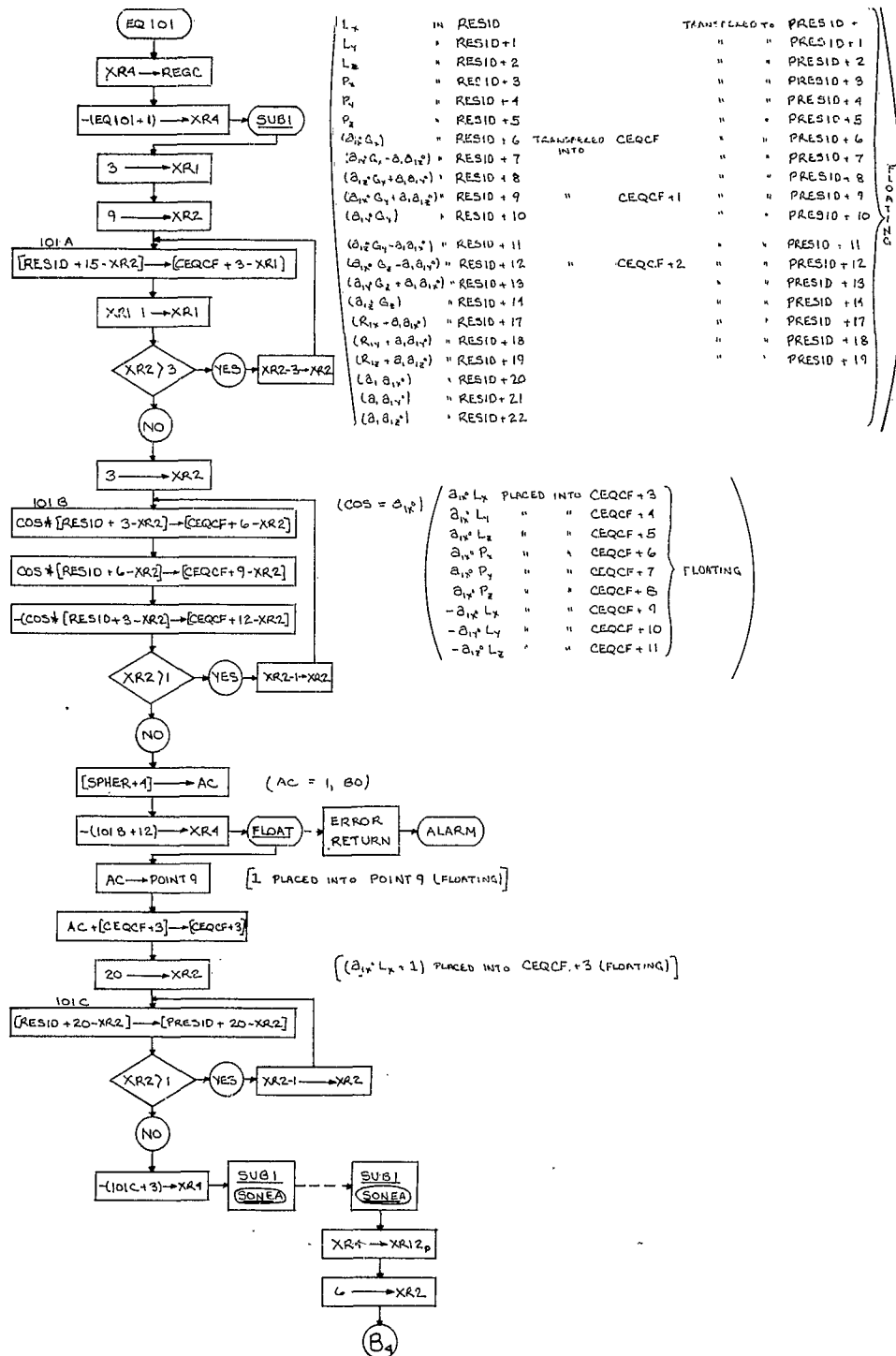


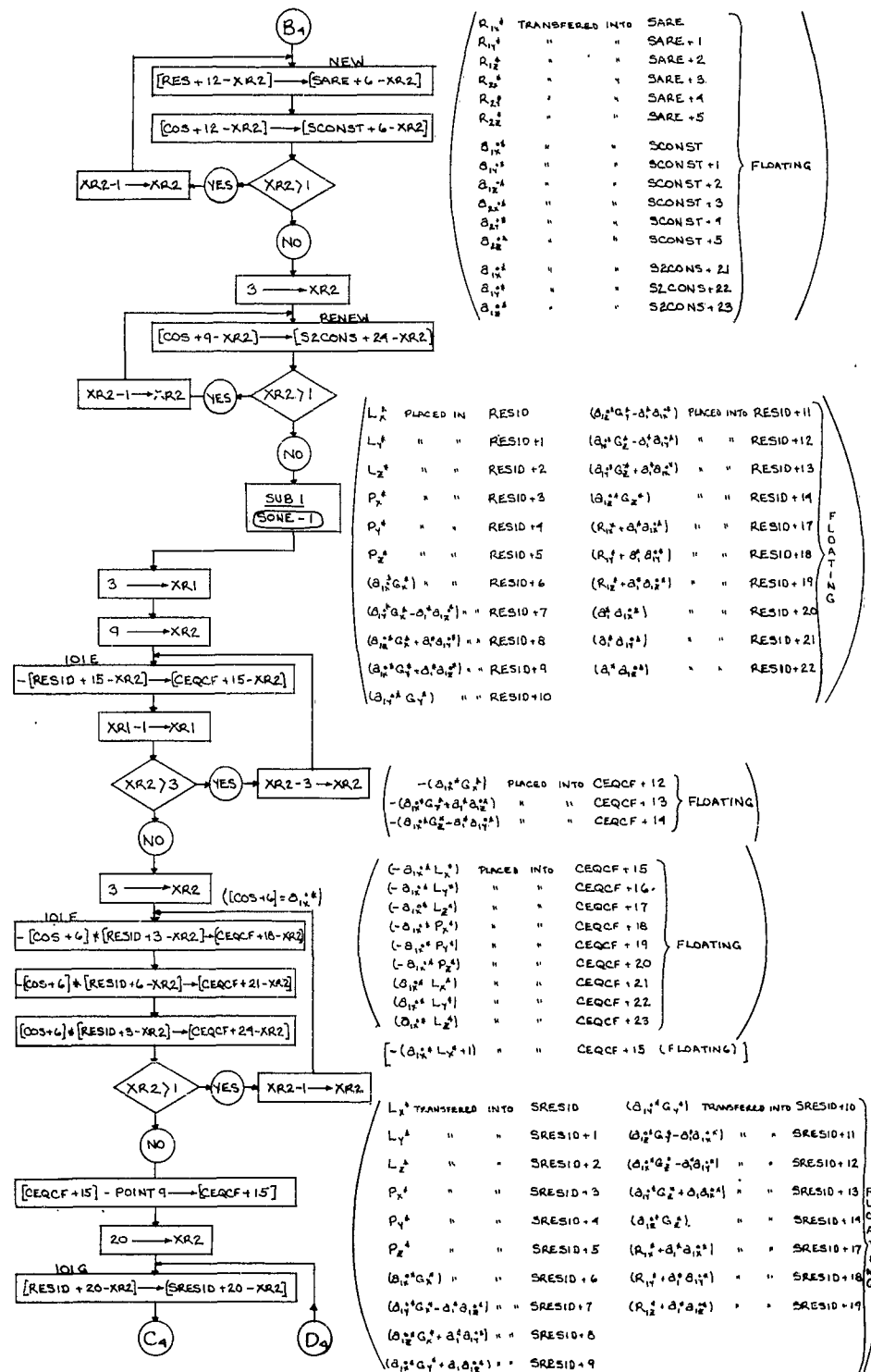
R _{ix} TRANSFERRED INTO SARE		
R _{ix}	"	SARE + 1
R _{ix}	"	SARE + 2
R _{ix}	"	SARE + 3
R _{ix}	"	SARE + 4
R _{ix}	"	SARE + 5
a _{ix} ⁽¹⁾	"	SCONST AND S2CONS + 21
a _{ix} ⁽²⁾	"	SCONST + 1 " S2CONS + 22
a _{ix} ⁽³⁾	"	SCONST + 2 " S2CONS + 23
a _{ix} ⁽⁴⁾	"	SCONST + 3
a _{ix} ⁽⁵⁾	"	SCONST + 4
a _{ix} ⁽⁶⁾	"	SCONST + 5

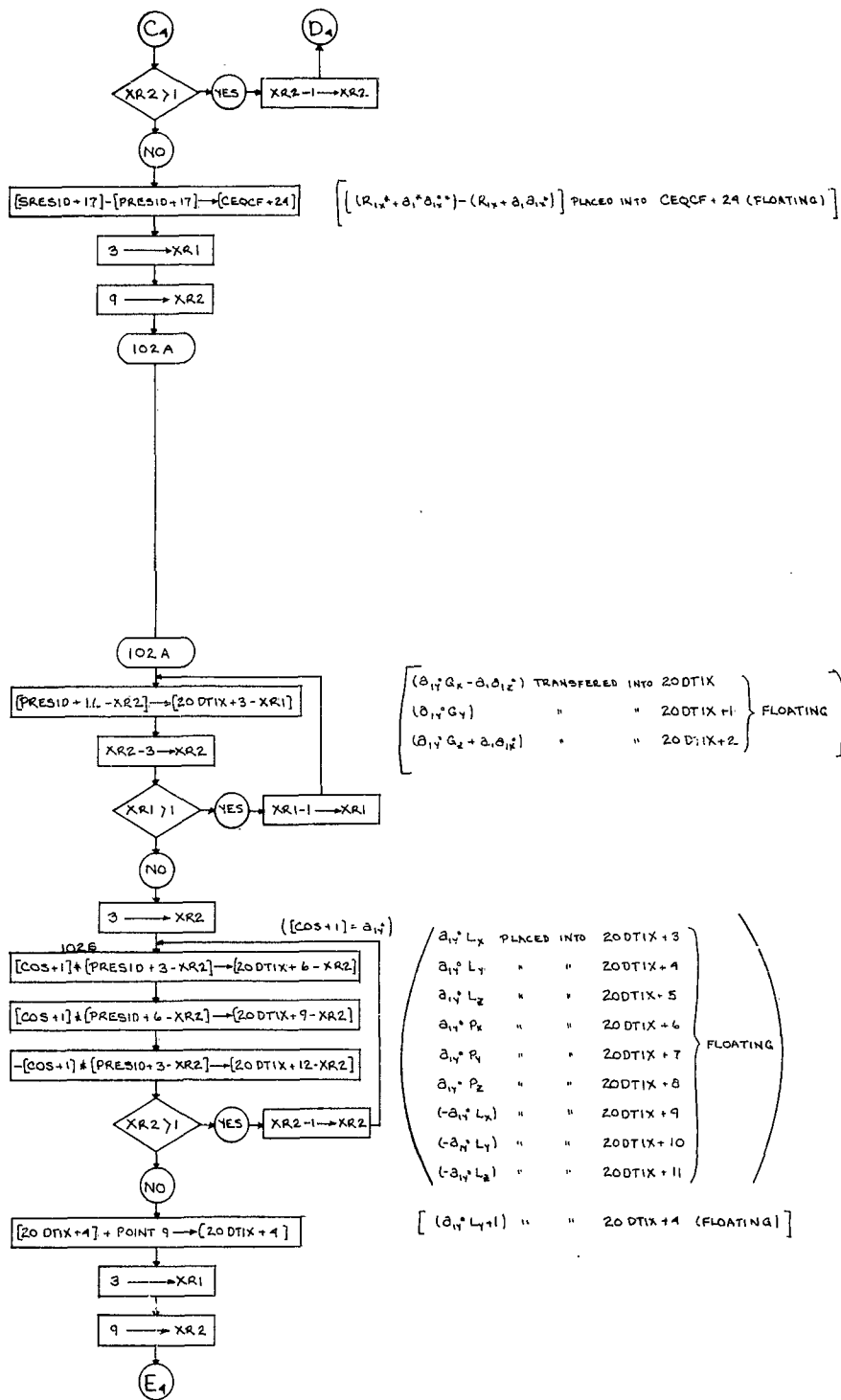
L _{ix} ⁽¹⁾	PLACED INTO	RESID
L _{ix} ⁽²⁾	"	RESID + 1
L _{ix} ⁽³⁾	"	RESID + 2
P _{ix} ⁽¹⁾	"	RESID + 3
P _{ix} ⁽²⁾	"	RESID + 4
P _{ix} ⁽³⁾	"	RESID + 5
(a _{ix} G _{ix}) ⁽¹⁾	"	RESID + 6
(a _{ix} G _{ix} - a _{ix} a _{ix}) ⁽¹⁾	"	RESID + 7
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	RESID + 8
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	RESID + 9
(a _{ix} G _{ix}) ⁽¹⁾	"	RESID + 10
(a _{ix} G _{ix} - a _{ix} a _{ix}) ⁽¹⁾	"	RESID + 11
(a _{ix} G _{ix} - a _{ix} a _{ix}) ⁽¹⁾	"	RESID + 12
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	RESID + 13
(a _{ix} G _{ix}) ⁽¹⁾	"	RESID + 14
(R _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	RESID + 17
(R _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	RESID + 18
(R _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	RESID + 19
(a _{ix} a _{ix}) ⁽¹⁾	"	RESID + 20
(a _{ix} a _{ix}) ⁽¹⁾	"	RESID + 21
(a _{ix} a _{ix}) ⁽¹⁾	"	RESID + 22

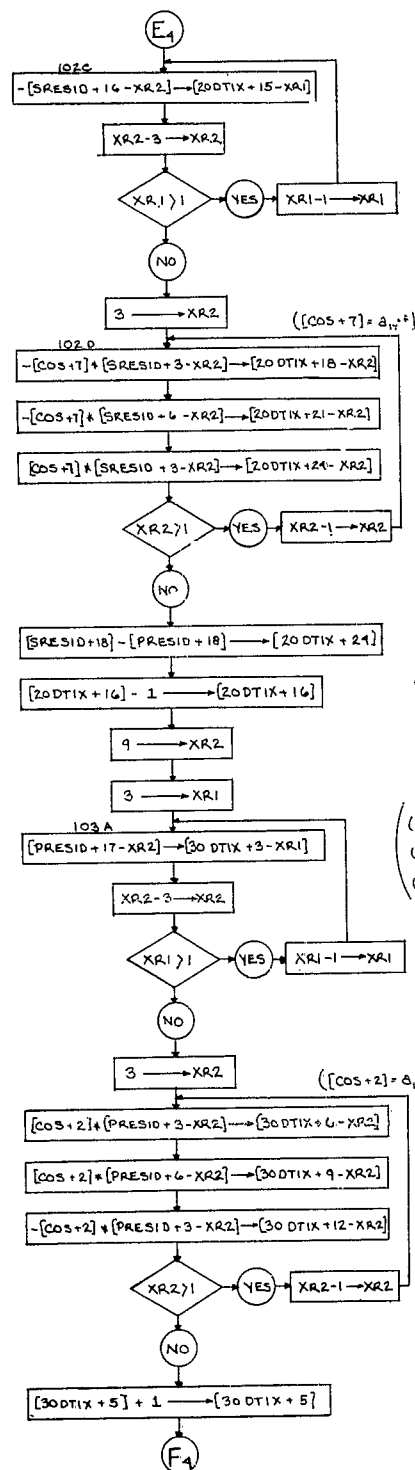
PLACED INTO DTIX		
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	DTIX + 1
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	DTIX + 2
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	DTIX + 3
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	DTIX + 4
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	DTIX + 5
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	DTIX + 6
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	DTIX + 7
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	DTIX + 8
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	DTIX + 9
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	DTIX + 10
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	DTIX + 11
(a _{ix} G _{ix} + a _{ix} a _{ix}) ⁽¹⁾	"	DTIX + 12











$$\left(\begin{array}{l} -(\delta_{11}^* G_K^* - \delta_{12}^* G_L^*) \text{ TRANSFERRED INTO } 20DTIX+12 \\ -(\delta_{11}^* G_Y^*) \text{ " " } 20DTIX+13 \\ -(\delta_{11}^* G_Z^* + \delta_{12}^* G_X^*) \text{ " " } 20DTIX+14 \end{array} \right) \text{ FLOATING}$$

$$\left(\begin{array}{l} (-\delta_{11}^* L_X^*) \text{ PLACED INTO } 20DTIX+15 \\ (-\delta_{11}^* L_Y^*) \text{ " " } 20DTIX+16 \\ (-\delta_{11}^* L_Z^*) \text{ " " } 20DTIX+17 \\ (-\delta_{11}^* P_X^*) \text{ " " } 20DTIX+18 \\ (-\delta_{11}^* P_Y^*) \text{ " " } 20DTIX+19 \\ (-\delta_{11}^* P_Z^*) \text{ " " } 20DTIX+20 \\ (\delta_{11}^* L_X^*) \text{ " " } 20DTIX+21 \\ (\delta_{11}^* L_Y^*) \text{ " " } 20DTIX+22 \\ (\delta_{11}^* L_Z^*) \text{ " " } 20DTIX+23 \end{array} \right) \text{ FLOATING}$$

$$\left[\begin{array}{l} (R_{11}^* + \delta_{11}^* - (R_{11} + \delta_{11}^*)) \text{ PLACED INTO } 20DTIX+24 \text{ (FLOATING)} \\ [-(\delta_{11}^* L_Y^* + 1) \text{ " " } 20DTIX+16 \text{ " "}] \end{array} \right]$$

$$\left(\begin{array}{l} (\delta_{12}^* G_K^* + \delta_{11}^* G_L^*) \text{ TRANSFERRED INTO } 30DTIX \\ (\delta_{12}^* G_Y^* + \delta_{11}^* G_Z^*) \text{ " " } 30DTIX+1 \\ (\delta_{12}^* G_X^*) \text{ " " } 30DTIX+2 \end{array} \right) \text{ FLOATING}$$

$$\left(\begin{array}{l} (\delta_{12}^* L_X^*) \text{ PLACED INTO } 30DTIX+3 \\ (\delta_{12}^* L_Y^*) \text{ " " } 30DTIX+4 \\ (\delta_{12}^* L_Z^*) \text{ " " } 30DTIX+5 \\ (\delta_{12}^* P_X^*) \text{ " " } 30DTIX+6 \\ (\delta_{12}^* P_Y^*) \text{ " " } 30DTIX+7 \\ (\delta_{12}^* P_Z^*) \text{ " " } 30DTIX+8 \\ (-\delta_{12}^* L_X^*) \text{ " " } 30DTIX+9 \\ (-\delta_{12}^* L_Y^*) \text{ " " } 30DTIX+10 \\ (-\delta_{12}^* L_Z^*) \text{ " " } 30DTIX+11 \end{array} \right) \text{ FLOATING}$$

$$[(\delta_{12}^* L_Z^* + 1) \text{ " " } 30DTIX+5 \text{ (FLOATING)}]$$

SUMMARY of EQ 102

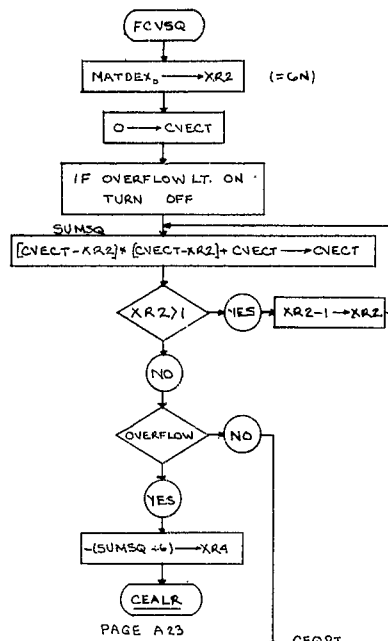
$(\partial_{11}^* G_x - \partial_1 \partial_{11}^*)$ IN	30DTIX TRANSFERRED LATER INTO	CEQCF	
$(\partial_{11}^* G_x)$	" 30DTIX+1 "	CEQCF+1	
$(\partial_{11}^* G_x + \partial_1 \partial_{11}^*)$	" 30DTIX+2 "	CEQCF+2	
$(\partial_{11}^* L_x)$	" 30DTIX+3 "	CEQCF+3	
$(\partial_{11}^* L_x + 1)$	" 30DTIX+4 "	CEQCF+4	
$(\partial_{11}^* L_x)$	" 30DTIX+5 "	CEQCF+5	
$(\partial_{11}^* P_x)$	" 30DTIX+6 "	CEQCF+6	
$(\partial_{11}^* P_x)$	" 30DTIX+7 "	CEQCF+7	
$(\partial_{11}^* P_x)$	" 30DTIX+8 "	CEQCF+8	
$(-\partial_{11}^* L_y)$	" 30DTIX+9 "	CEQCF+9	
$(-\partial_{11}^* L_y)$	" 30DTIX+10 "	CEQCF+10	
$(-\partial_{11}^* L_y)$	" 30DTIX+11 "	CEQCF+11	
$(-\partial_{11}^* G_x^2 - \partial_1^2 \partial_{11}^*)$	" 30DTIX+12 "	CEQCF+12	
$(-\partial_{11}^* G_x^2)$	" 30DTIX+13 "	CEQCF+13	
$(-\partial_{11}^* G_x^2 + \partial_1^2 \partial_{11}^*)$	" 30DTIX+14 "	CEQCF+14	
$(-\partial_{11}^* L_y^2)$	" 30DTIX+15 "	CEQCF+15	
$(-\partial_{11}^* L_y^2 + 1)$	" 30DTIX+16 "	CEQCF+16	
$(-\partial_{11}^* L_y^2)$	" 30DTIX+17 "	CEQCF+17	
$(-\partial_{11}^* P_x^2)$	" 30DTIX+18 "	CEQCF+18	
$(-\partial_{11}^* P_x^2)$	" 30DTIX+19 "	CEQCF+19	
$(-\partial_{11}^* P_x^2)$	" 30DTIX+20 "	CEQCF+20	
$(\partial_{11}^* L_x^2)$	" 30DTIX+21 "	CEQCF+21	
$(\partial_{11}^* L_y^2)$	" 30DTIX+22 "	CEQCF+22	
$(\partial_{11}^* L_x^2)$	" 30DTIX+23 "	CEQCF+23	
$[(R_{11}^* + \partial_1^2 \partial_{11}^*) - (R_{11} + \partial_1 \partial_{11}^*)]$ IN	30DTIX+24 "	CEQCF+24	

$$\begin{aligned}
 & (\partial_{11}^* G_x - \partial_1 \partial_{11}^*) dT_{11} + (\partial_{11}^* G_x) dT_{11} + (\partial_{11}^* G_x - \partial_1 \partial_{11}^*) dT_{11} \\
 & + (\partial_{11}^* L_x) dR_{11} + (\partial_{11}^* L_x + 1) dR_{11} + (\partial_{11}^* L_x) dR_{11} \\
 & + (\partial_{11}^* P_x) dT_{21} + (\partial_{11}^* P_x) dT_{21} + (\partial_{11}^* P_x) dT_{21} \\
 & - (\partial_{11}^* L_y) dR_{21} - (\partial_{11}^* L_y) dR_{21} - (\partial_{11}^* L_y) dR_{21} \\
 & - (\partial_{11}^* G_x^2 - \partial_1^2 \partial_{11}^*) dT_{11} - (\partial_{11}^* G_x^2) dT_{11} - (\partial_{11}^* G_x^2 + \partial_1^2 \partial_{11}^*) dT_{11} \\
 & - (\partial_{11}^* L_y^2) dR_{11} - (\partial_{11}^* L_y^2 + 1) dR_{11} - (\partial_{11}^* L_y^2) dR_{11} \\
 & - (\partial_{11}^* P_x^2) dT_{21} - (\partial_{11}^* P_x^2) dT_{21} - (\partial_{11}^* P_x^2) dT_{21} \\
 & + (\partial_{11}^* L_x^2) dR_{21} + (\partial_{11}^* L_x^2) dR_{21} + (\partial_{11}^* L_x^2) dR_{21} \\
 & = R_{11}^* + \partial_1^2 \partial_{11}^* - R_{11} - \partial_1 \partial_{11}^*
 \end{aligned}$$

SUMMARY of EQ 103

$(\partial_{12}^* G_x + \partial_1 \partial_{12}^*)$ IN	30DTIX TRANSFERRED LATER INTO	CEQCF	
$(\partial_{12}^* G_x - \partial_1 \partial_{12}^*)$	" 30DTIX+1 "	CEQCF+1	
$(\partial_{12}^* G_x)$	" 30DTIX+2 "	CEQCF+2	
$(\partial_{12}^* L_x)$	" 30DTIX+3 "	CEQCF+3	
$(\partial_{12}^* L_x)$	" 30DTIX+4 "	CEQCF+4	
$(\partial_{12}^* L_x + 1)$	" 30DTIX+5 "	CEQCF+5	
$(\partial_{12}^* P_x)$	" 30DTIX+6 "	CEQCF+6	
$(\partial_{12}^* P_x)$	" 30DTIX+7 "	CEQCF+7	
$(\partial_{12}^* P_x)$	" 30DTIX+8 "	CEQCF+8	
$(-\partial_{12}^* L_y)$	" 30DTIX+9 "	CEQCF+9	
$(-\partial_{12}^* L_y)$	" 30DTIX+10 "	CEQCF+10	
$(-\partial_{12}^* L_y)$	" 30DTIX+11 "	CEQCF+11	
$(-\partial_{12}^* G_x^2 + \partial_1^2 \partial_{12}^*)$	" 30DTIX+12 "	CEQCF+12	
$(-\partial_{12}^* G_x^2 - \partial_1^2 \partial_{12}^*)$	" 30DTIX+13 "	CEQCF+13	
$(-\partial_{12}^* G_x^2)$	" 30DTIX+14 "	CEQCF+14	
$(-\partial_{12}^* L_x^2)$	" 30DTIX+15 "	CEQCF+15	
$(-\partial_{12}^* L_x^2 + 1)$	" 30DTIX+16 "	CEQCF+16	
$(-\partial_{12}^* L_x^2)$	" 30DTIX+17 "	CEQCF+17	
$(-\partial_{12}^* P_x^2)$	" 30DTIX+18 "	CEQCF+18	
$(-\partial_{12}^* P_x^2)$	" 30DTIX+19 "	CEQCF+19	
$(-\partial_{12}^* P_x^2)$	" 30DTIX+20 "	CEQCF+20	
$(\partial_{12}^* L_x^2)$	" 30DTIX+21 "	CEQCF+21	
$(\partial_{12}^* L_y^2)$	" 30DTIX+22 "	CEQCF+22	
$(\partial_{12}^* L_x^2)$	" 30DTIX+23 "	CEQCF+23	
$[(R_{12}^* + \partial_1^2 \partial_{12}^*) - (R_{12} + \partial_1 \partial_{12}^*)]$ IN	30DTIX+24 "	CEQCF+24	

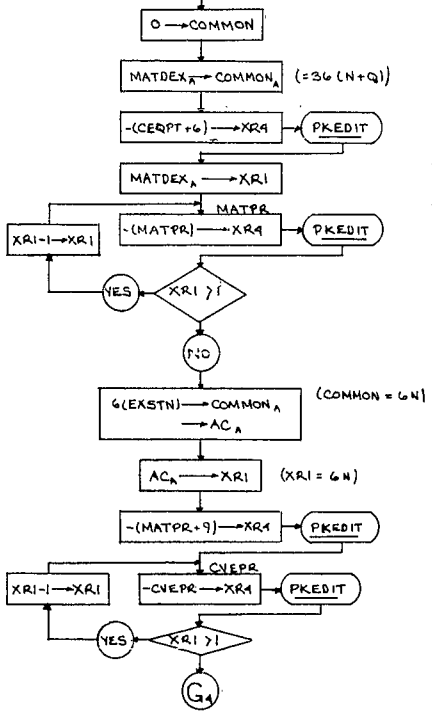
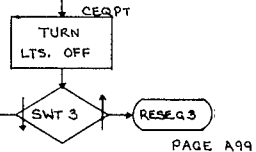
$$\begin{aligned}
 & (\partial_{12}^* G_x + \partial_1 \partial_{12}^*) dT_{11} + (\partial_{12}^* G_x - \partial_1 \partial_{12}^*) dT_{11} + (\partial_{12}^* G_x) dT_{11} \\
 & + (\partial_{12}^* L_x) dR_{11} + (\partial_{12}^* L_x + 1) dR_{11} + (\partial_{12}^* L_x) dR_{11} \\
 & + (\partial_{12}^* P_x) dT_{21} + (\partial_{12}^* P_x) dT_{21} + (\partial_{12}^* P_x) dT_{21} \\
 & - (\partial_{12}^* L_y) dR_{21} - (\partial_{12}^* L_y) dR_{21} - (\partial_{12}^* L_y) dR_{21} \\
 & - (\partial_{12}^* G_x^2 + \partial_1^2 \partial_{12}^*) dT_{11} - (\partial_{12}^* G_x^2 - \partial_1^2 \partial_{12}^*) dT_{11} - (\partial_{12}^* G_x^2) dT_{11} \\
 & - (\partial_{12}^* L_x^2) dR_{11} - (\partial_{12}^* L_x^2 + 1) dR_{11} - (\partial_{12}^* L_x^2) dR_{11} \\
 & - (\partial_{12}^* P_x^2) dT_{21} - (\partial_{12}^* P_x^2) dT_{21} - (\partial_{12}^* P_x^2) dT_{21} \\
 & + (\partial_{12}^* L_x^2) dR_{21} + (\partial_{12}^* L_x^2) dR_{21} + (\partial_{12}^* L_x^2) dR_{21} \\
 & = R_{12}^* + \partial_1^2 \partial_{12}^* - R_{12} - \partial_1 \partial_{12}^*
 \end{aligned}$$



$$CNECT = \sum_{i=1}^{6N} \epsilon_i^2$$

WHERE ϵ = NORMAL EQUATION VALUE

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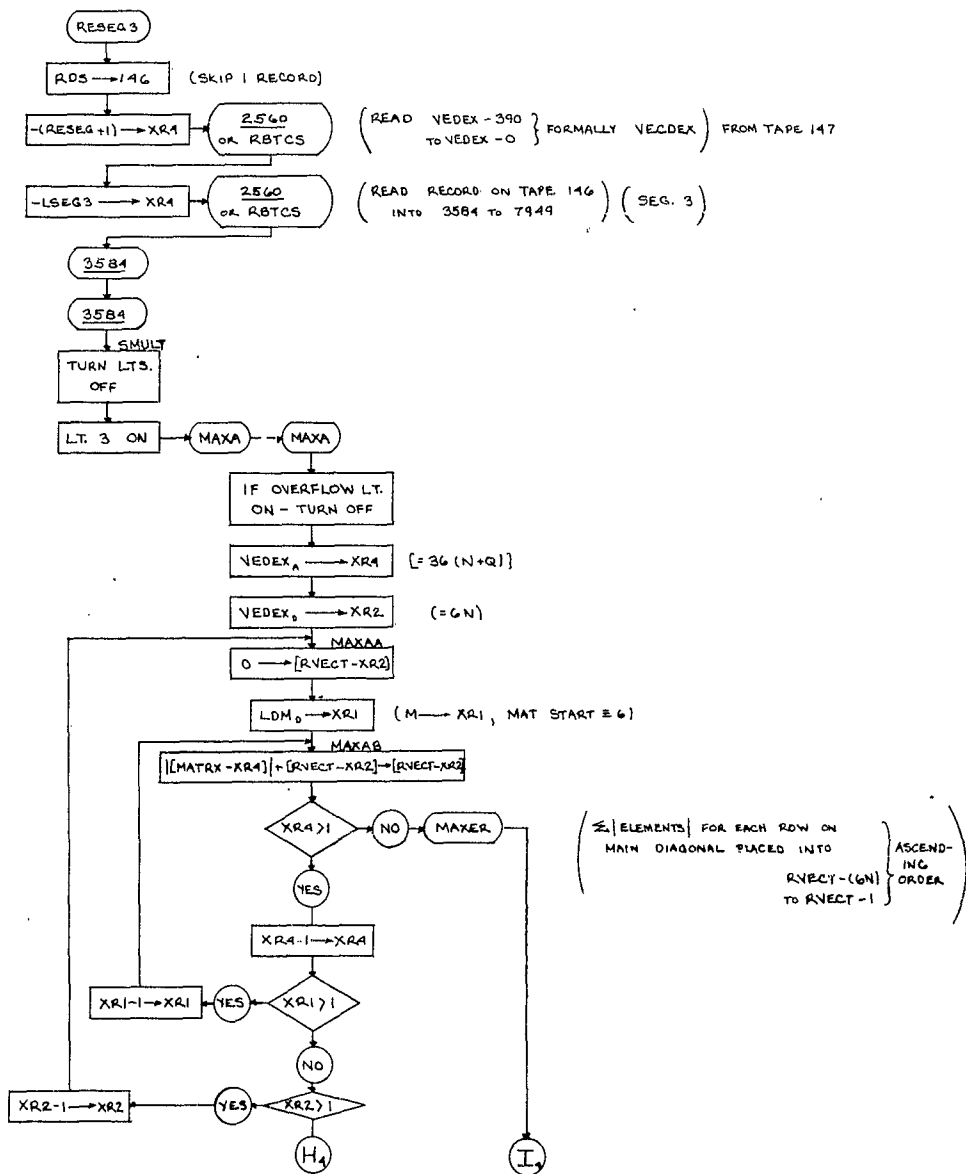
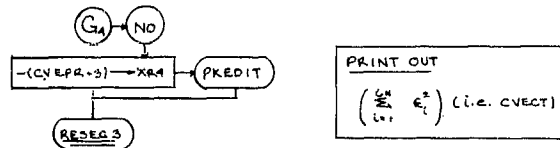


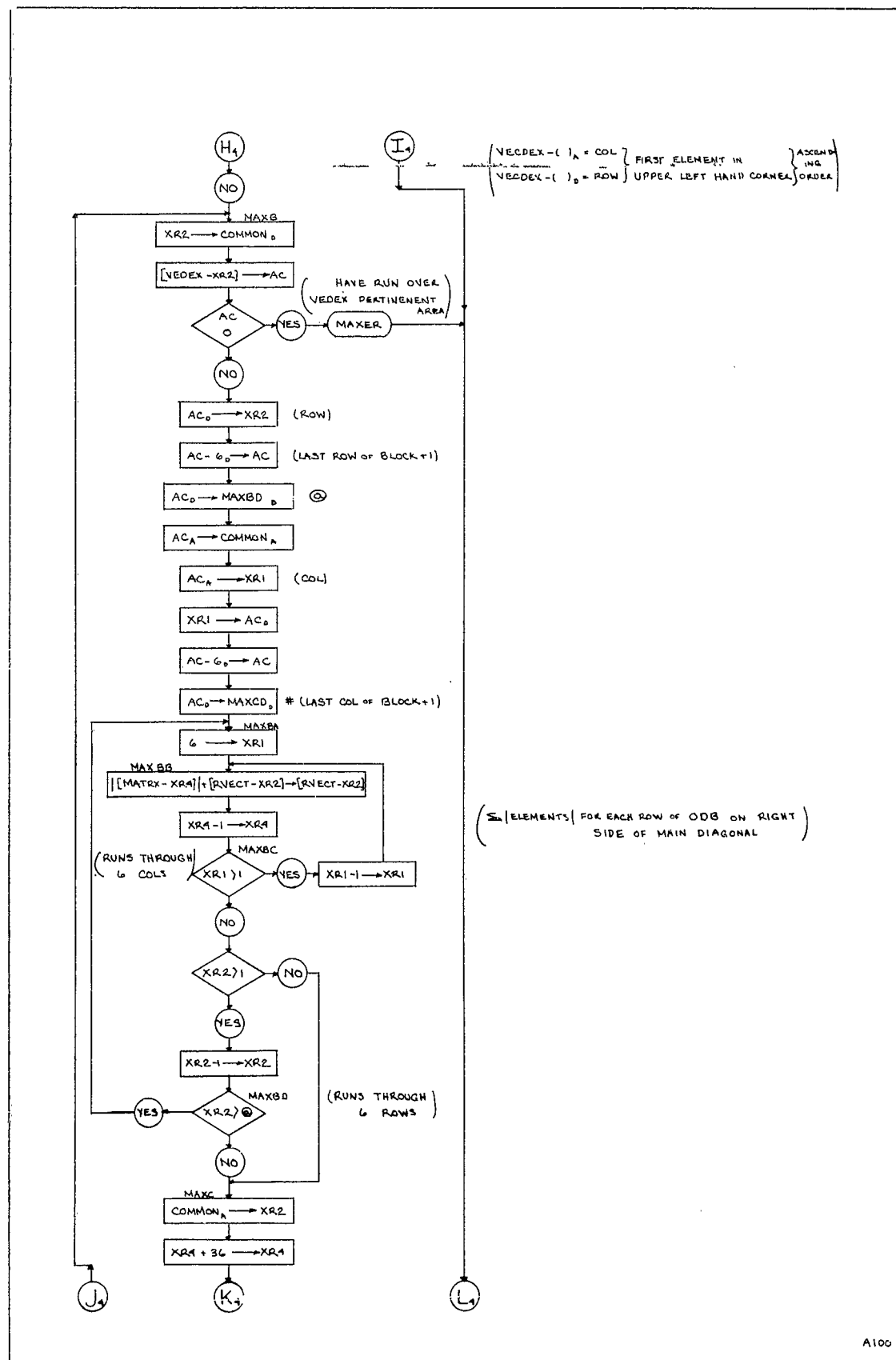
PRINT OUT
"NORMAL MATRIX" (N) "PHOTOS" [36(N+Q)] "ELEMENTS"

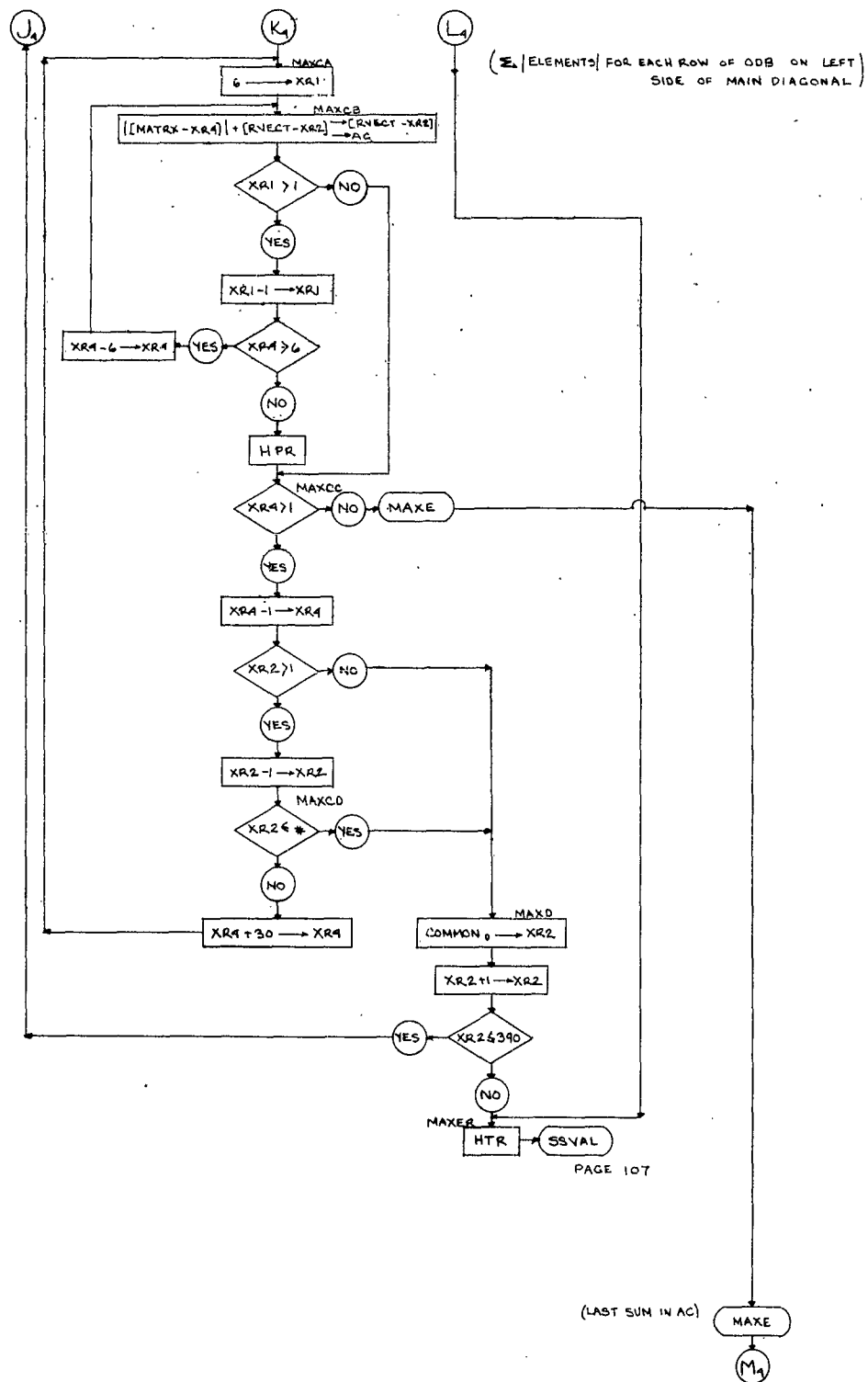
PRINT OUT
ALL THE NORMAL MATRIX (NON-ZERO BLOCKS) ELEMENTS

PRINT OUT
"CONSTANT VECTOR, ORDER" (6N)

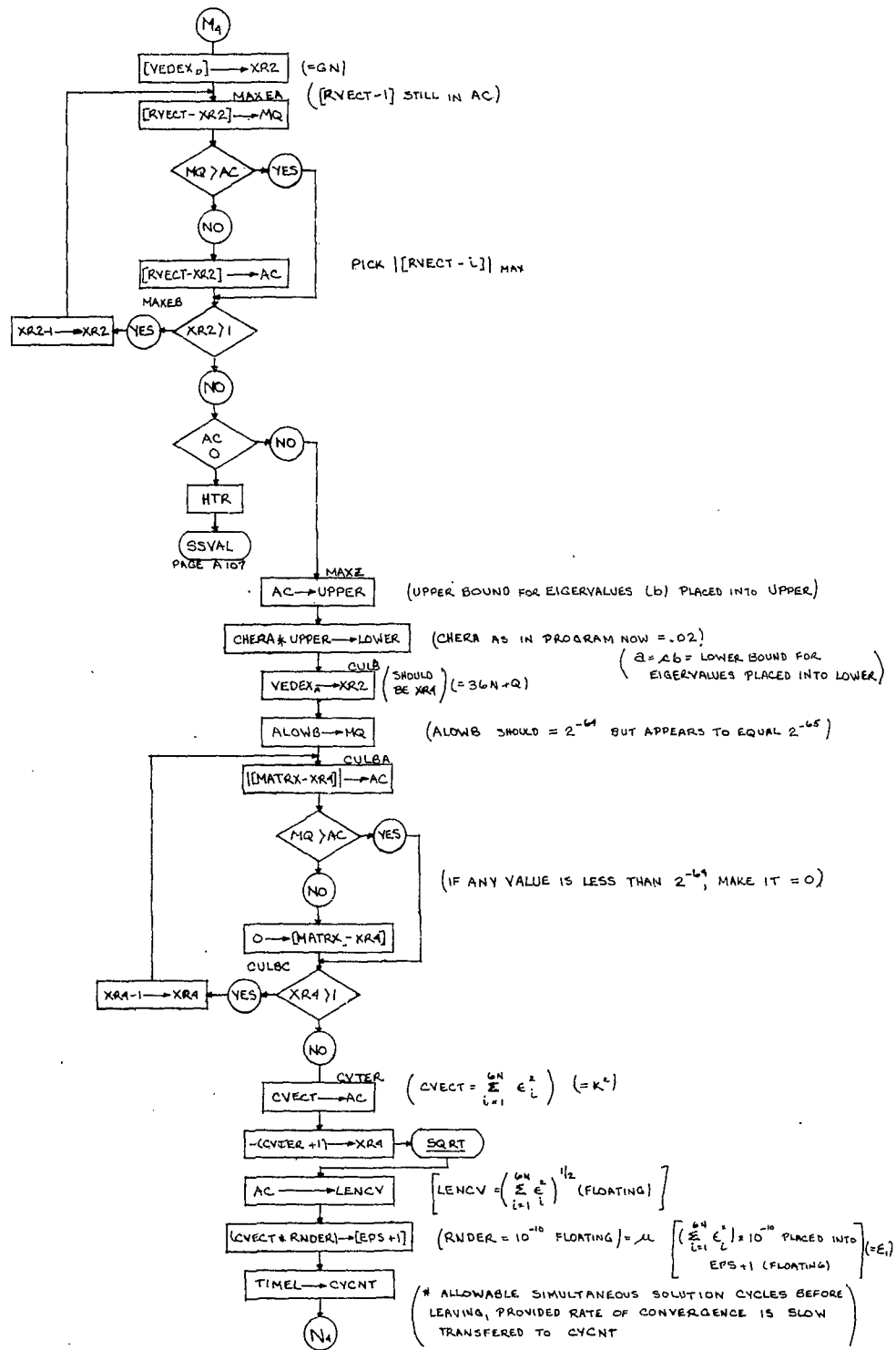
PRINT OUT
ALL THE APPROPRIATE VALUES (6N)

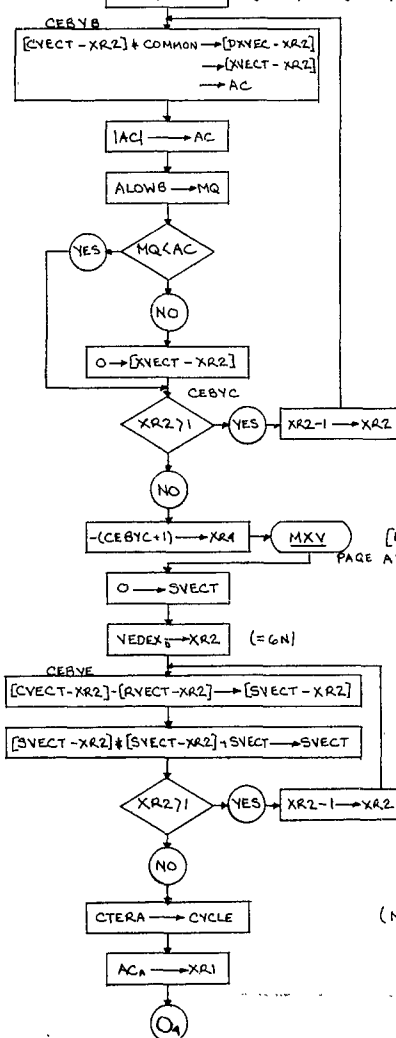
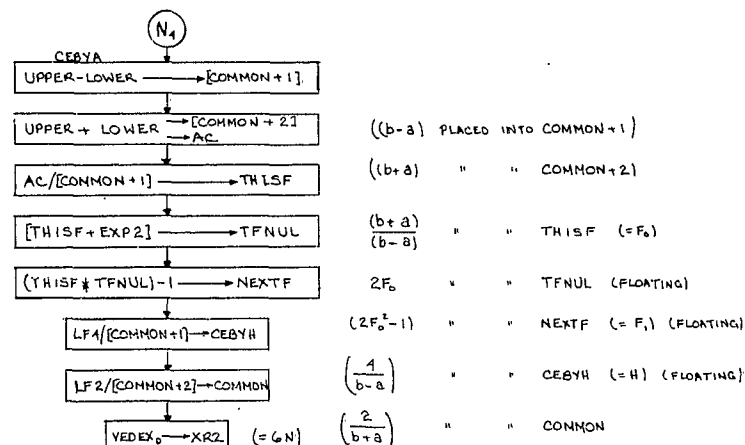






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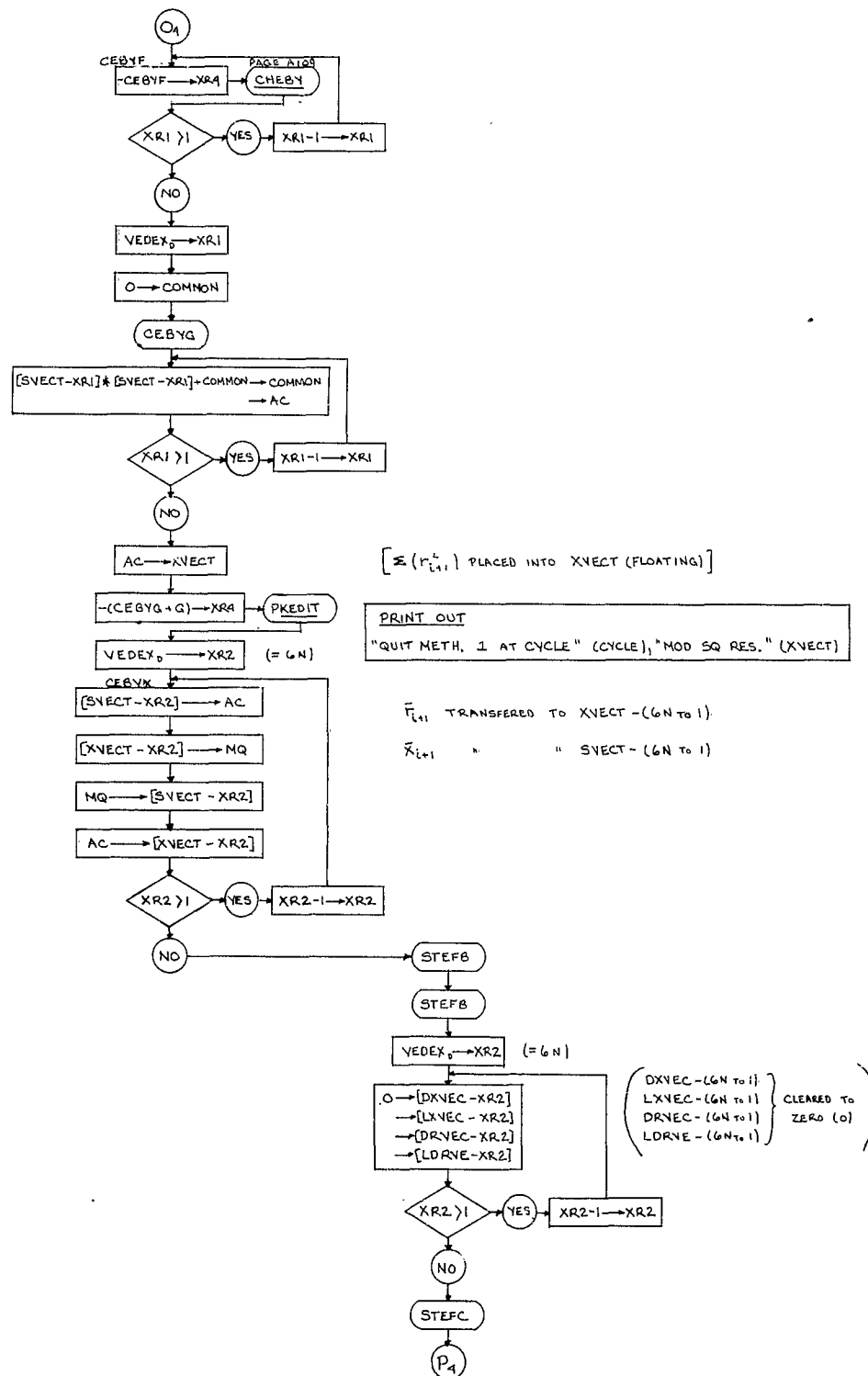
STARTING VECTOR
 $\left\{ \frac{2}{b+a} \right\}^T$ PLACED INTO DXVEC- (...) (= $\Delta \bar{X}_0$)
 $\&$ XNVEC- (...) (= $\bar{X}_1$) FLOATING

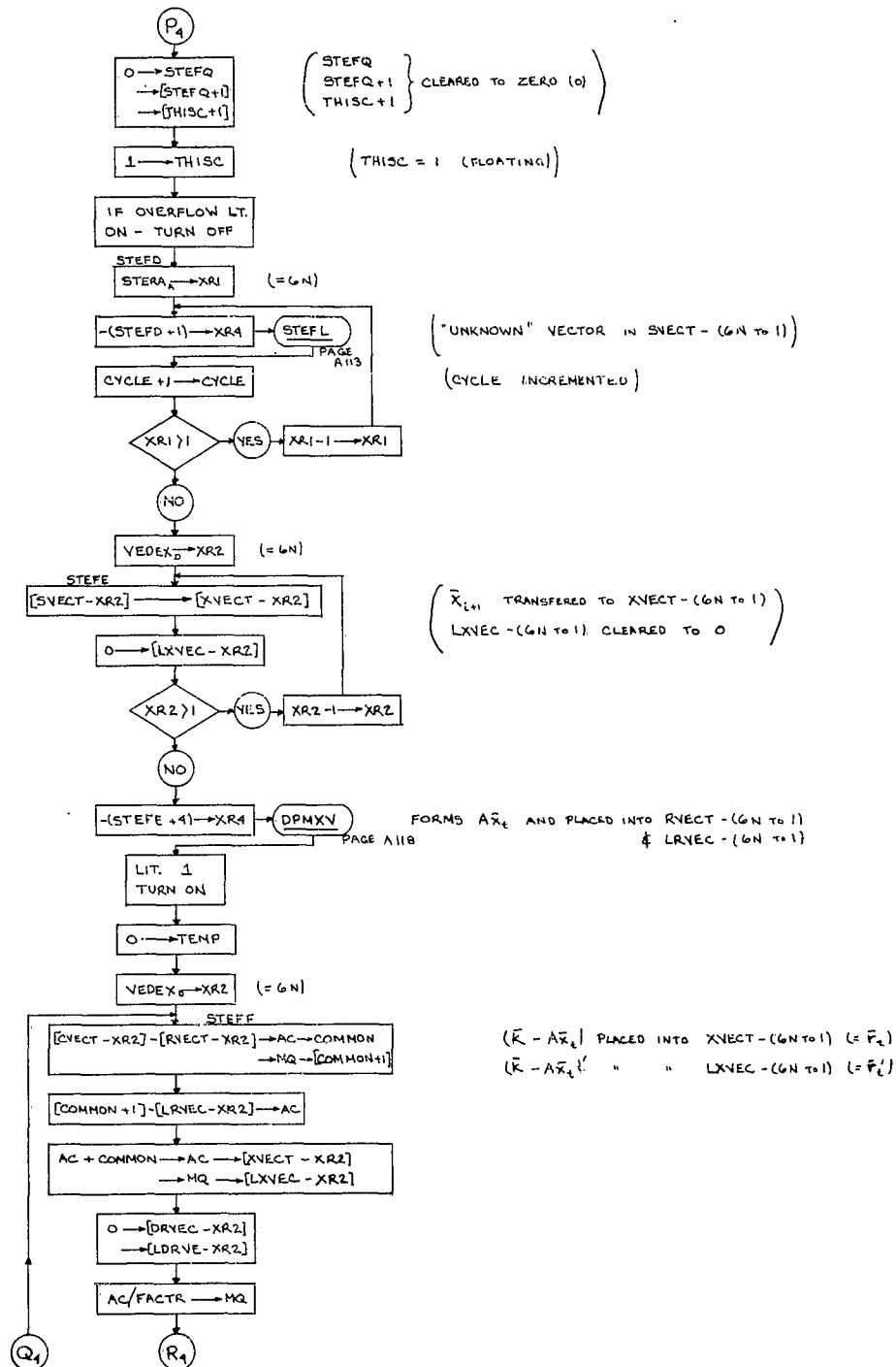
FORMS $A \bar{X}_1$ IN RXVEC- (GN TO 1) (FLOATING)
 (WHERE A IS MATRIX- (...))

$(\bar{K} - A \bar{X}_1)$ PLACED INTO SVECT- (GN TO 1) (= $\bar{F}_1$) (FLOATING)

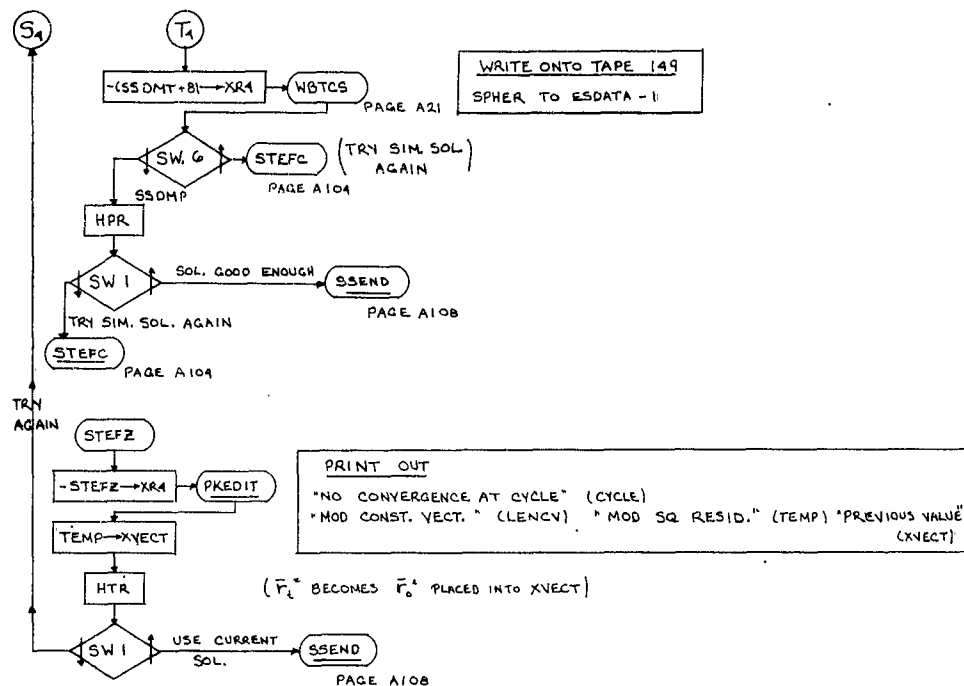
$[Z(P^2)] \text{ " " SVECT + O (FLOATING)}$

(NUMBER OF CYCLES OF CHEBYSHEV IN CYCLE) (INT)

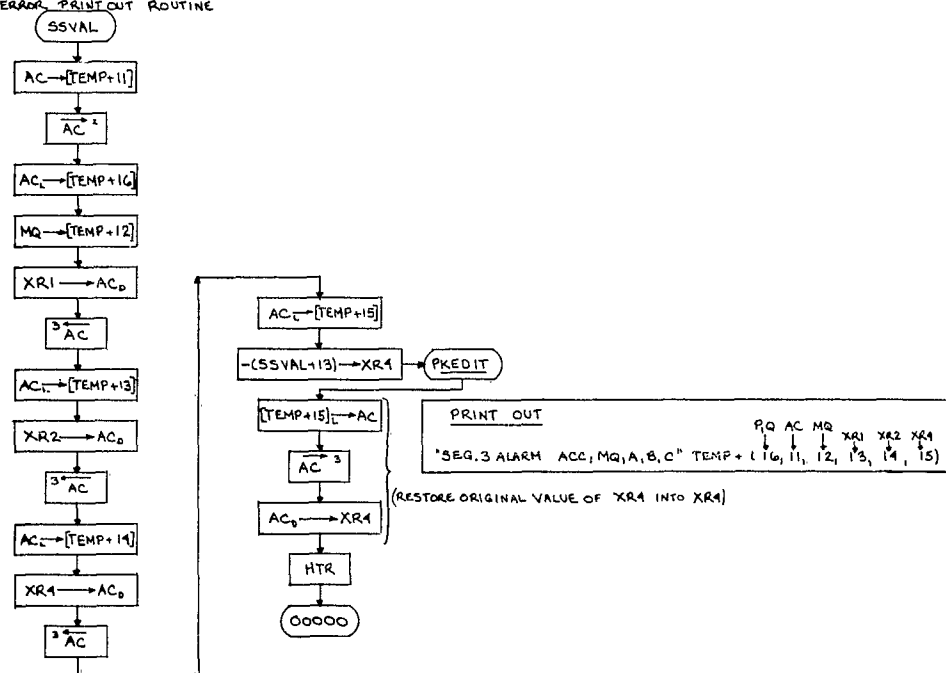


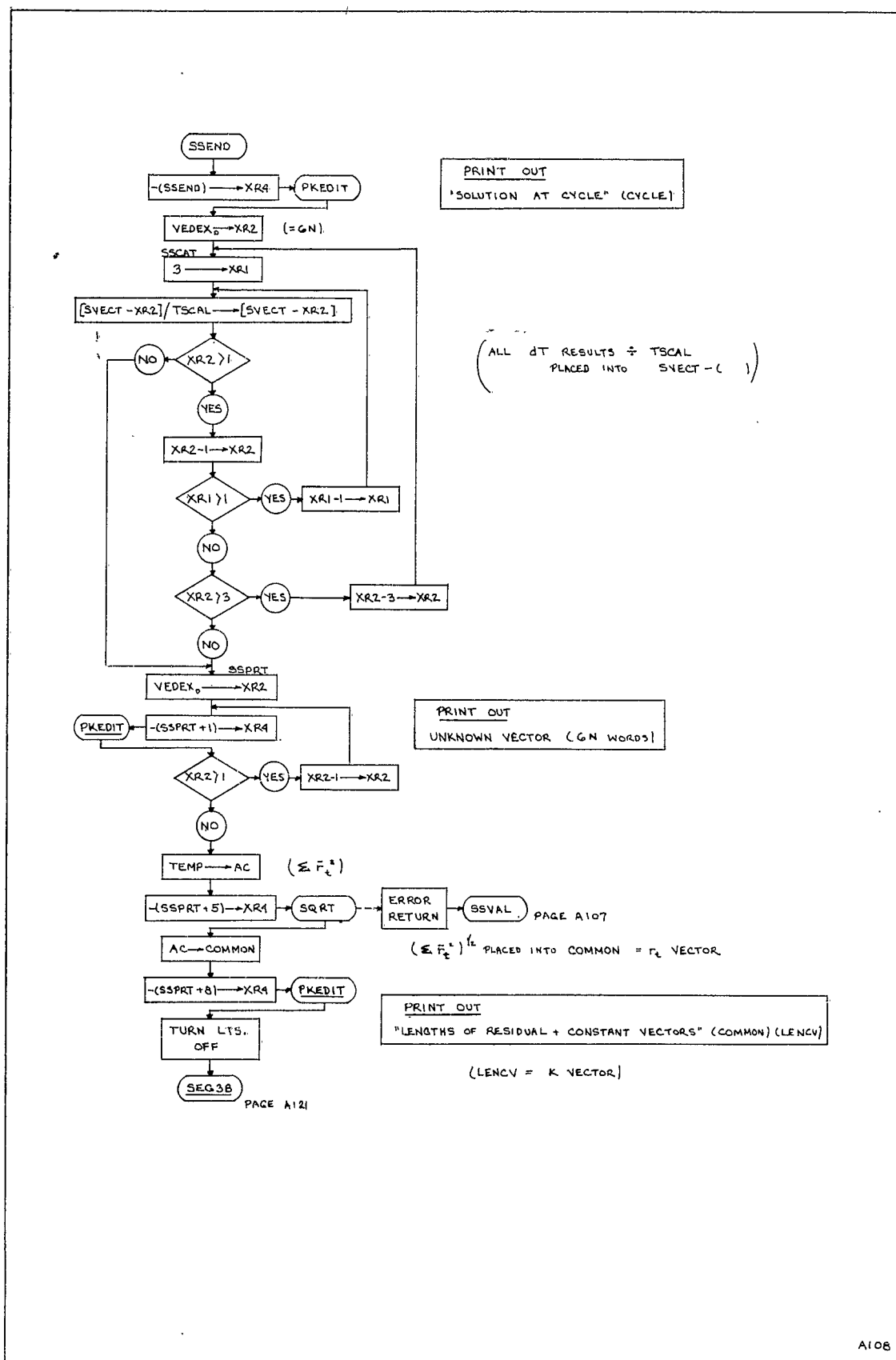


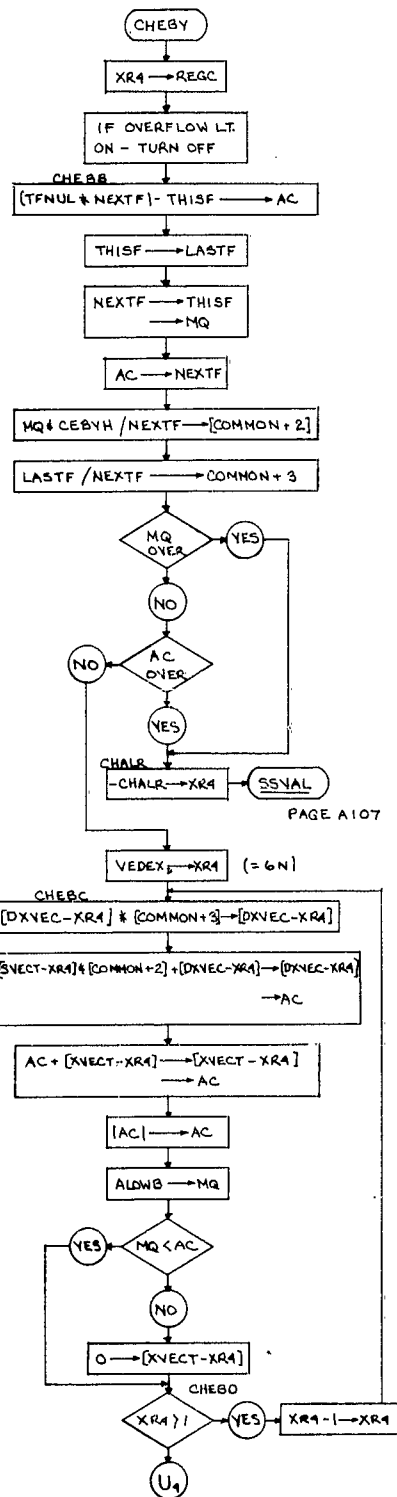




ERROR PRINT OUT ROUTINE







$(2 F_0 F_L - F_{L-1})$ PLACED IN AC AND LATER TRANSFERRED
TO NEXTF (= F_{L+1} (LATER ON))

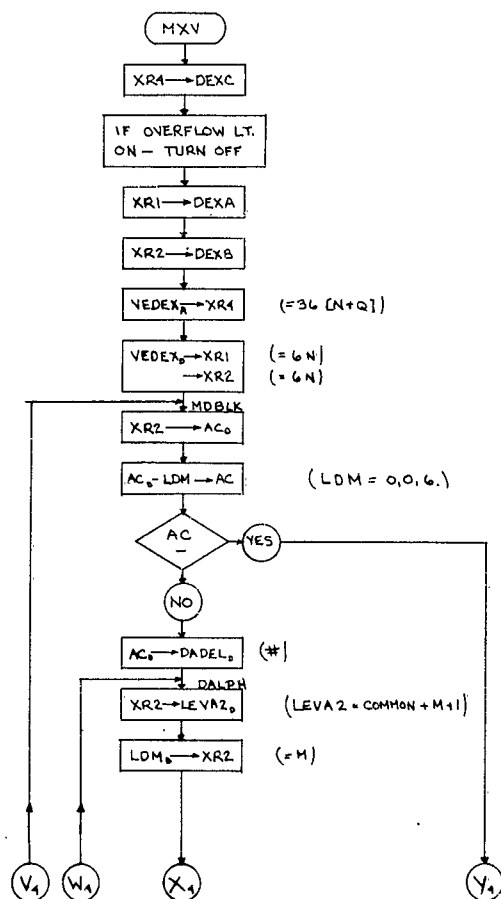
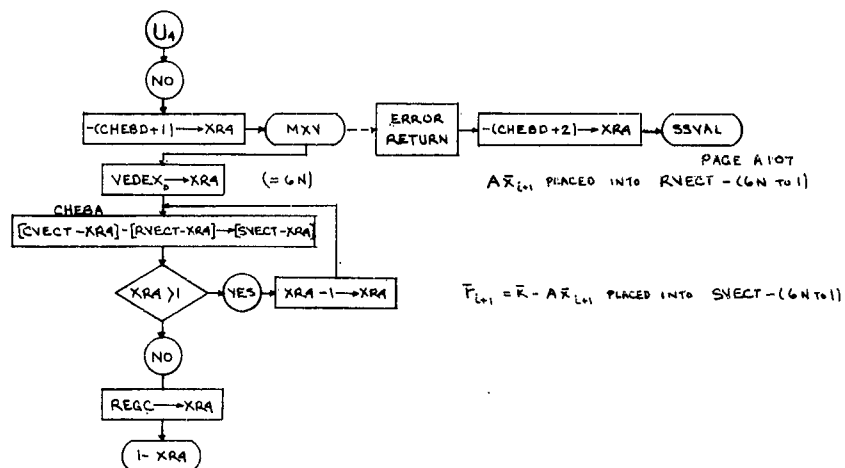
F_0 TRANSFERRED TO LASTF (WILL BE F_{L-1} LATER ON)
 F_L " " THISF (" " F_0 " ")

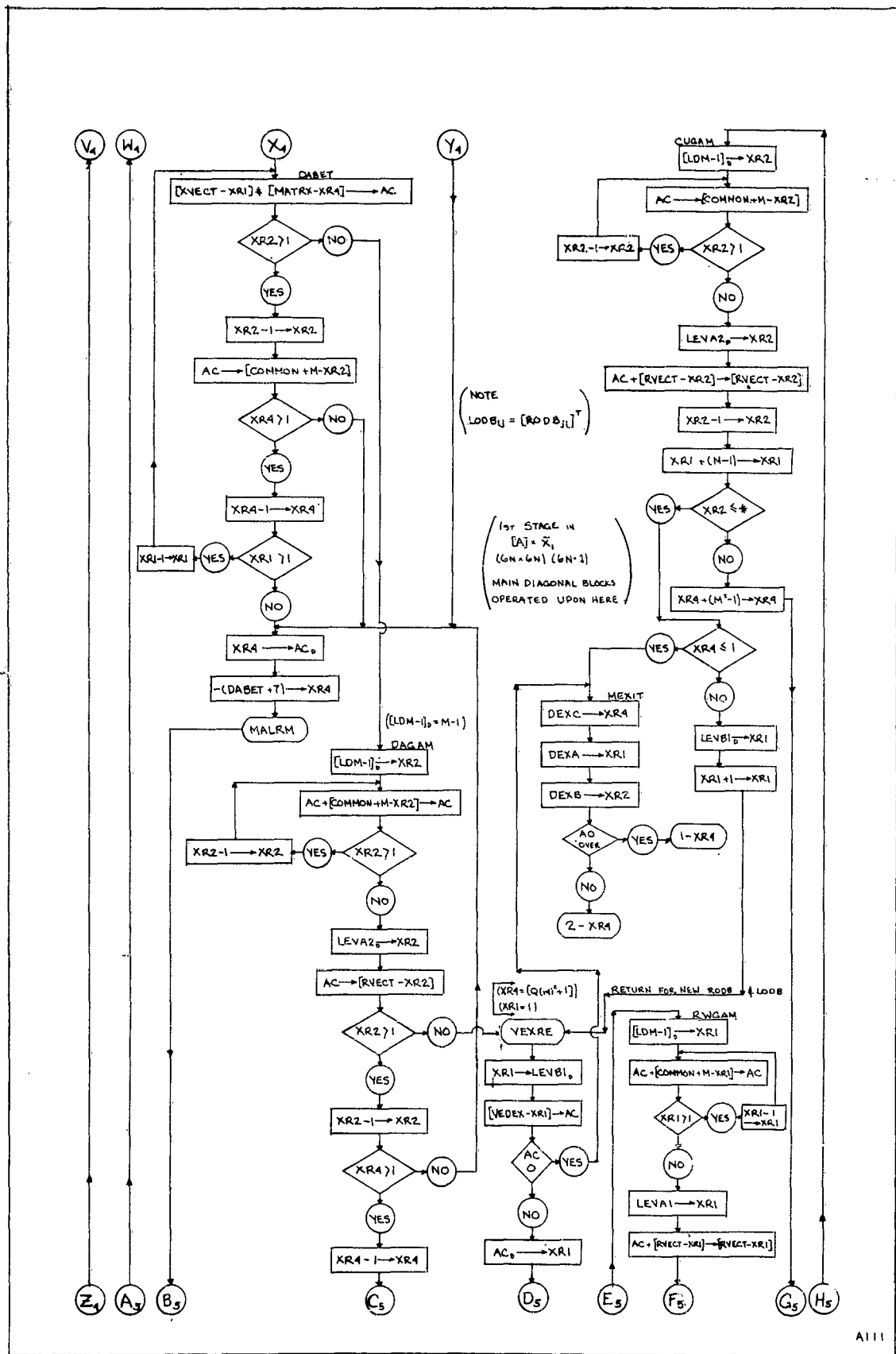
$\frac{F_L H}{F_{L+1}}$ PLACED INTO COMMON + 2

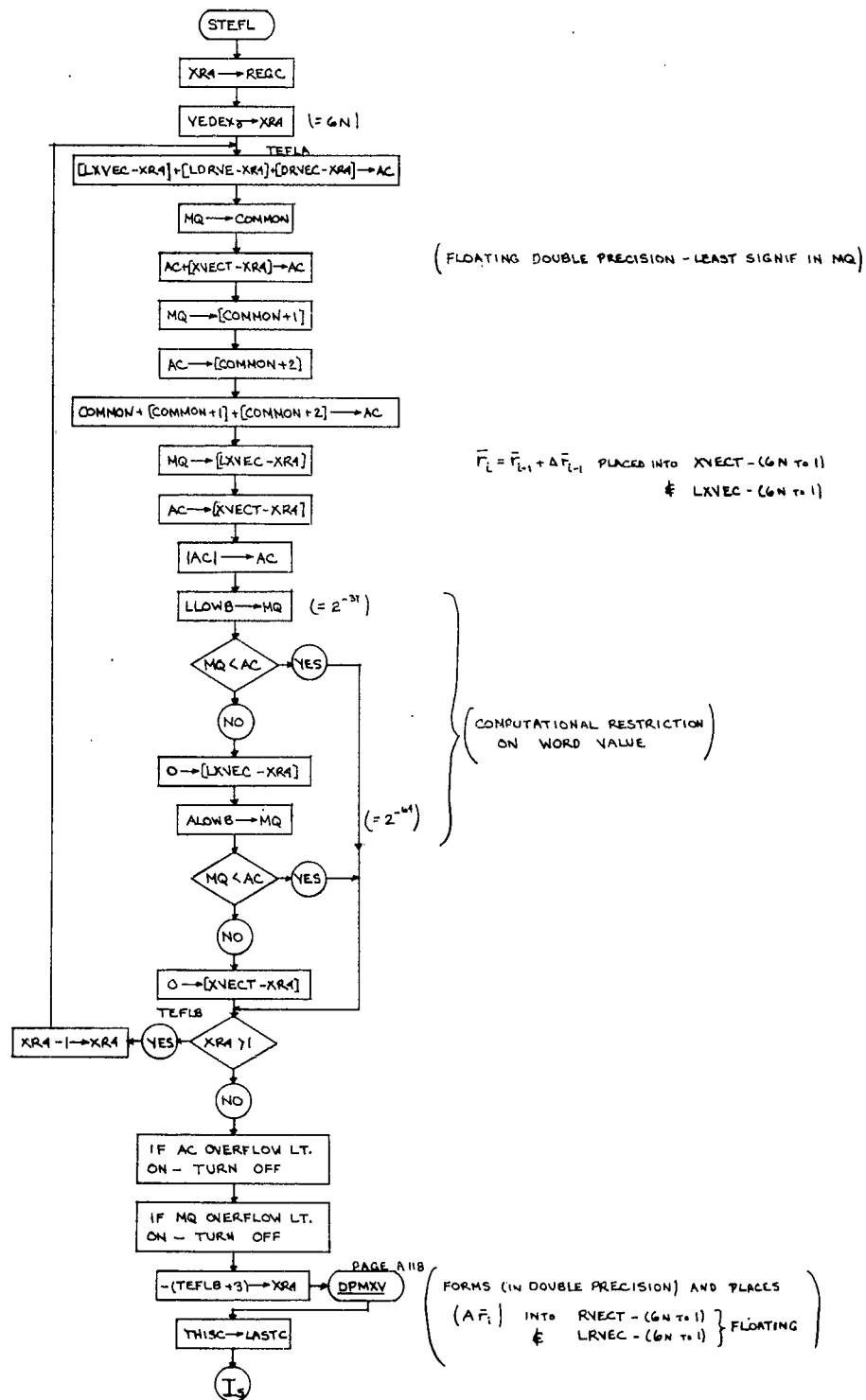
$\frac{F_{L-1}}{F_{LH}}$ " " COMMON + 3

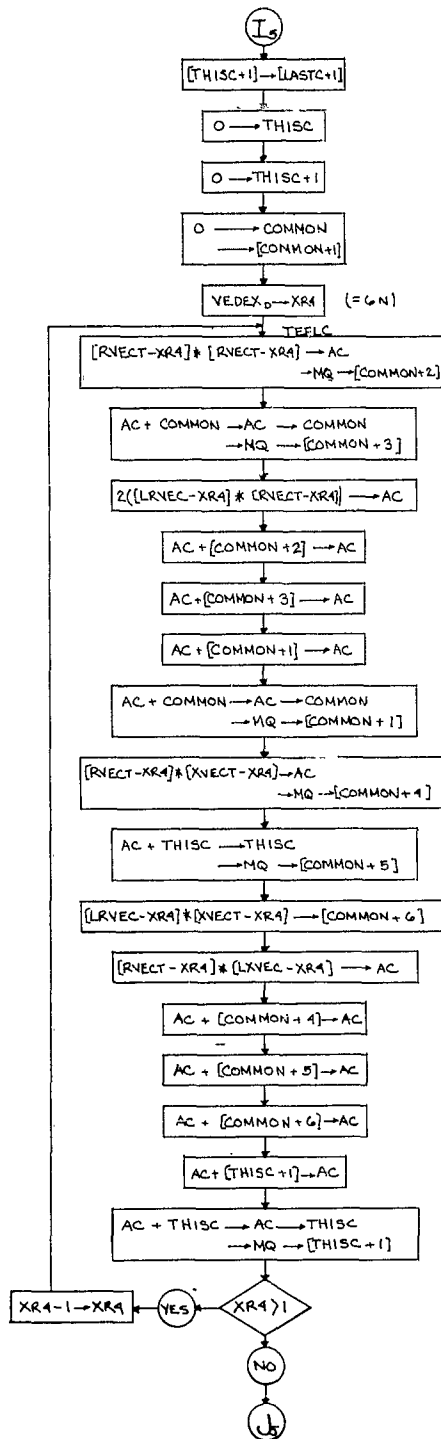
$\Delta \bar{X}_L = \frac{F_L H \bar{F}_L + F_{L-1} \Delta \bar{X}_{L-1}}{F_{L+1}}$ PLACED INTO DXNEC - (6N+1)

$\bar{X}_{L+1} = \bar{X}_L + \Delta \bar{X}_L$ " " XVECT - (6N+1)







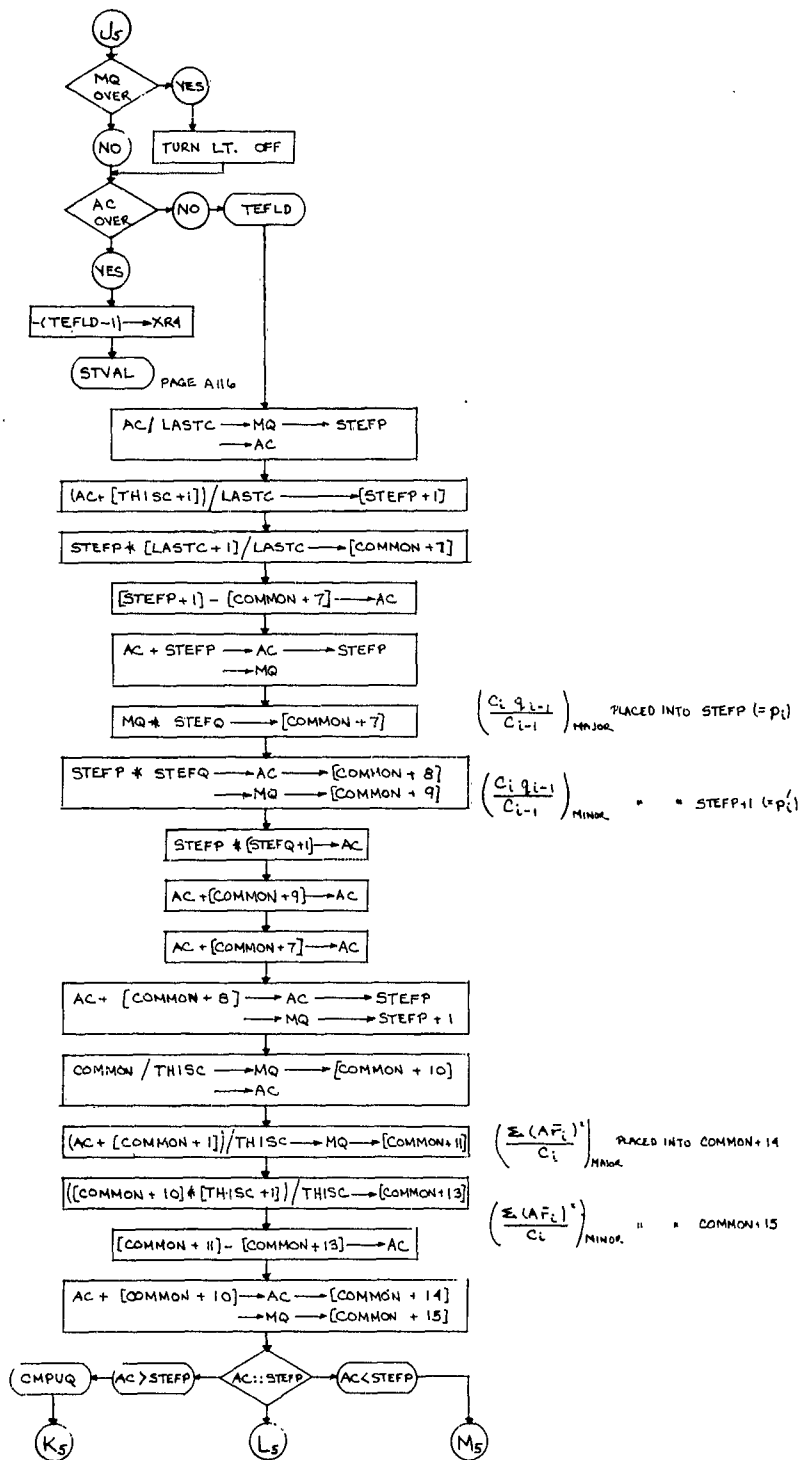


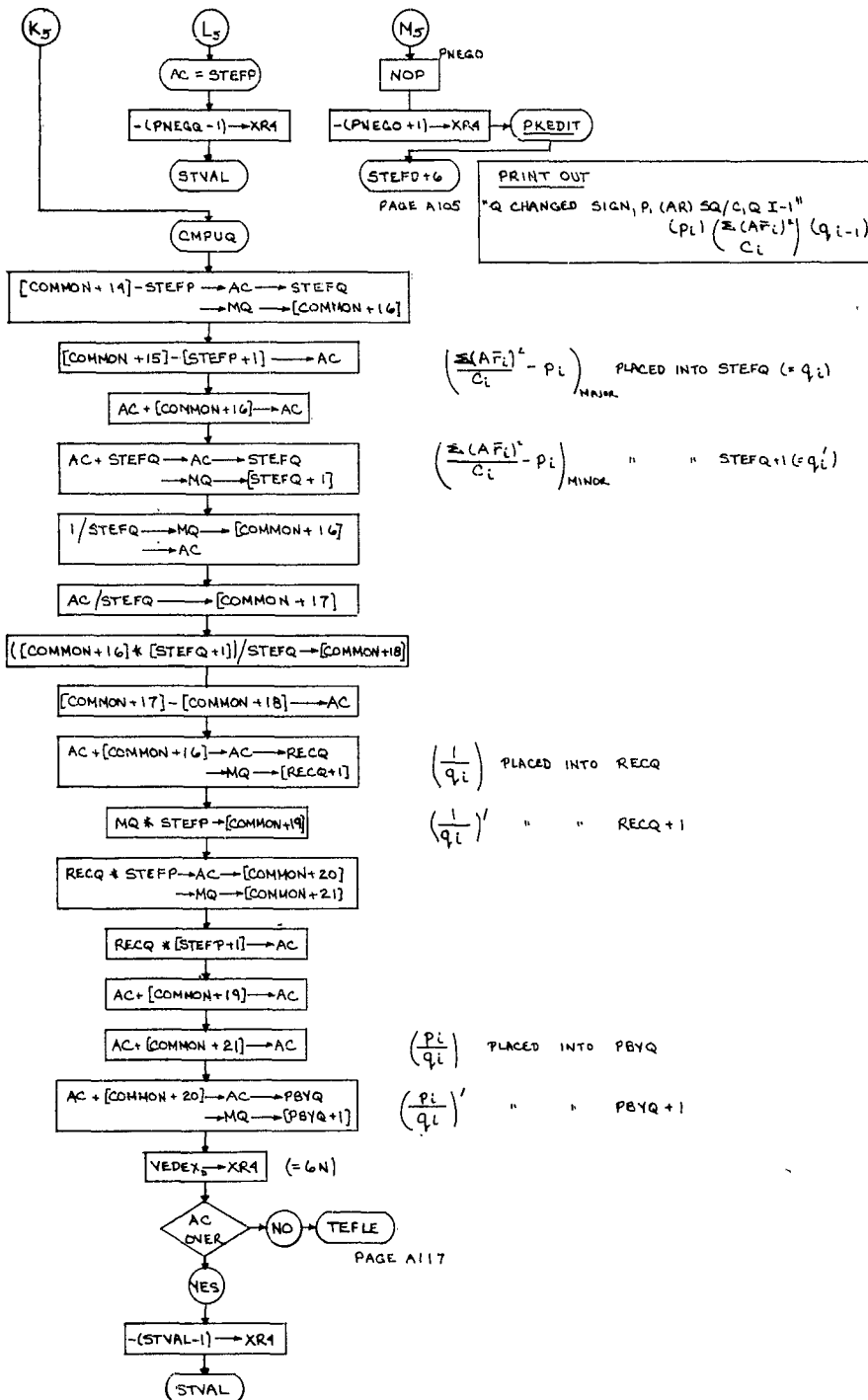
C_0 PLACED INTO LASTC (BECOMES C_{i-1})
 C'_0 " " LASTC+1 (" C'_{i-1})

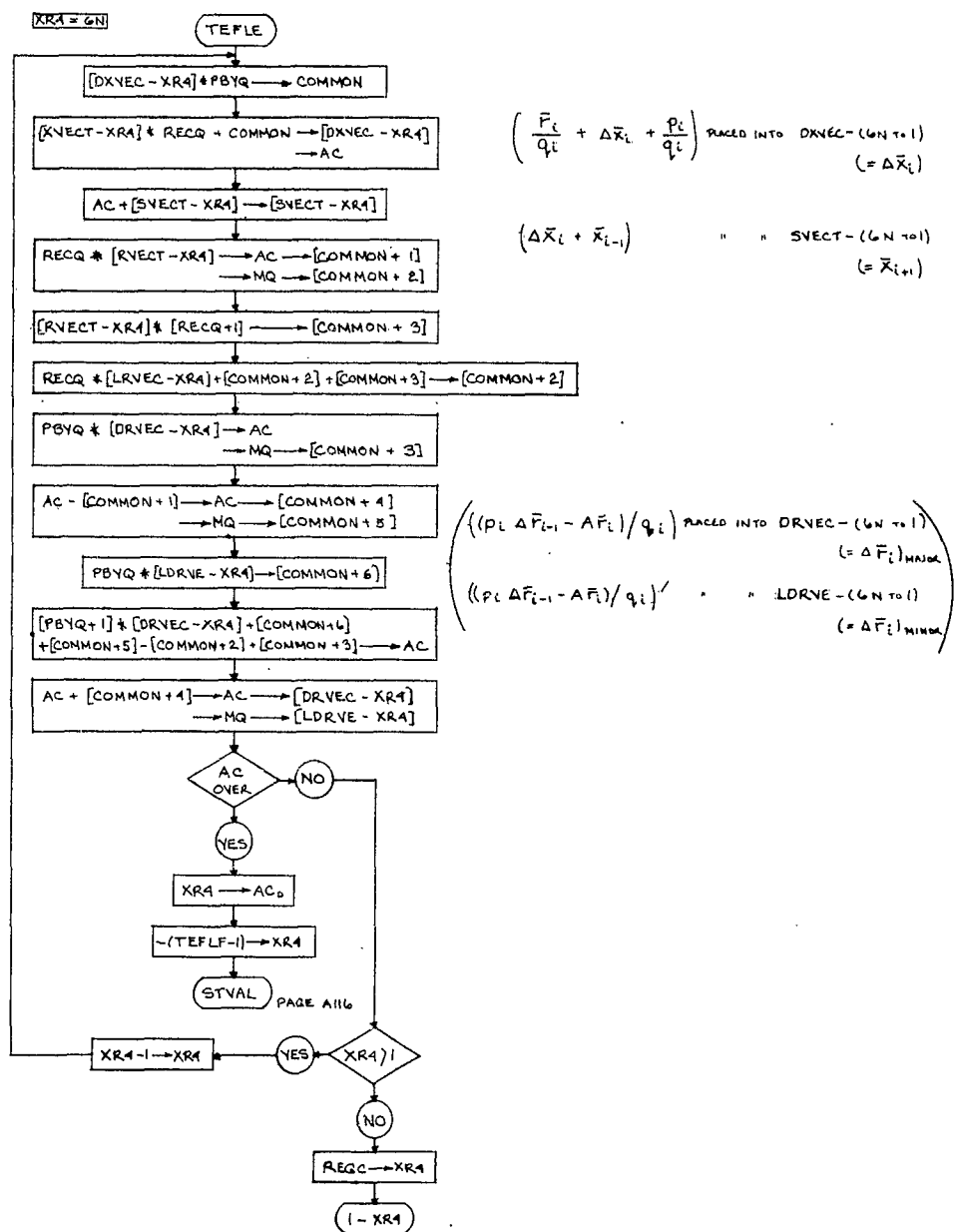
C_0 MADE = 0
 C'_0 " = 0

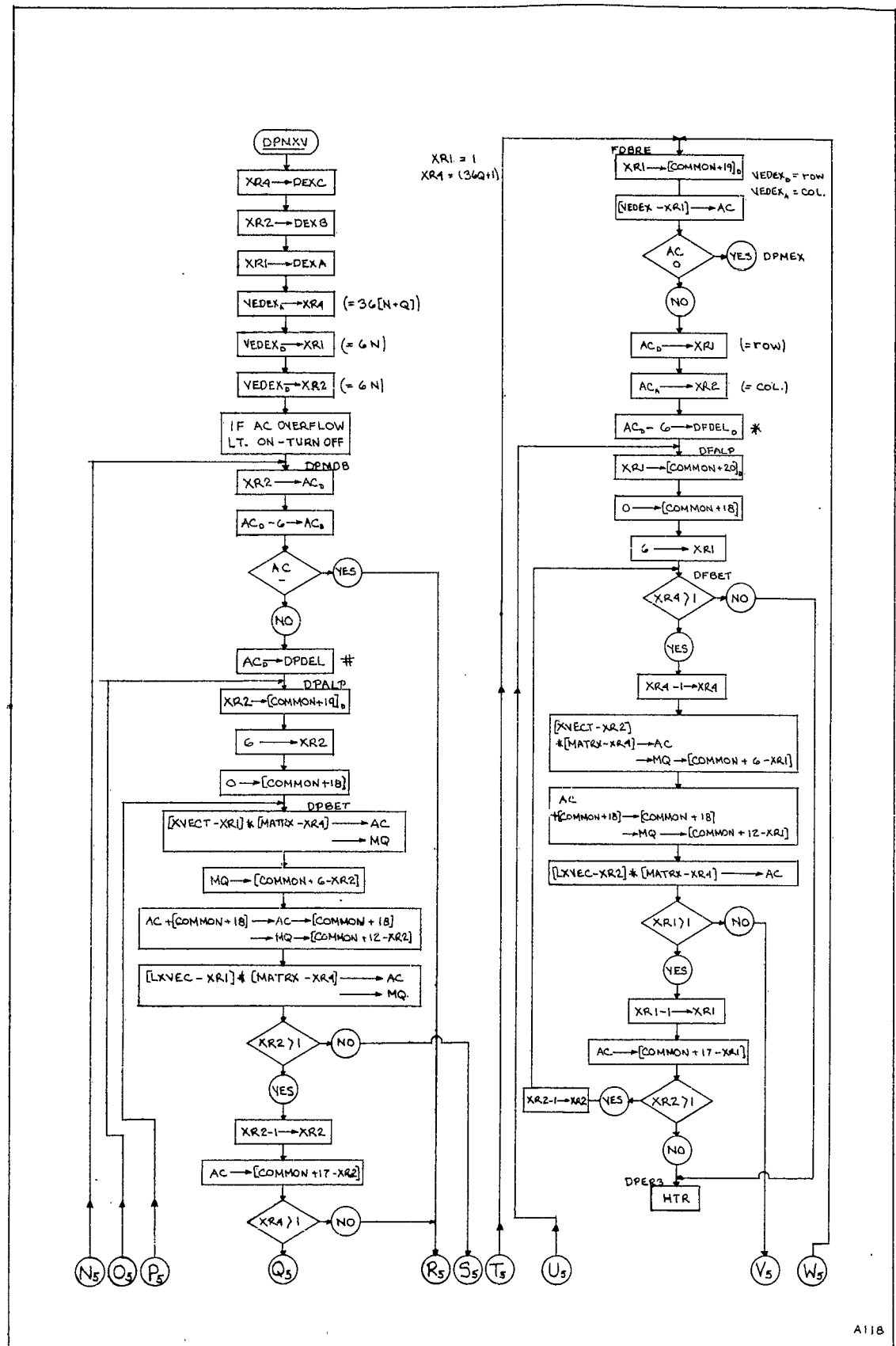
$\Sigma (AF_i)^k$ (MAJOR) IN COMMON
 $\Sigma (AF_i)^k$ (MINOR) = COMMON + 1

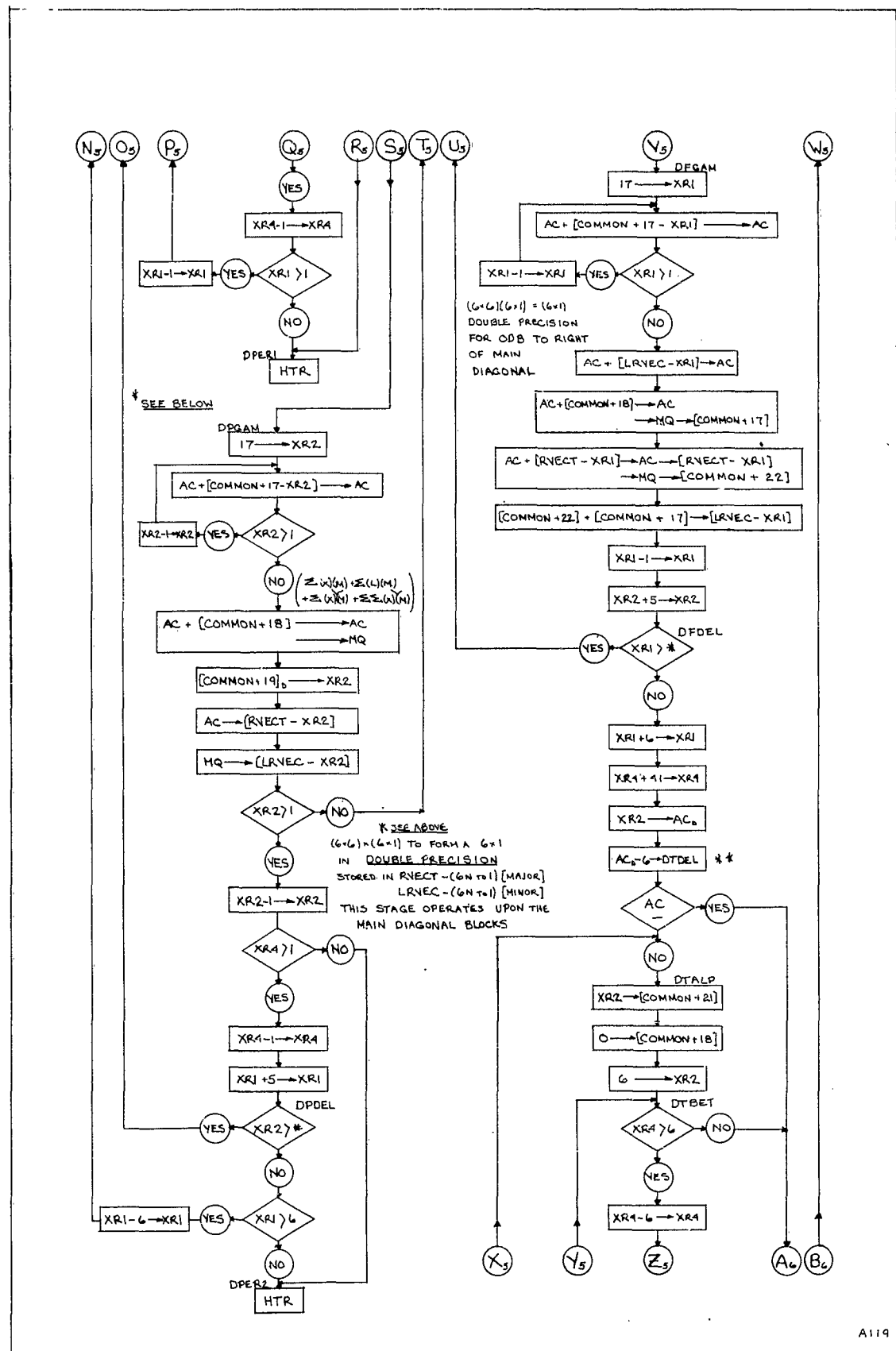
$[F_i \cdot (AF_i)]_{Maj}$ PLACED INTO THISC (= C_i)
 $[F_i \cdot (AF_i)]_{Min}$ " " THISC+1 (= C'_i)

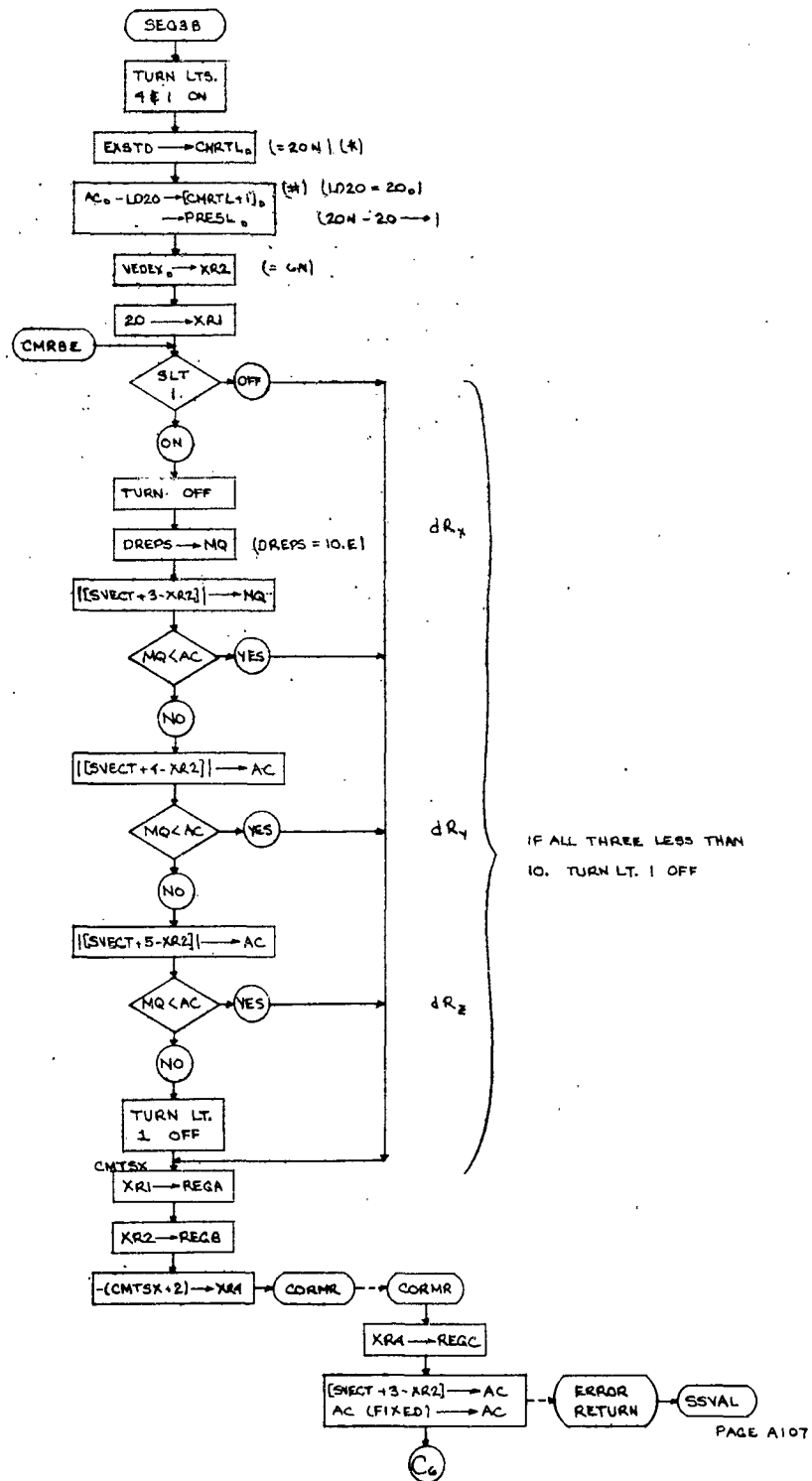


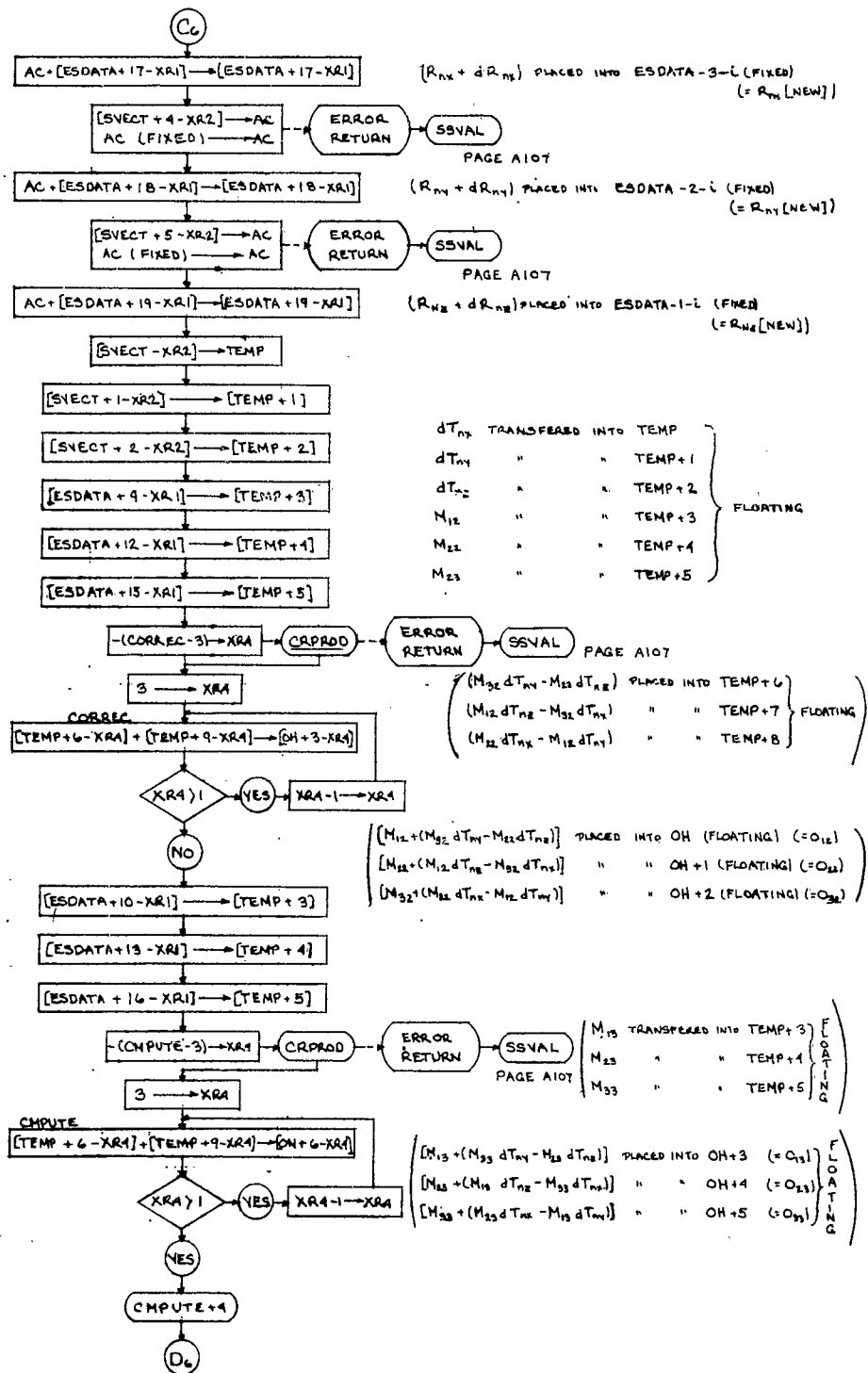




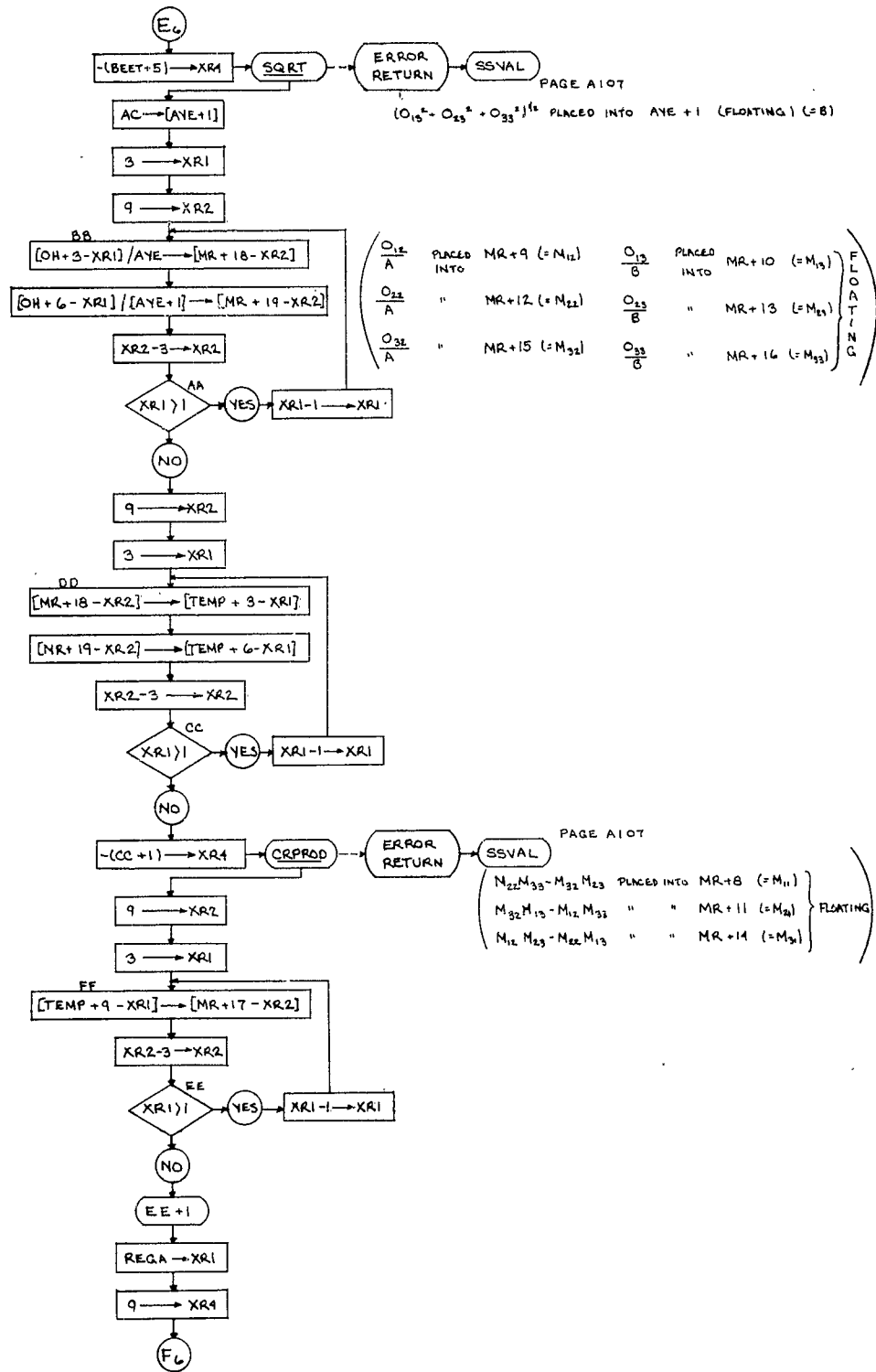


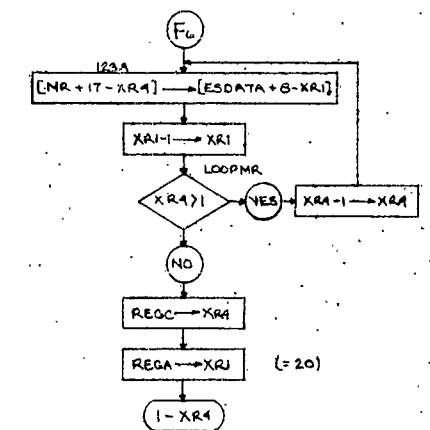




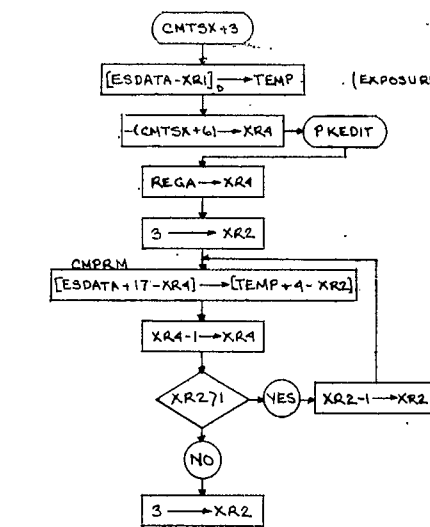






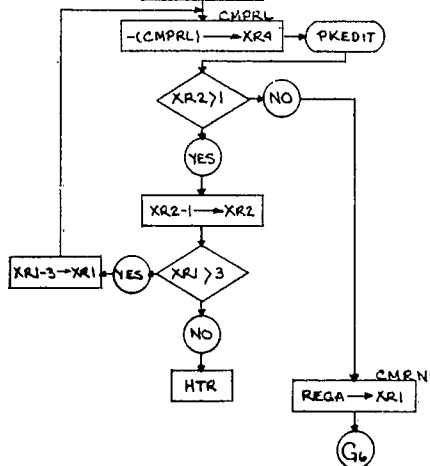


M ₁₁	PLACED INTO	ESDATA - 12 - i	} FLOATING
M ₁₂	"	ESDATA - 11 - i	
M ₁₃	"	ESDATA - 10 - i	
M ₂₁	"	ESDATA - 9 - i	
M ₂₂	"	ESDATA - 8 - i	
M ₂₃	"	ESDATA - 7 - i	
M ₃₁	"	ESDATA - 6 - i	
M ₃₂	"	ESDATA - 5 - i	
M ₃₃	"	ESDATA - 4 - i	

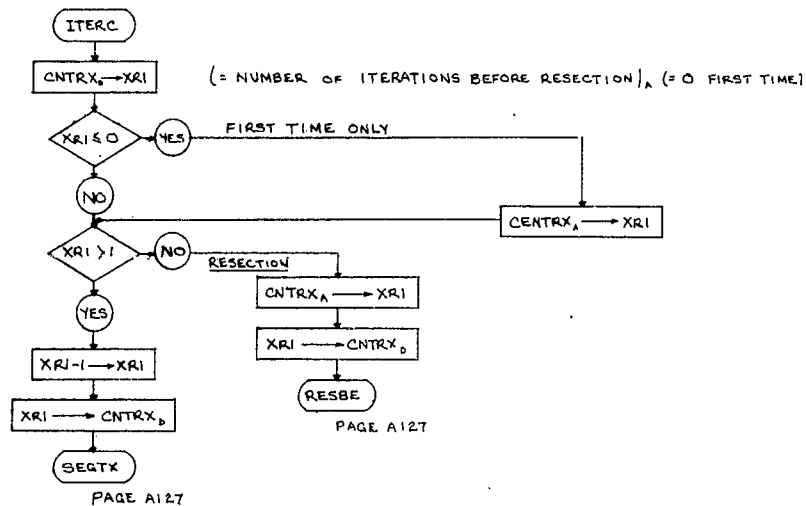
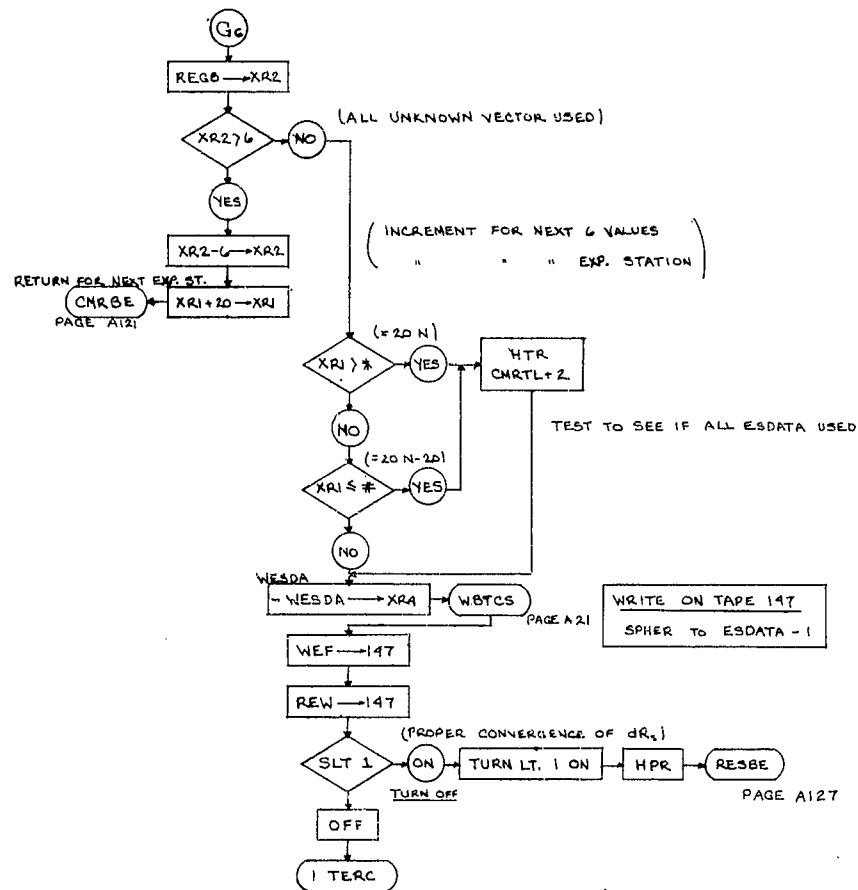


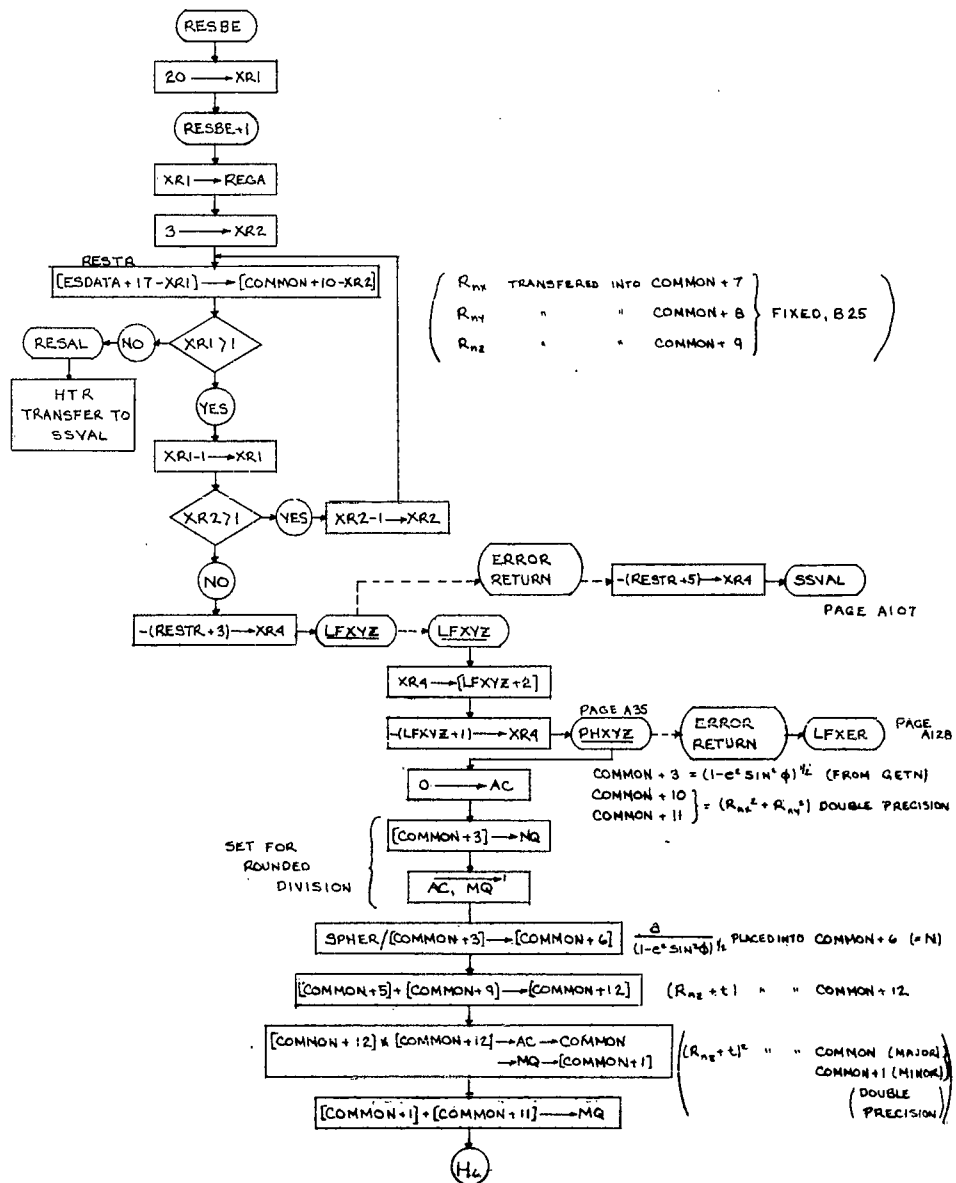
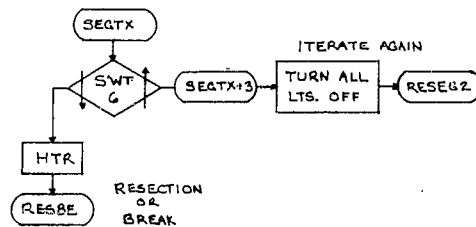
PRINT OUT
"PHOTO" (TEMP)

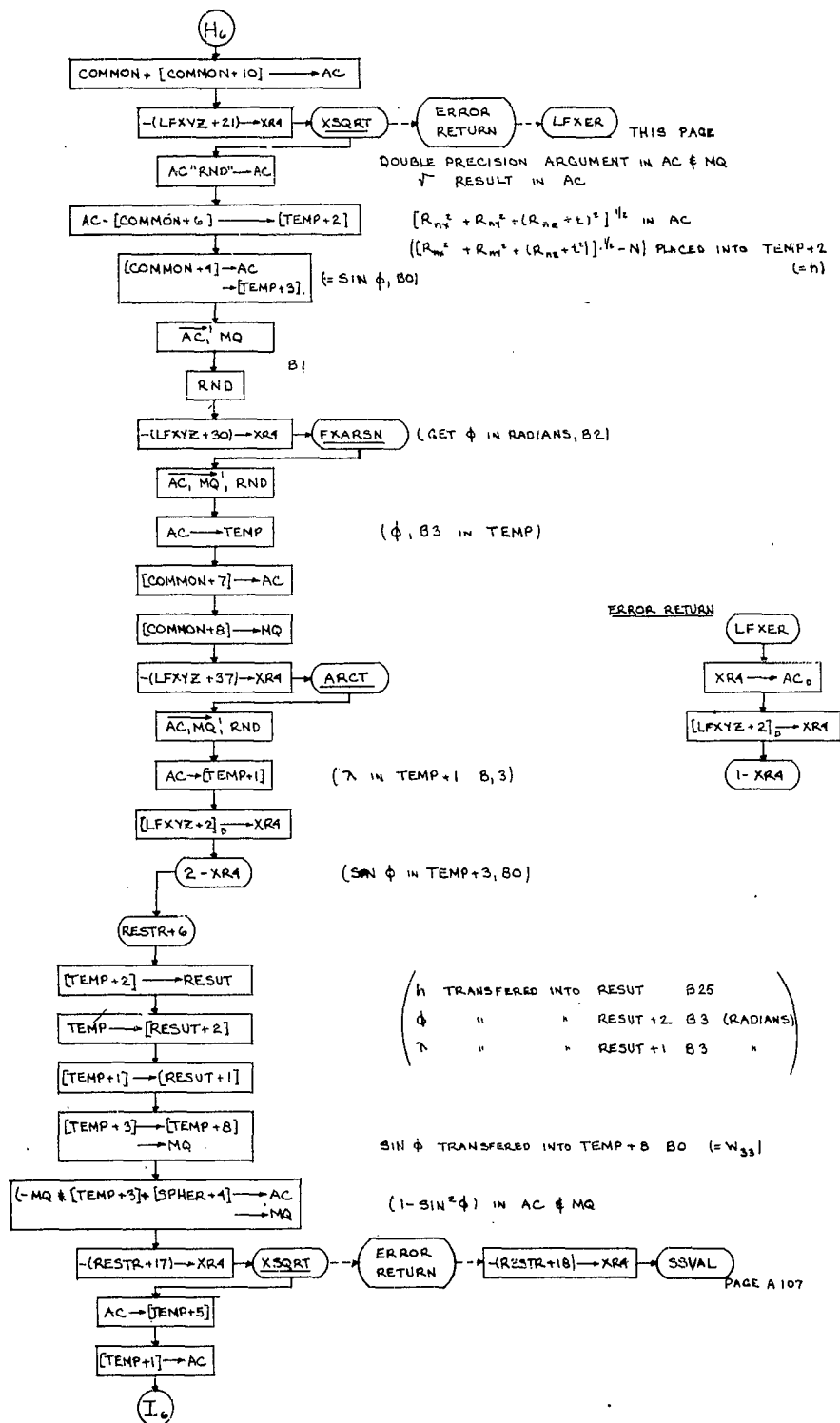
PRINT OUT
R_{nx} TRANSFERED INTO TEMP + 1
R_{ny} " " TEMP + 2
R_{nz} " " TEMP + 3
FIXED, B25

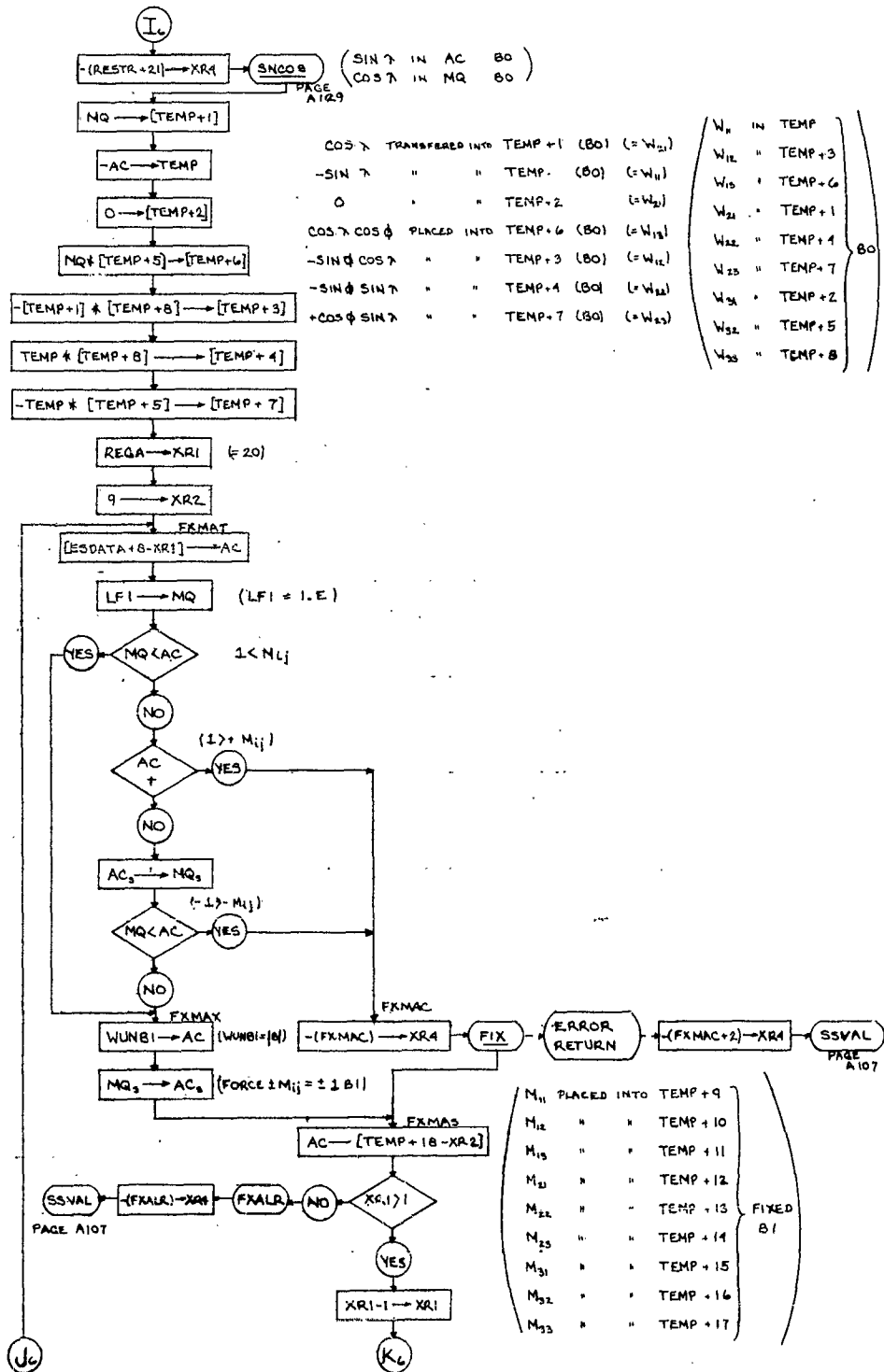


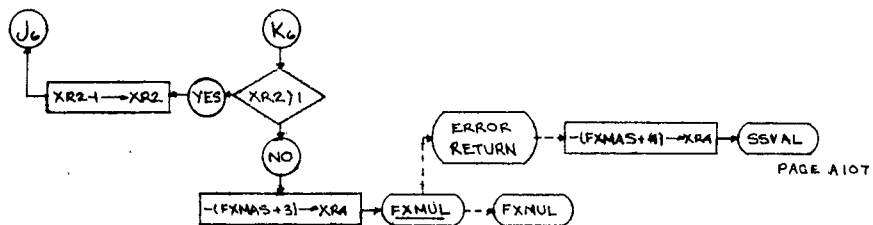
PRINT OUT
R_{nx} (M₁₁) (M₁₂) (M₁₃)
R_{ny} (M₂₁) (M₂₂) (M₂₃)
R_{nz} (M₃₁) (M₃₂) (M₃₃)





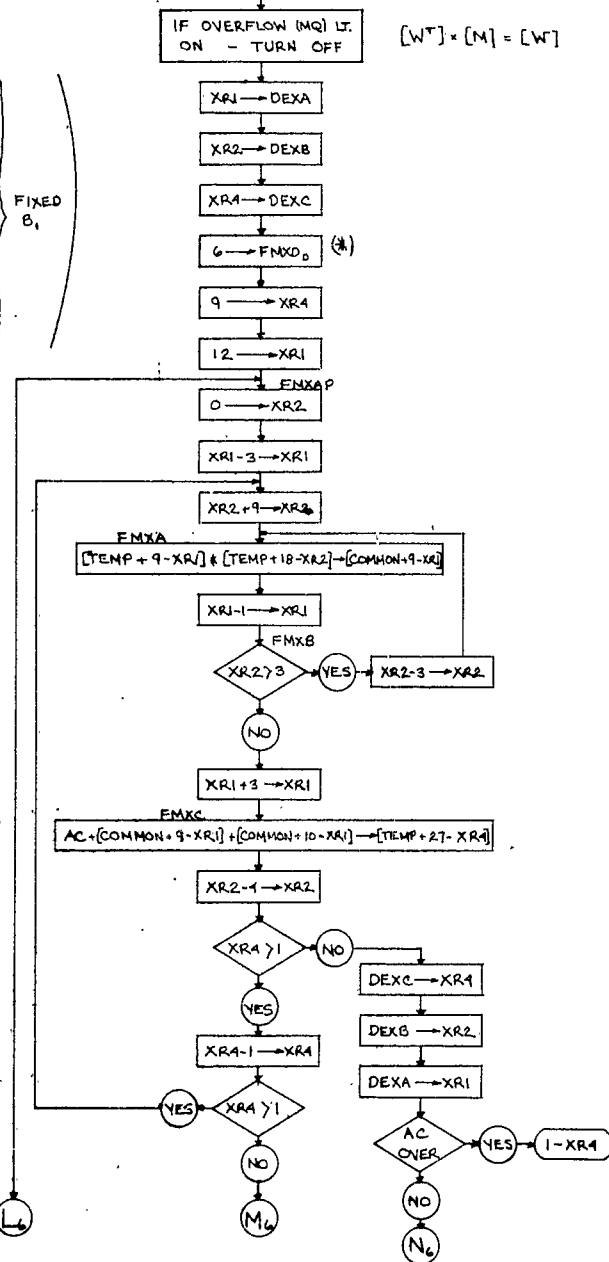


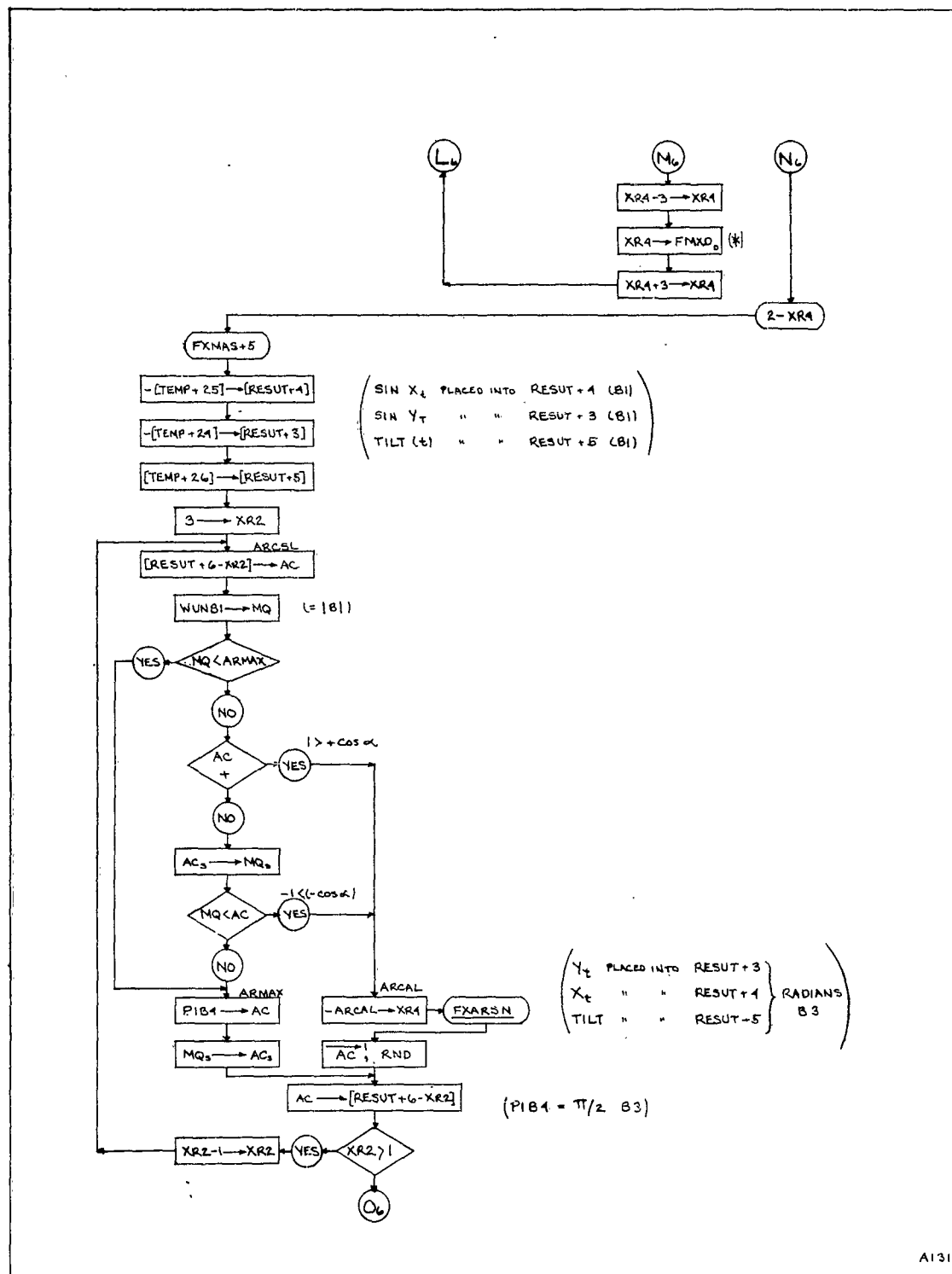


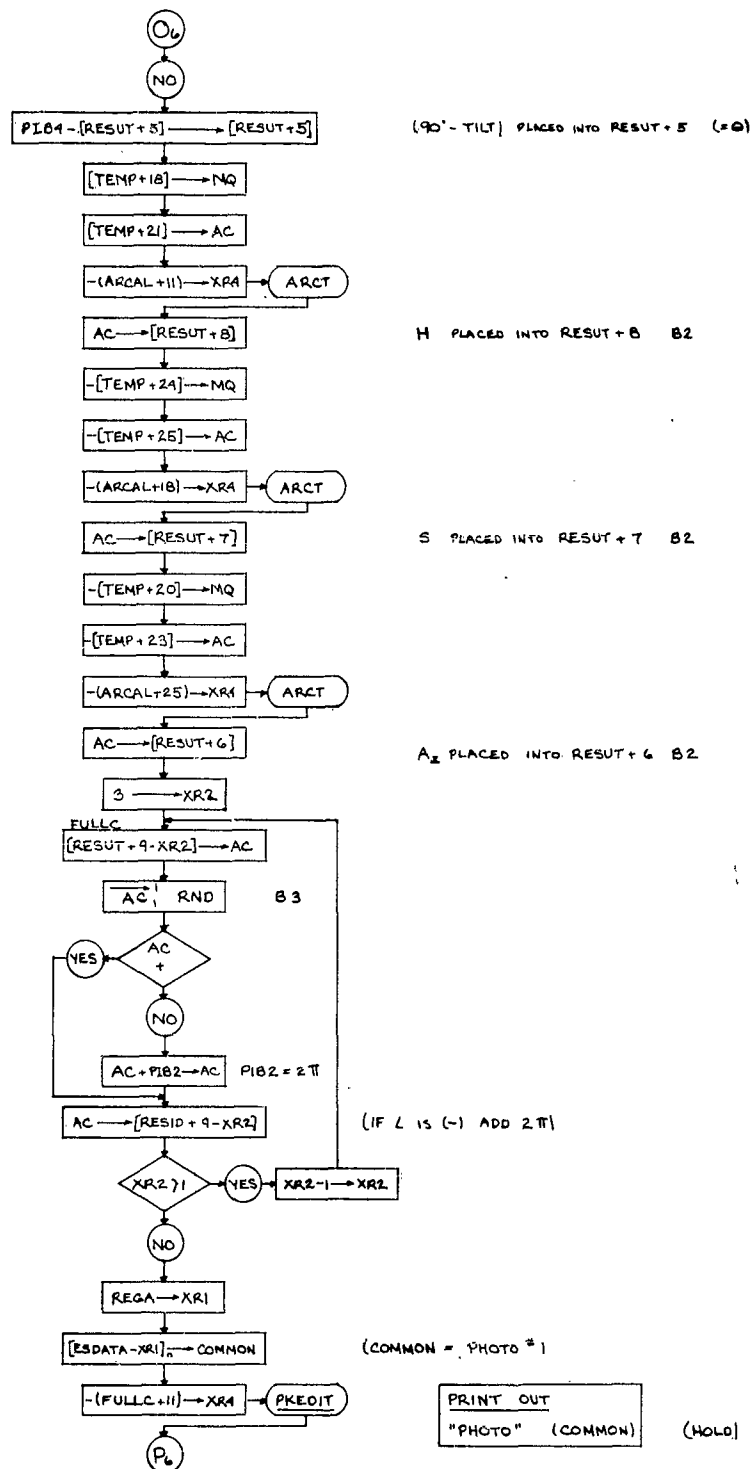


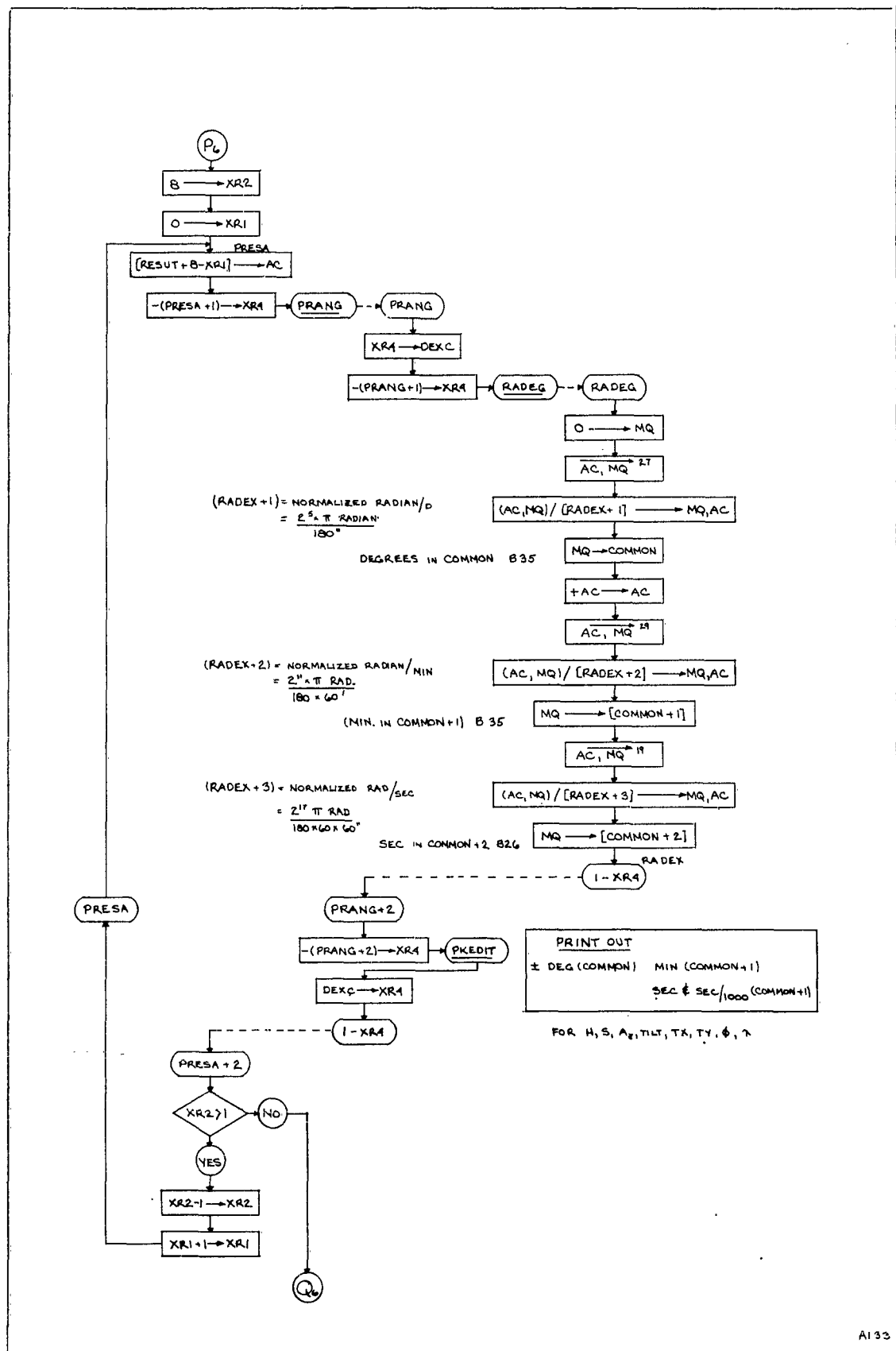
W_{11} PLACED INTO TEMP+18
 W_{12} " " TEMP+19
 W_{13} " " TEMP+20
 W_{21} " " TEMP+21
 W_{22} " " TEMP+22
 W_{23} " " TEMP+23
 W_{31} " " TEMP+24
 W_{32} " " TEMP+25
 W_{33} " " TEMP+26

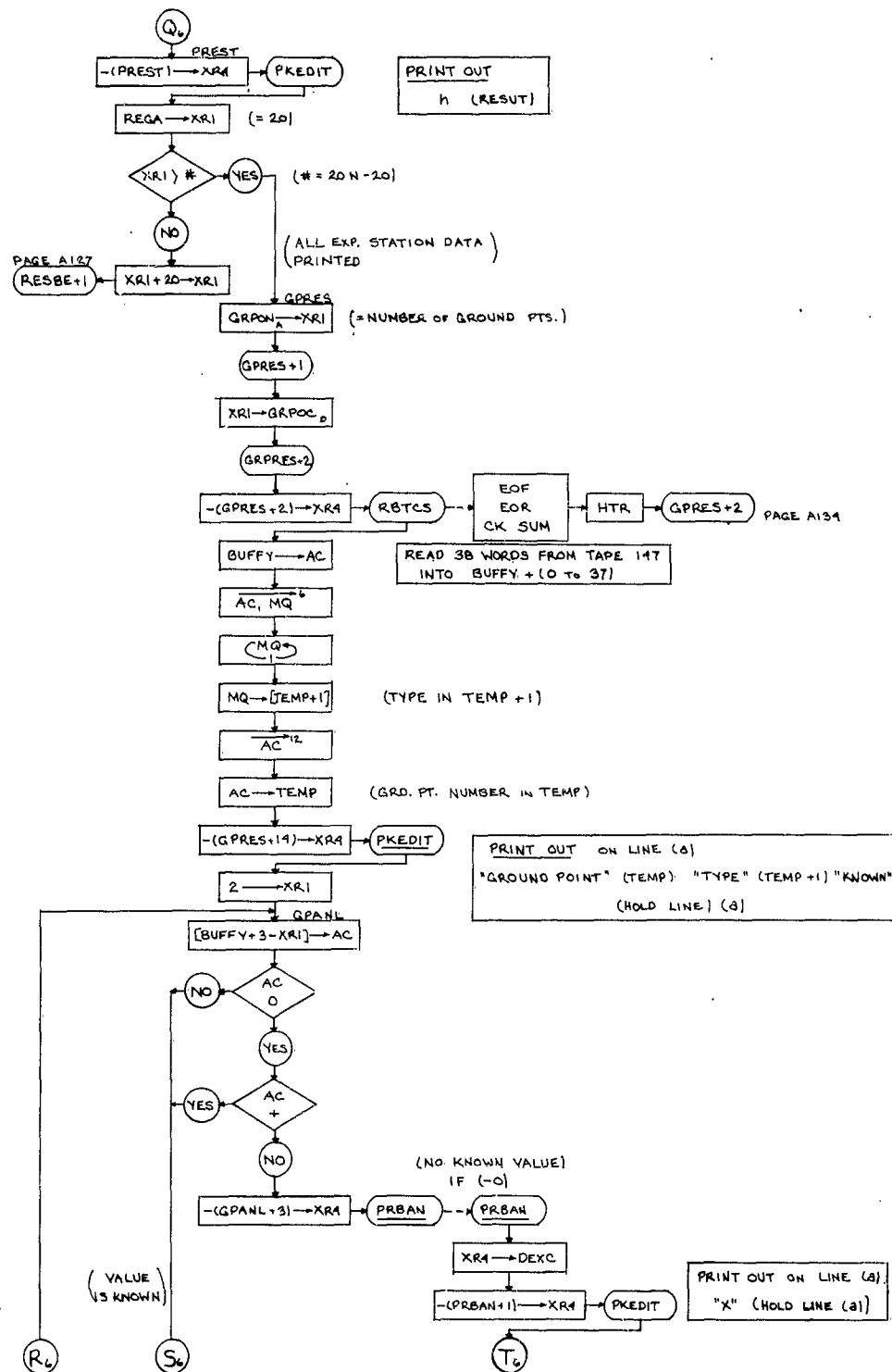
FIXED B_1

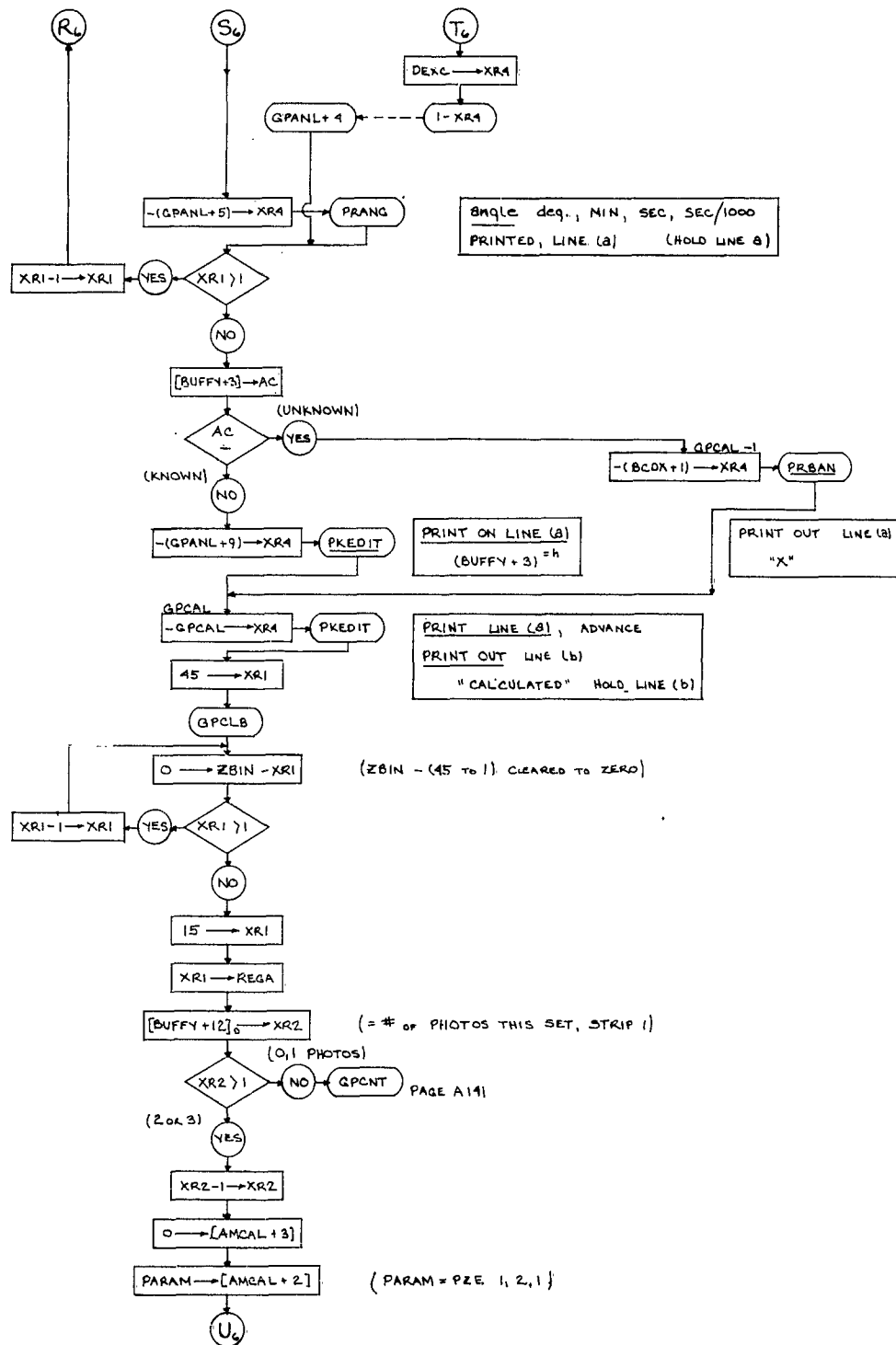




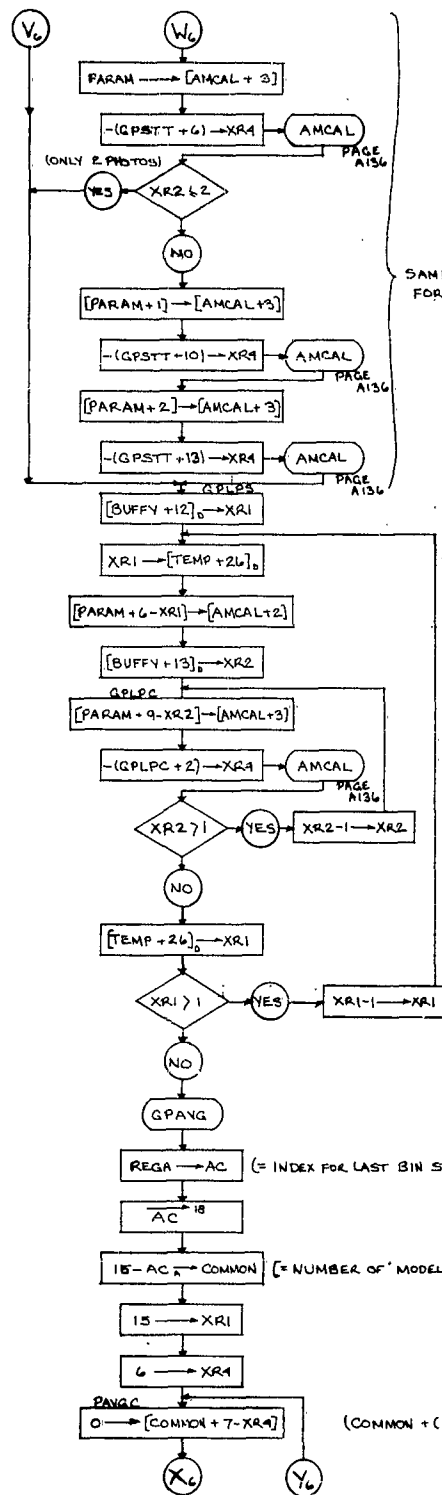












TRANSFERRED INTO XBIN - 12

R _x 1-2	"	"	YBIN - 12
R _y 1-2	"	"	ZBIN - 12
R _x 2-3	"	"	XBIN - 11
R _y 2-3	"	"	YBIN - 11
R _x 3-4	"	"	ZBIN - 11
R _y 3-4	"	"	XBIN - 10
R _x 4-5	"	"	YBIN - 10
R _y 4-5	"	"	ZBIN - 10

FIXED, 825

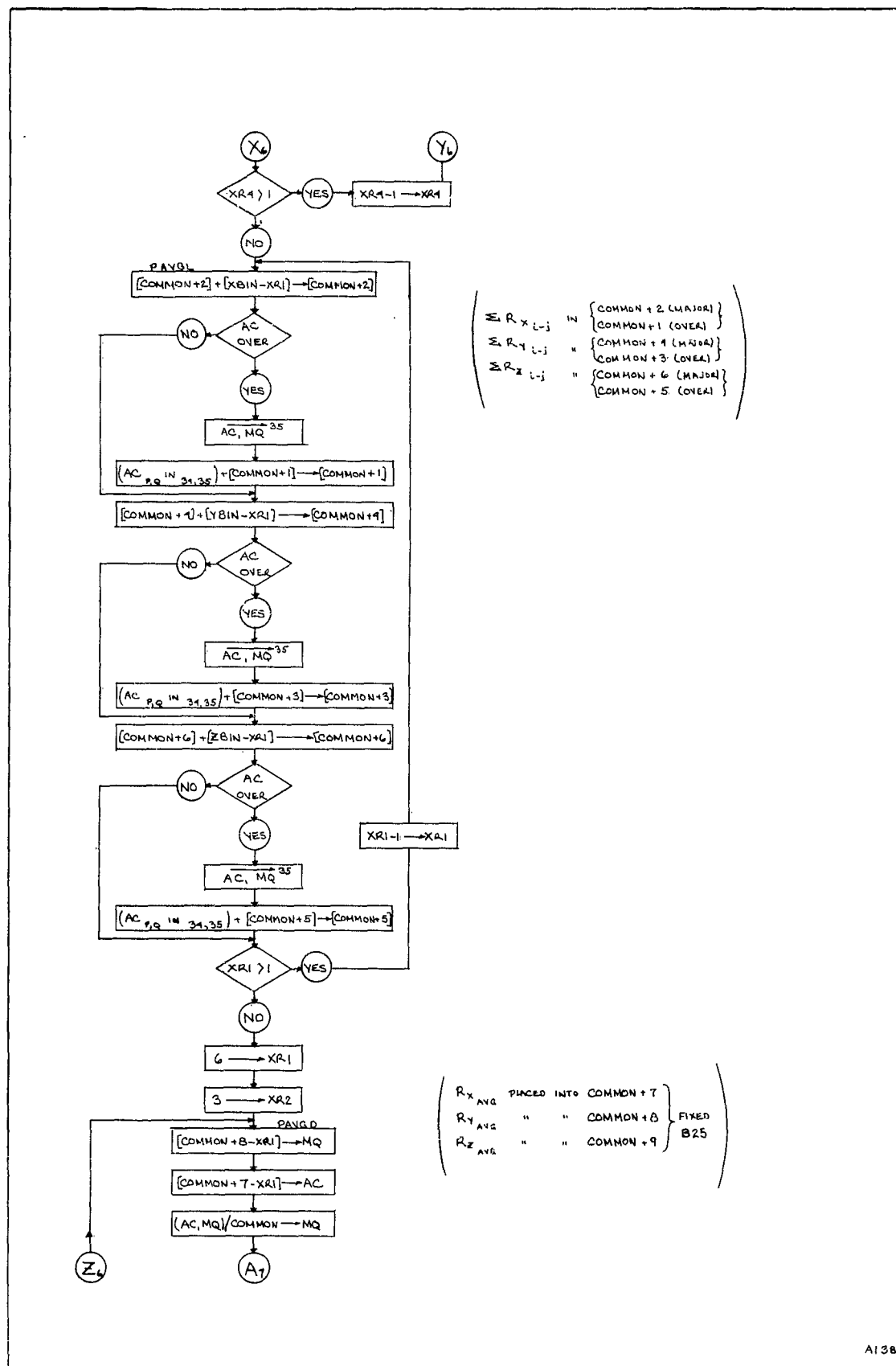
PARAM + 0 = PZE 3,3,2
PARAM + 4 = PZE 2,2,1
PARAM + 5 = PZE 1,1,1

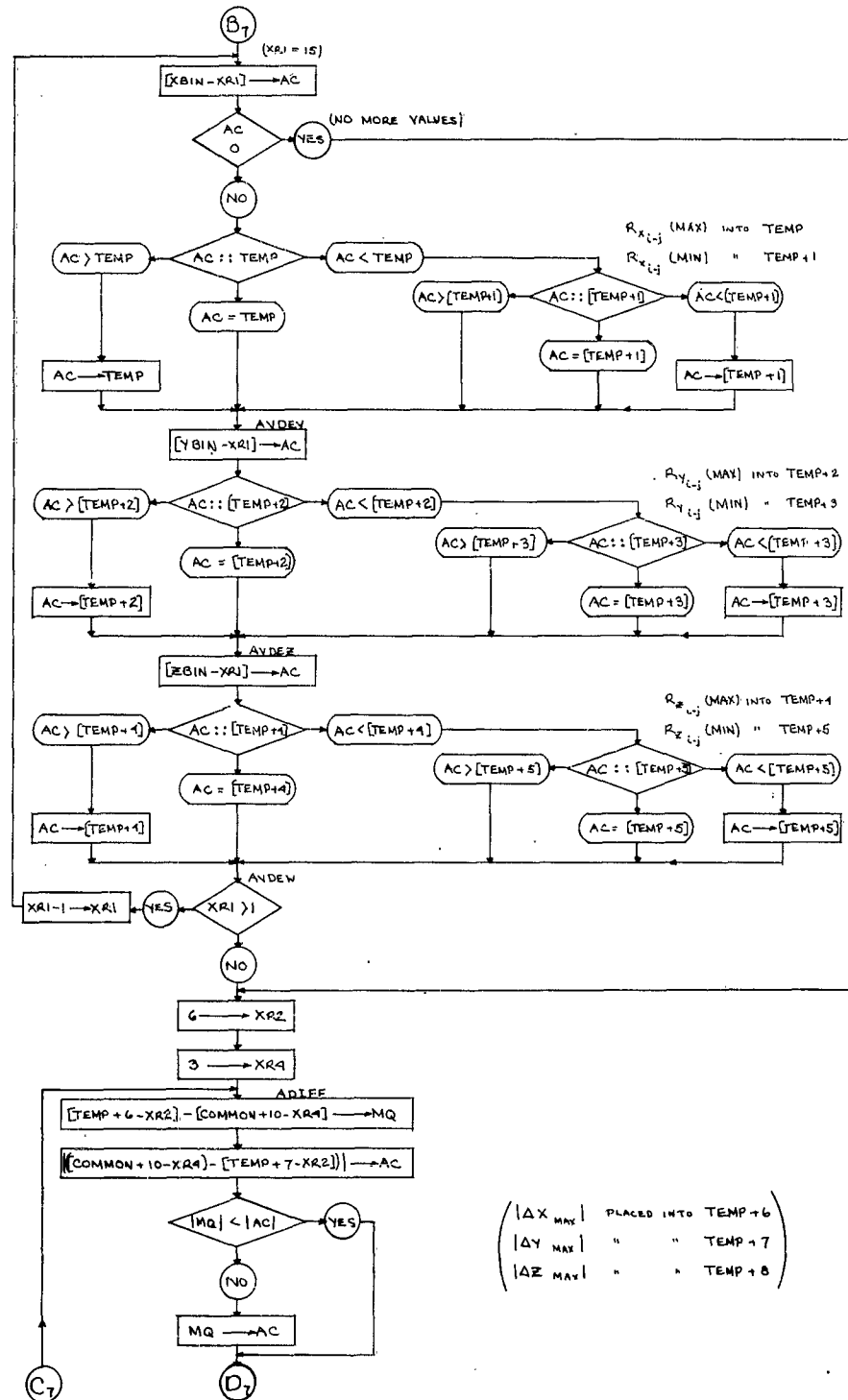
PARAM + 6 = PZE 3,3,2
PARAM + 7 = PZE 2,2,2
PARAM + 8 = PZE 1,1,2

TRANSFERRED INTO XBIN - 9

R _x 3-4	"	"	YBIN - 9
R _y 3-4	"	"	ZBIN - 9
R _x 4-5	"	"	XBIN - 8
R _y 4-5	"	"	YBIN - 8
R _x 5-6	"	"	ZBIN - 8
R _y 5-6	"	"	XBIN - 7
R _x 6-7	"	"	YBIN - 7
R _y 6-7	"	"	ZBIN - 7
R _x 7-8	"	"	XBIN - 6
R _y 7-8	"	"	YBIN - 6
R _x 8-9	"	"	ZBIN - 6
R _y 8-9	"	"	XBIN - 5
R _x 9-10	"	"	YBIN - 5
R _y 9-10	"	"	ZBIN - 5
R _x 10-11	"	"	XBIN - 4
R _y 10-11	"	"	YBIN - 4
R _x 11-12	"	"	ZBIN - 4
R _y 11-12	"	"	XBIN - 3
R _x 12-13	"	"	YBIN - 3
R _y 12-13	"	"	ZBIN - 3
R _x 13-14	"	"	XBIN - 2
R _y 13-14	"	"	YBIN - 2
R _x 14-15	"	"	ZBIN - 2
R _y 14-15	"	"	XBIN - 1
R _x 15-16	"	"	YBIN - 1
R _y 15-16	"	"	ZBIN - 1

FIXED 825

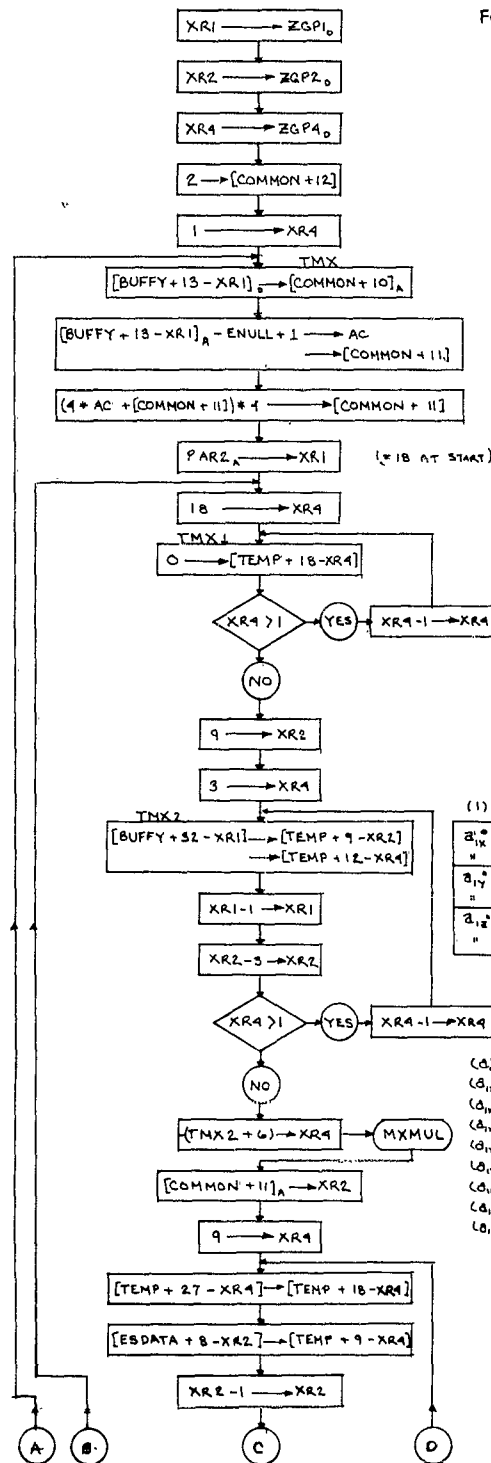




APPENDIX B

ADDITIONS AND MODIFICATIONS TO ORIGINAL PROGRAM - FLOW CHART

FORMATION OF T MATRIX



BUFFY + 12_A = # of 1st PHOTO THIS SET - STRIP 1
 BUFFY + 12_D = # of IMAGES THIS SET - STRIP 1
 BUFFY + 13_A = # of 1st PHOTO THIS SET - STRIP 2
 BUFFY + 13_D = # of IMAGES THIS SET - STRIP 2

COMMON + 10_A = # OF PHOTOS (OR IMAGES)
 COMMON + 11_A = 20 (# 1st PHOTO - # ORIGIN PHOTO + 1)

0 STORED IN TEMP + (0 TO 17)

(1)	(2)	(3)	(4)	(5)	(6)	
δ_{11}^*	δ_{21}^*	δ_{31}^*	δ_{41}^*	δ_{51}^*	δ_{61}^*	TRANSFERRED INTO
δ_{12}^*	δ_{22}^*	δ_{32}^*	δ_{42}^*	δ_{52}^*	δ_{62}^*	TEMP + 0
"	"	"	"	"	"	TEMP + 9
δ_{13}^*	δ_{23}^*	δ_{33}^*	δ_{43}^*	δ_{53}^*	δ_{63}^*	TEMP + 3
"	"	"	"	"	"	TEMP + 8
δ_{14}^*	δ_{24}^*	δ_{34}^*	δ_{44}^*	δ_{54}^*	δ_{64}^*	TEMP + 10
"	"	"	"	"	"	TEMP + 11

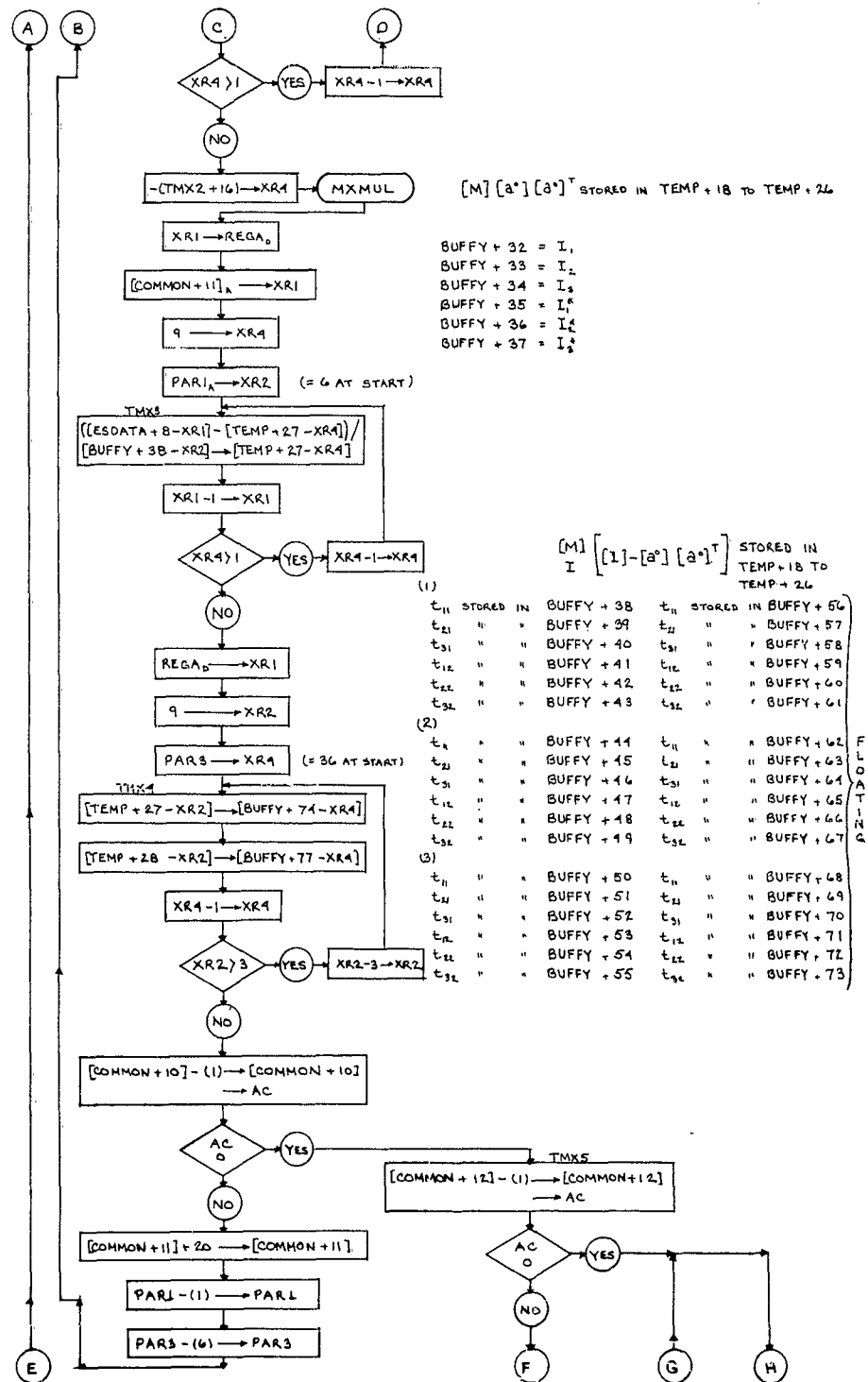
(δ_{ij}^*)' STORED IN TEMP + 18 TRANSFERRED INTO TEMP + 9

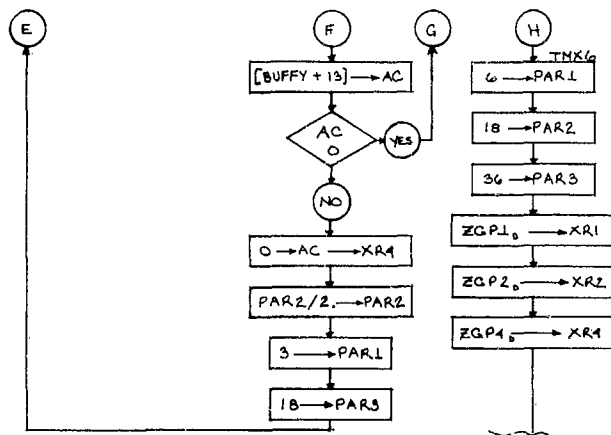
(δ_{11}^*)(δ_{11}^*)	"	TEMP + 19	"	TEMP + 10
(δ_{12}^*)(δ_{12}^*)	"	TEMP + 20	"	TEMP + 11
(δ_{13}^*)(δ_{13}^*)	"	TEMP + 21	"	TEMP + 12
(δ_{14}^*)(δ_{14}^*)	"	TEMP + 22	"	TEMP + 13
(δ_{15}^*)(δ_{15}^*)	"	TEMP + 23	"	TEMP + 14
(δ_{16}^*)(δ_{16}^*)	"	TEMP + 24	"	TEMP + 15
(δ_{17}^*)(δ_{17}^*)	"	TEMP + 25	"	TEMP + 16
(δ_{18}^*)(δ_{18}^*)	"	TEMP + 26	"	TEMP + 17

M_{ij} STORED IN TEMP + 0

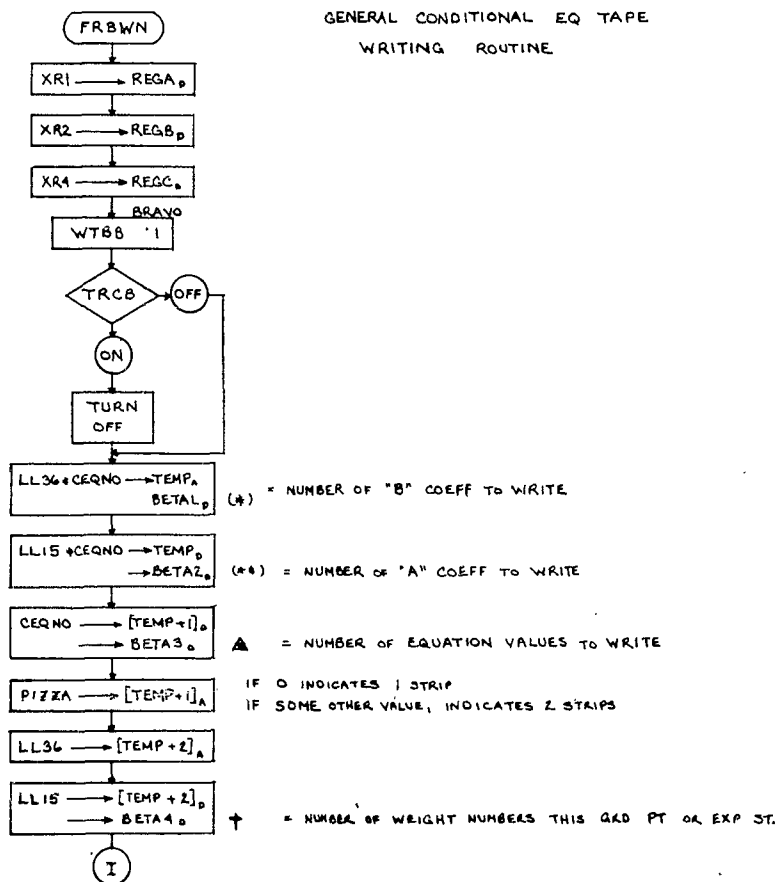
M ₁₁	"	TEMP + 1
M ₁₂	"	TEMP + 2
M ₁₃	"	TEMP + 3
M ₁₄	"	TEMP + 4
M ₁₅	"	TEMP + 5
M ₁₆	"	TEMP + 6
M ₁₇	"	TEMP + 7
M ₁₈	"	TEMP + 8

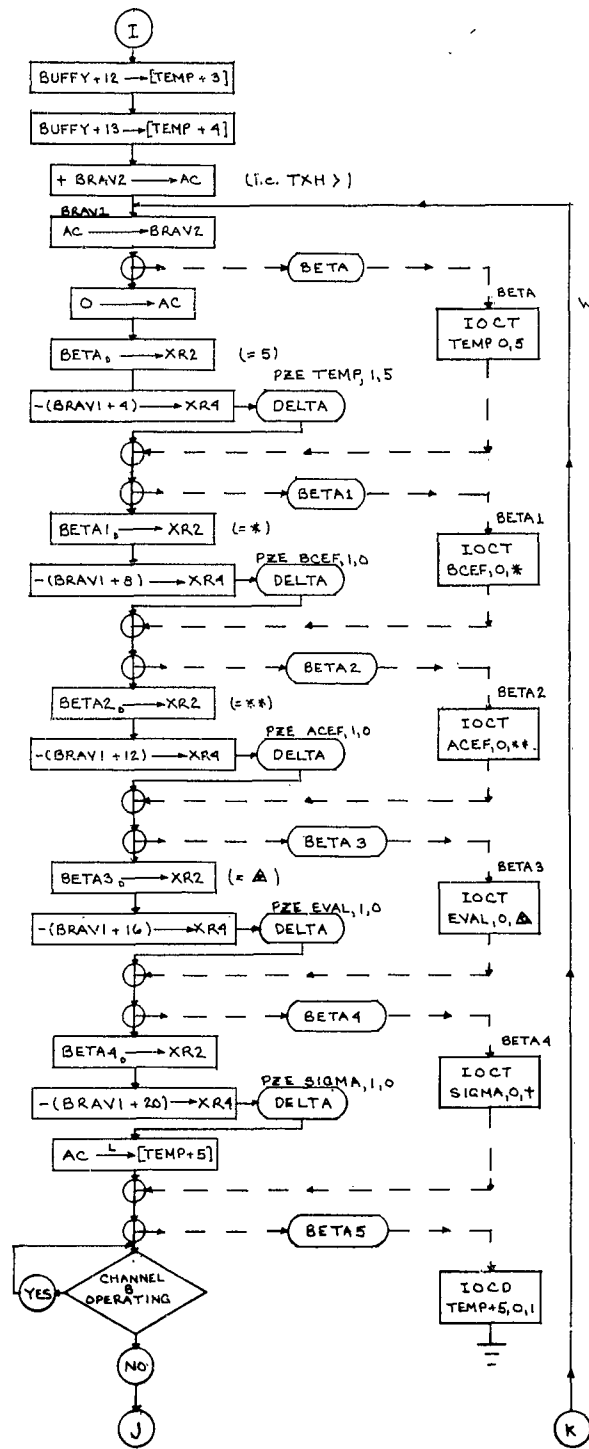
= [M]





GENERAL CONDITIONAL EQ TAPE WRITING ROUTINE





WRITE CONTROL WORDS.

TEMP_A = NO. of "B" COEFF
 TEMP_B = NO. of "A" COEFF
 TEMP+1_A = PIZZA
 TEMP+1_B = CEQNO
 TEMP+2_A = LL36
 TEMP+2_B = LL15
 TEMP+3 = BUFFY+12
 TEMP+4 = BUFFY+13

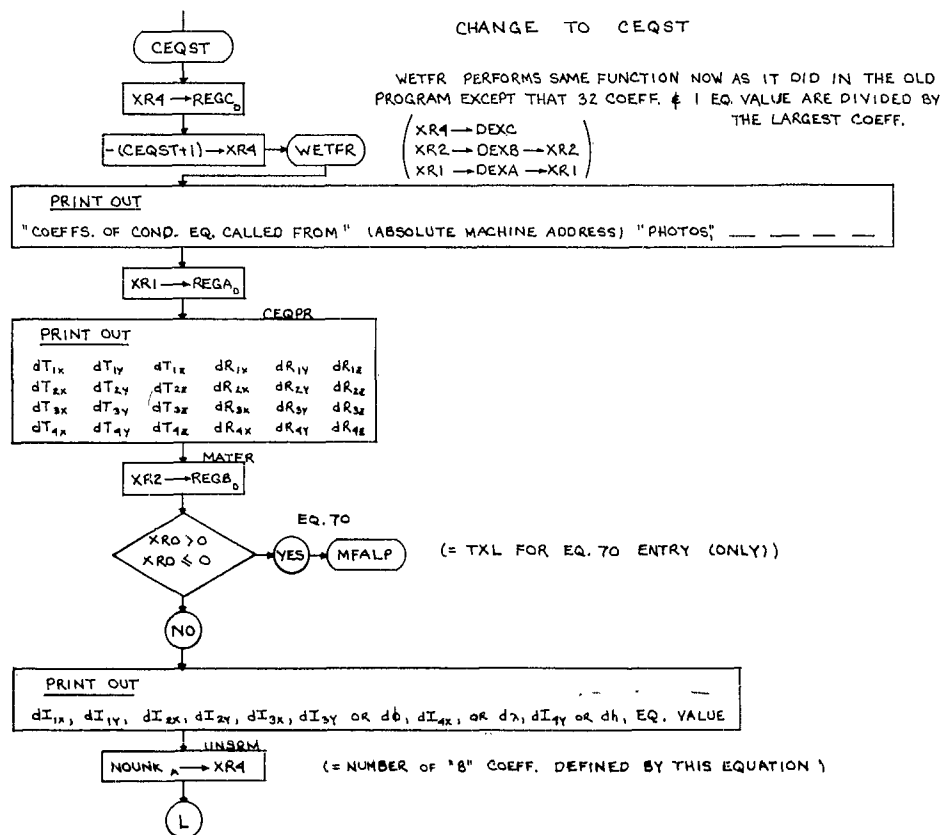
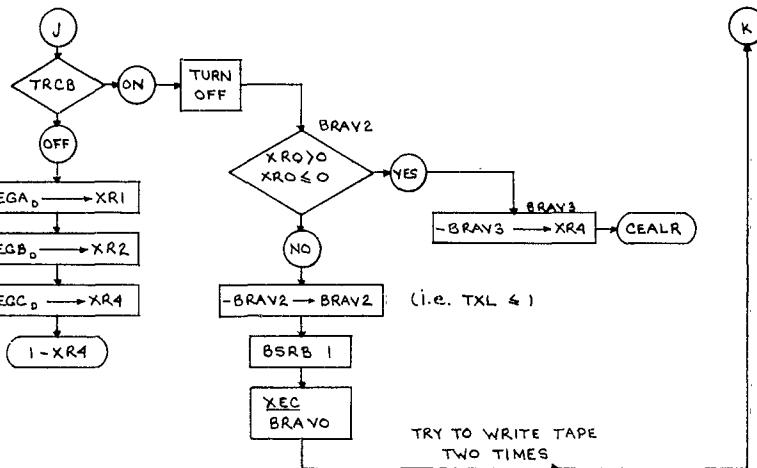
WRITE "B" COEFF

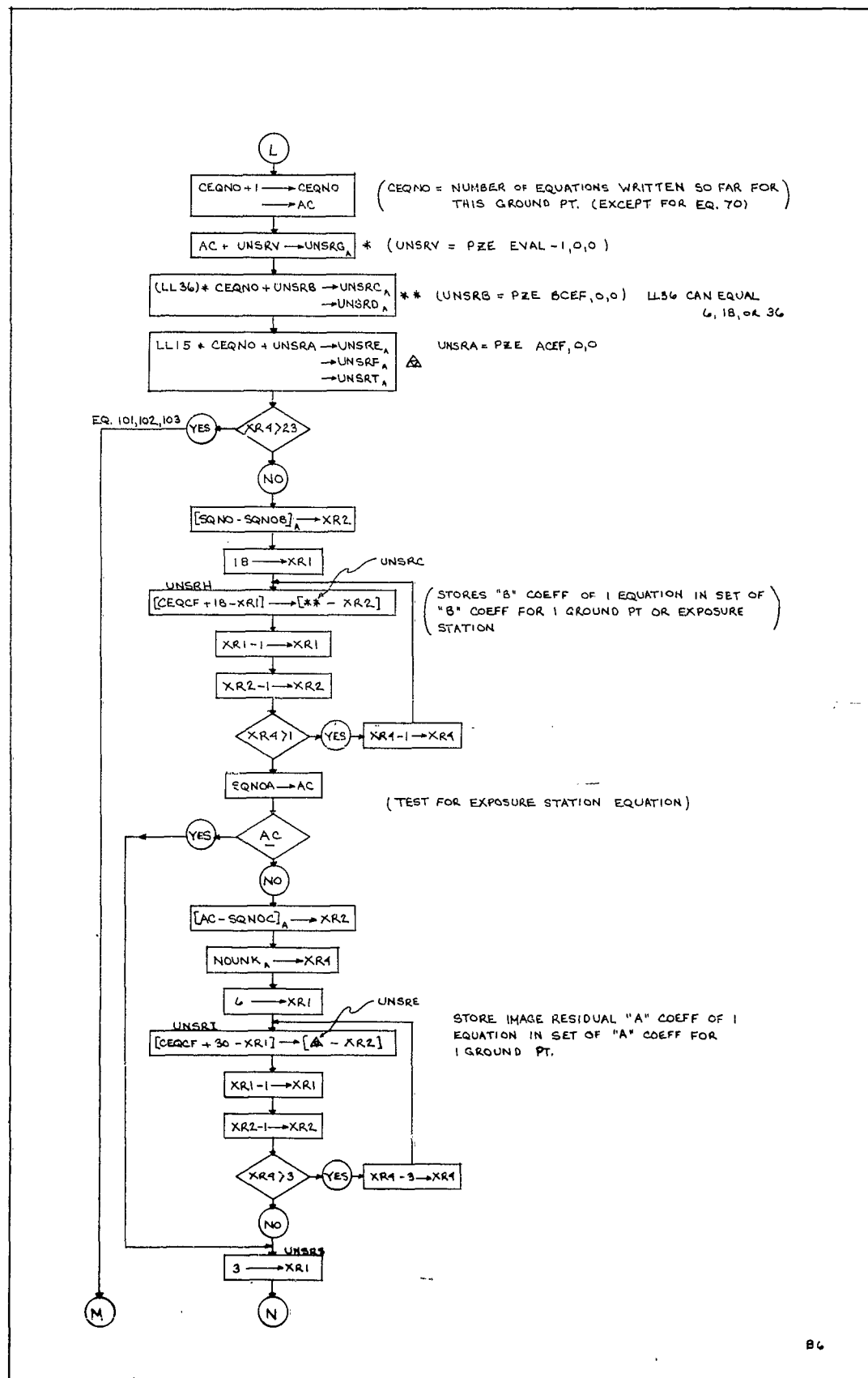
WRITE "A" COEFF

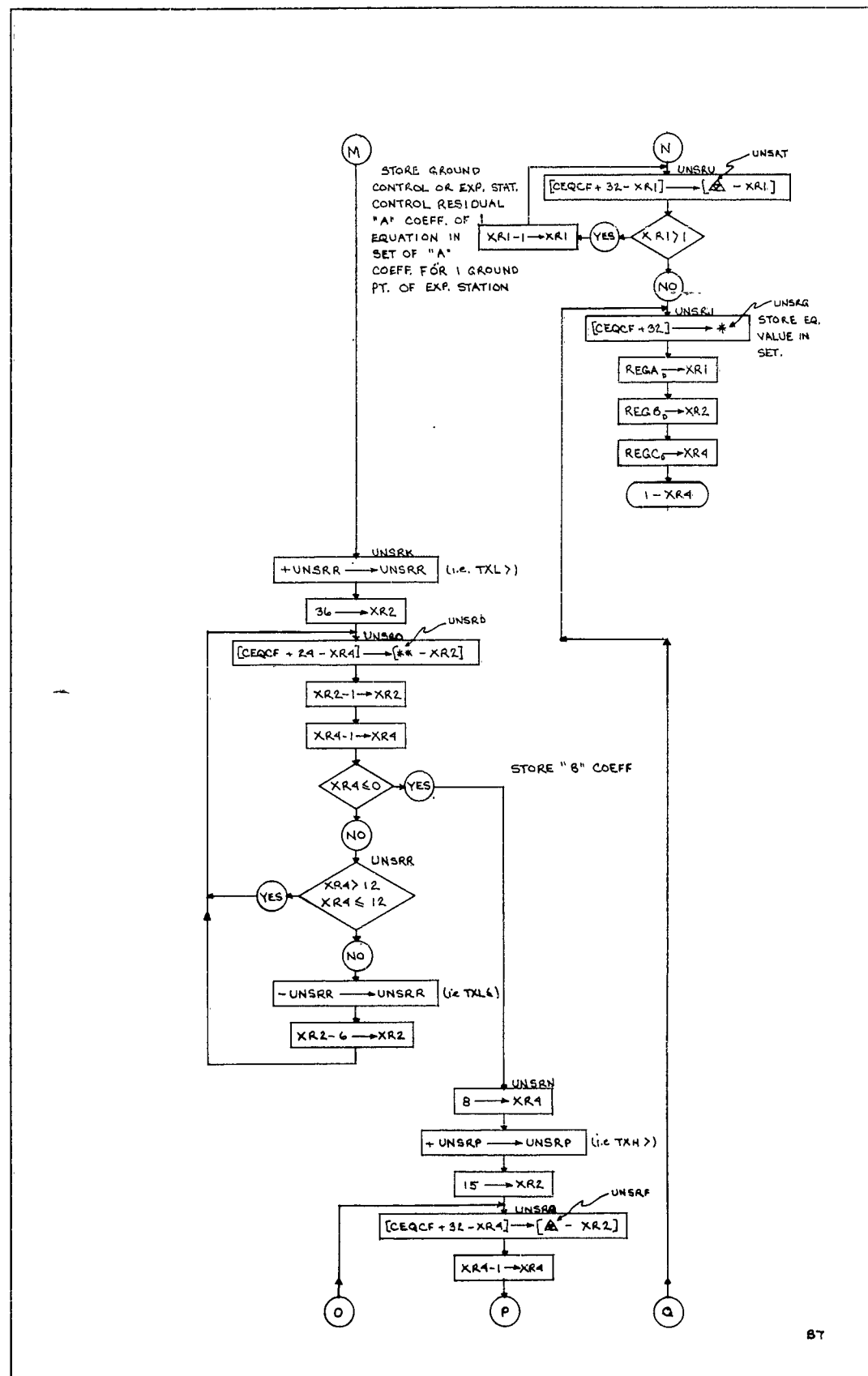
WRITE EQ. VALUE

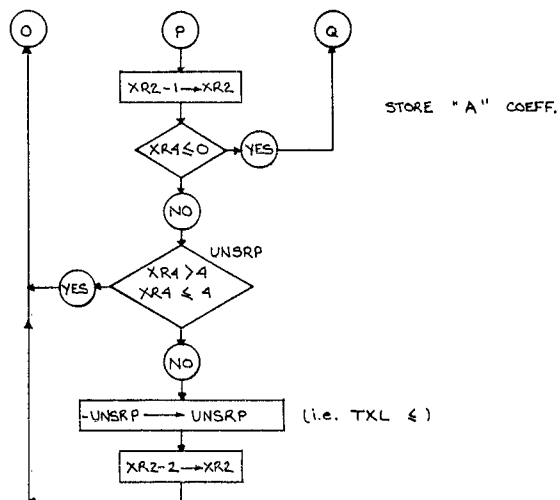
WRITE WEIGHT NUMBERS

WRITE CHECK SUM

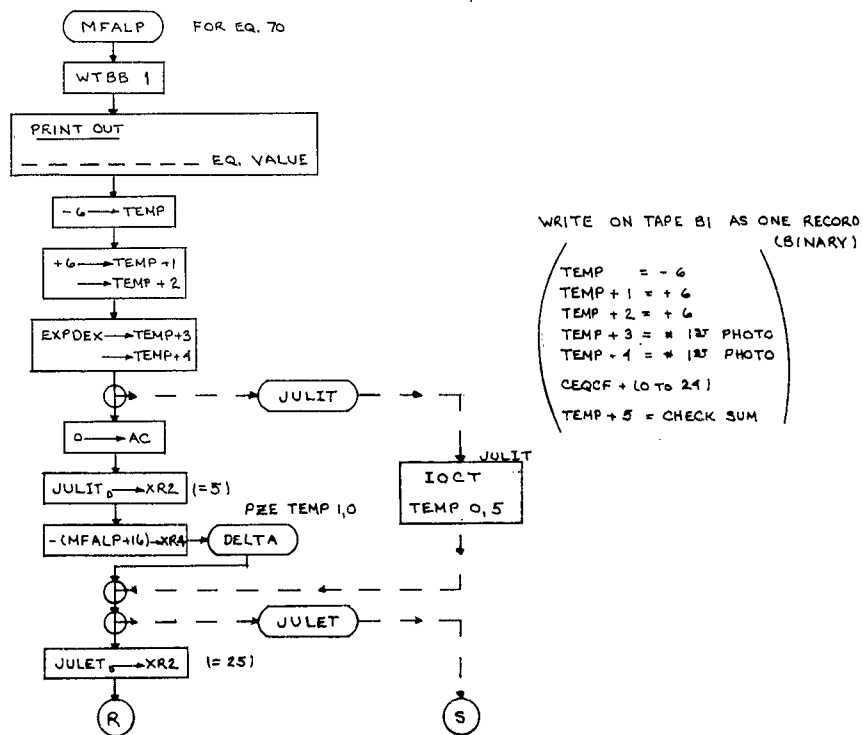


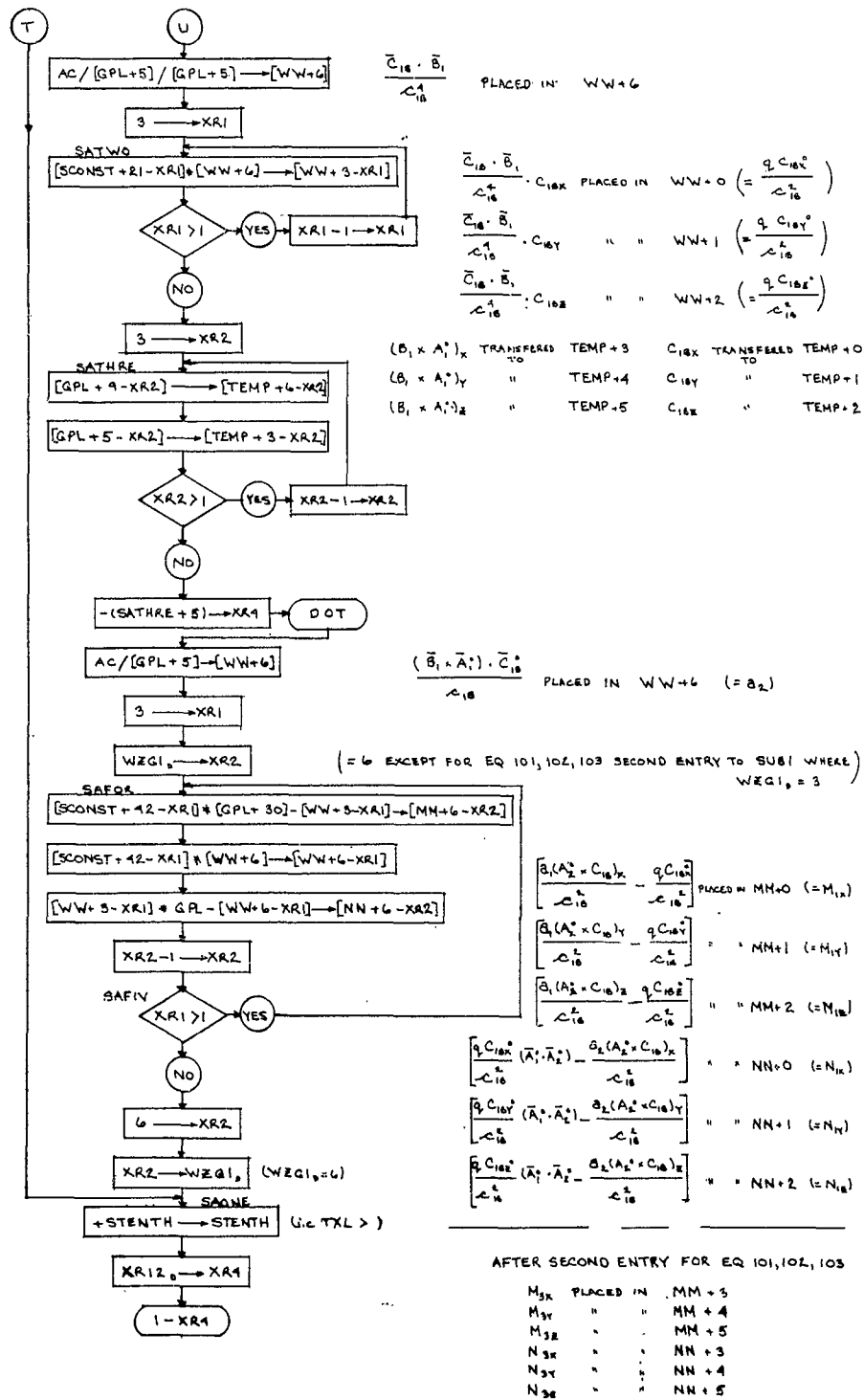






EQ. 70 TAPE WRITING ROUTINE

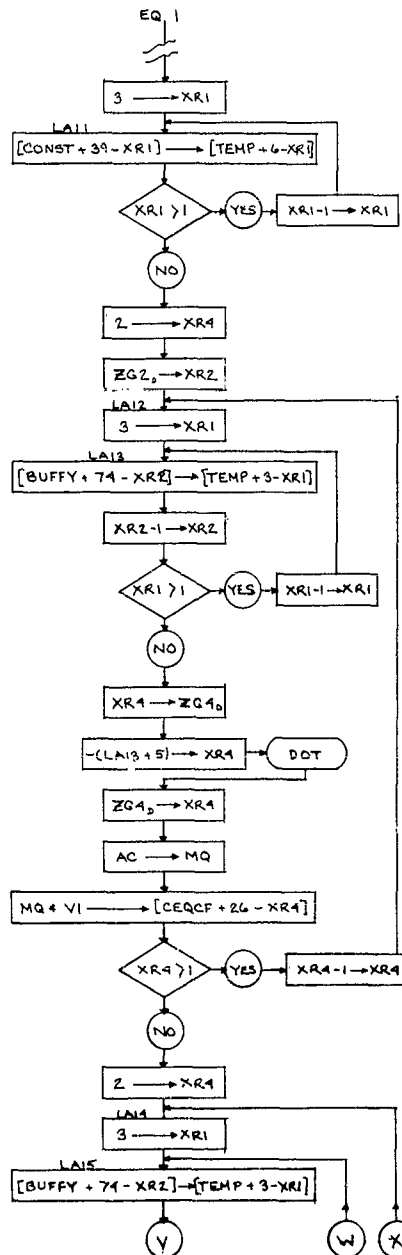




ADDITIONS TO EQ 1

IN CALLING SEQUENCE

PHOTOS	1,2	2,3	1*,2*	2*,3*
SQNO _A	= 36	30	18	12
ZGZ ₀	= 36	30	18	12
SQNOA _A	= 15	13	9	7



1ST LOOP

C_{100} TRANSFERRED TO TEMP + 3
 C_{100} " " TEMP + 4
 C_{100} " " TEMP + 5

2ND LOOP

$t_{11}^{(W)}$ TRANSFERRED TO TEMP
 $t_{21}^{(W)}$ " " TEMP + 1
 $t_{31}^{(W)}$ " " TEMP + 2

$t_{12}^{(W)}$ TRANSFERRED TO TEMP
 $t_{22}^{(W)}$ " " TEMP + 1
 $t_{32}^{(W)}$ " " TEMP + 2

$$AC = C_{100} t_{11}^{(W)} + C_{100} t_{21}^{(W)} + C_{100} t_{31}^{(W)}$$

$$AC = C_{100} t_{12}^{(W)} + C_{100} t_{22}^{(W)} + C_{100} t_{32}^{(W)}$$

dI₁₁ STORED IN CEQCF + 24

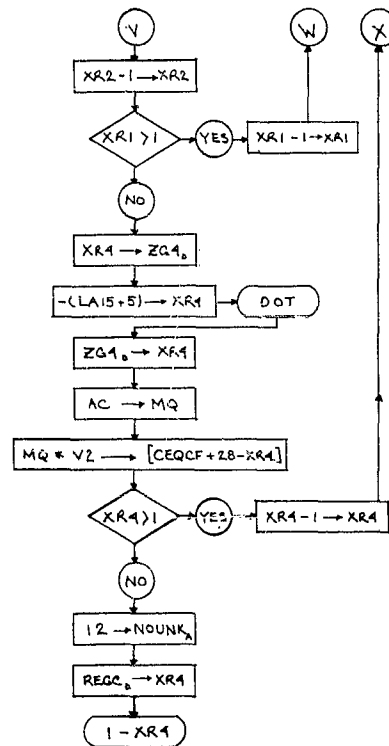
dI₁₁ STORED IN CEQCF + 25

1ST LOOP

$t_{11}^{(W)}$ TRANSFERRED TO TEMP
 $t_{21}^{(W)}$ " " TEMP + 1
 $t_{31}^{(W)}$ " " TEMP + 2

2ND LOOP

$t_{12}^{(W)}$ TRANSFERRED TO TEMP
 $t_{22}^{(W)}$ " " TEMP + 1
 $t_{32}^{(W)}$ " " TEMP + 2



1ST LOOP

2ND LOOP

$$AC = C_{100} t_{10}^{(1)} + C_{107} t_{21}^{(1)} + C_{108} t_{31}^{(1)}$$

$$AC = C_{100} t_{10}^{(1)} + C_{107} t_{21}^{(1)} + C_{108} t_{31}^{(1)}$$

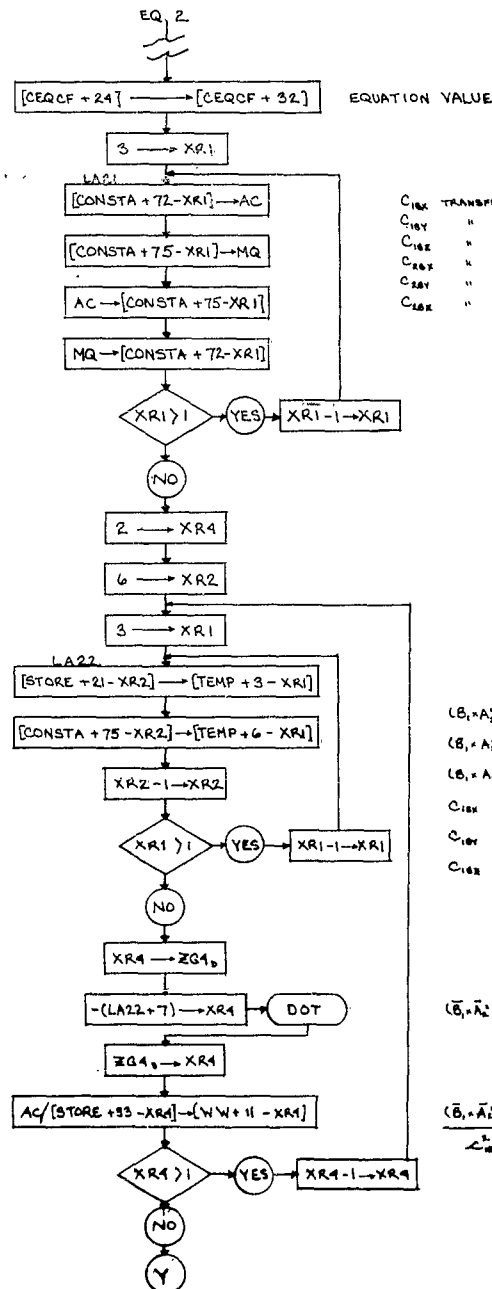
dI_{xy} STORED IN CEQCF+26

dI_{xy} STORED IN CEQCF+27

NOUNK_A = 12

ADDITIONS TO EQ 2

$\left. \begin{array}{ll} 1,2,3 & 1,2,3^* \\ \text{SQNO} & 36 \quad 18 \\ \text{ZG2}_0 & 36 \quad 18 \\ \text{SQNOA} & 15 \quad 9 \end{array} \right\} \text{ FROM CALLING SEQUENCE FOR EQ 1 (1ST PAIRS)}$



C_{18K} TRANSFERRED TO CONSTA + 69
 C_{18Y} " " CONSTA + 70
 C_{18Z} " " CONSTA + 71
 C_{20X} " " CONSTA + 72
 C_{20Y} " " CONSTA + 73
 C_{20Z} " " CONSTA + 74

1ST LOOP

$(B_1 + A_1^*)_x$ TRANSFERRED TEMP
 $(B_1 + A_1^*)_y$ " TEMP + 1
 $(B_1 + A_1^*)_z$ " TEMP + 2
 C_{18X} " TEMP + 3
 C_{18Y} " TEMP + 4
 C_{18Z} " TEMP + 5

2ND LOOP

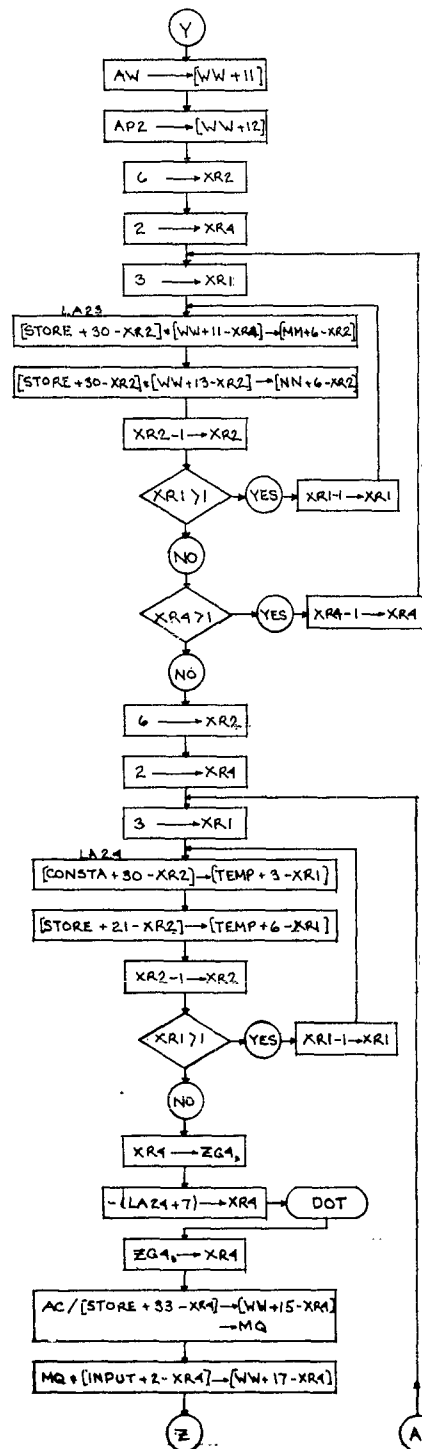
$(B_2 + A_2^*)_x$ TRANSFERRED TEMP
 $(B_2 + A_2^*)_y$ " TEMP + 1
 $(B_2 + A_2^*)_z$ " TEMP + 2
 C_{20X} " TEMP + 3
 C_{20Y} " TEMP + 4
 C_{20Z} " TEMP + 5

$(B_1 + A_1^*) \cdot \bar{C}_{18}$ PLACED IN AC

$(B_2 + A_2^*) \cdot \bar{C}_{20}$ PLACED IN AC

$\frac{(B_1 + A_1^*) \cdot \bar{C}_{18}}{C_{18}^2}$ STORED IN W/W + 9
 (= $\delta_{11} = \gamma_1$)

$\frac{(B_2 + A_2^*) \cdot \bar{C}_{20}}{C_{20}^2}$ STORED IN W/W + 10
 (= δ_{21})



B₂ TRANSFERRED TO WW+11
B₁ " " WW+12

1ST LOOP

B₁(A₁²·C₁₀)_x STORED IN MM+0
B₁(A₁²·C₁₀)_y " " MM+1
B₁(A₁²·C₁₀)_z " " MM+2
B₂(A₁²·C₁₀)_x " " NN+0
B₂(A₁²·C₁₀)_y " " NN+1
B₂(A₁²·C₁₀)_z " " NN+2

2ND LOOP

B₃(A₁²·C₁₀)_x STORED IN MM+3
B₃(A₁²·C₁₀)_y " " MM+4
B₃(A₁²·C₁₀)_z " " MM+5
B₄(A₁²·C₁₀)_x " " NN+3
B₄(A₁²·C₁₀)_y " " NN+4
B₄(A₁²·C₁₀)_z " " NN+5

1ST LOOP

B₁² TRANSFERRED TO TEMP+0
B₁₁² " " TEMP+1
B₁₂² " " TEMP+2
(B₁·A₁)_x " " TEMP+3
(B₁·A₁)_y " " TEMP+4
(B₁·A₁)_z " " TEMP+5

2ND LOOP

B₂² TRANSFERRED TO TEMP+0
B₂₁² " " TEMP+1
B₂₂² " " TEMP+2
(B₂·A₁)_x " " TEMP+3
(B₂·A₁)_y " " TEMP+4
(B₂·A₁)_z " " TEMP+5

$\bar{A}_1 \cdot (\bar{B}_1 \cdot \bar{A}_1)$ PLACED IN AC

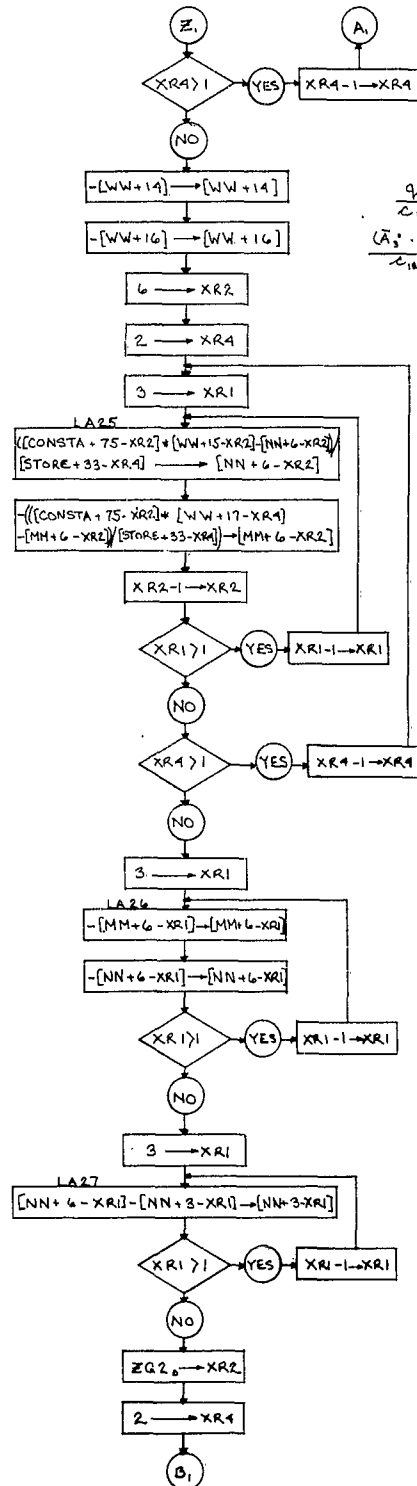
$\bar{A}_2 \cdot (\bar{B}_2 \cdot \bar{A}_1)$ PLACED IN AC

$\bar{A}_1 \cdot (\bar{B}_1 \cdot \bar{A}_2)$ PLACED IN WW+13
 $\frac{(\bar{A}_1 \cdot \bar{B}_1) \cdot \bar{A}_2}{C_{10}}$ $\left(\frac{q_1}{C_{10}} \right)$

$\bar{A}_2 \cdot (\bar{B}_2 \cdot \bar{A}_2)$ PLACED IN WW+14
 $\frac{(\bar{A}_2 \cdot \bar{B}_2) \cdot \bar{A}_2}{C_{10}}$ $\left(\frac{q_2}{C_{10}} \right)$

$(\bar{A}_1 \cdot \bar{A}_2) \left[\frac{\bar{A}_1 \cdot (\bar{B}_1 \cdot \bar{A}_2)}{C_{10}} \right]$
PLACED IN WW+15
 $= \frac{(\bar{A}_1 \cdot \bar{A}_2) \cdot q_1}{C_{10}}$

$(\bar{A}_2 \cdot \bar{A}_2) \left[\frac{\bar{A}_2 \cdot (\bar{B}_2 \cdot \bar{A}_2)}{C_{10}} \right]$
PLACED IN WW+16
 $= \frac{(\bar{A}_2 \cdot \bar{A}_2) \cdot q_2}{C_{10}}$



$$\frac{q_L}{C_{10}} \text{ PLACED IN } WW + 14$$

$$\frac{(\bar{A}_1 \cdot \bar{A}_2) q_L}{C_{10}} \text{ " } WW + 16$$

1ST LOOP

$$\frac{C_{10} q_L - q_L (A_1 + C_{10})}{C_{10}} \text{ PLACED IN } NN + 0$$

$$\frac{C_{10} q_L - q_L (A_1 + C_{10})}{C_{10}} \text{ " } NN + 1$$

$$\frac{C_{10} q_L - q_L (A_1 + C_{10})}{C_{10}} \text{ " } NN + 2$$

$$\frac{C_{10} q_L (\bar{A}_1 \cdot \bar{A}_2) - q_L (A_1 + C_{10})}{C_{10}} \text{ PLACED IN } MM + 0 (=M_{20})$$

$$\frac{C_{10} q_L (\bar{A}_1 \cdot \bar{A}_2) - q_L (A_1 + C_{10})}{C_{10}} \text{ PLACED IN } MM + 1 (=M_{21})$$

$$\frac{C_{10} q_L (\bar{A}_1 \cdot \bar{A}_2) - q_L (A_1 + C_{10})}{C_{10}} \text{ PLACED IN } MM + 2 (=M_{22})$$

2ND LOOP

$$\frac{C_{10} q_L - q_L (A_1 + C_{10})}{C_{10}} \text{ PLACED IN } NN + 3$$

$$\frac{C_{10} q_L - q_L (A_1 + C_{10})}{C_{10}} \text{ " } NN + 4$$

$$\frac{C_{10} q_L - q_L (A_1 + C_{10})}{C_{10}} \text{ " } NN + 5$$

$$\frac{C_{10} q_L (\bar{A}_1 \cdot \bar{A}_2) - q_L (A_1 + C_{10})}{C_{10}} \text{ PLACED IN } MM + 3 (=M_{23})$$

$$\frac{C_{10} q_L (\bar{A}_1 \cdot \bar{A}_2) - q_L (A_1 + C_{10})}{C_{10}} \text{ PLACED IN } MM + 4 (=M_{24})$$

$$\frac{C_{10} q_L (\bar{A}_1 \cdot \bar{A}_2) - q_L (A_1 + C_{10})}{C_{10}} \text{ PLACED IN } MM + 5 (=M_{25})$$

$$M_{20}' \text{ PLACED IN } MM + 3$$

$$M_{21}' \text{ " " } MM + 4$$

$$M_{22}' \text{ " " } MM + 5$$

$$N_{20}' \text{ " " } NN + 3$$

$$N_{21}' \text{ " " } NN + 4$$

$$N_{22}' \text{ " " } NN + 5$$

$$(N_{20}' - N_{21}') \text{ PLACED IN } NN + 0$$

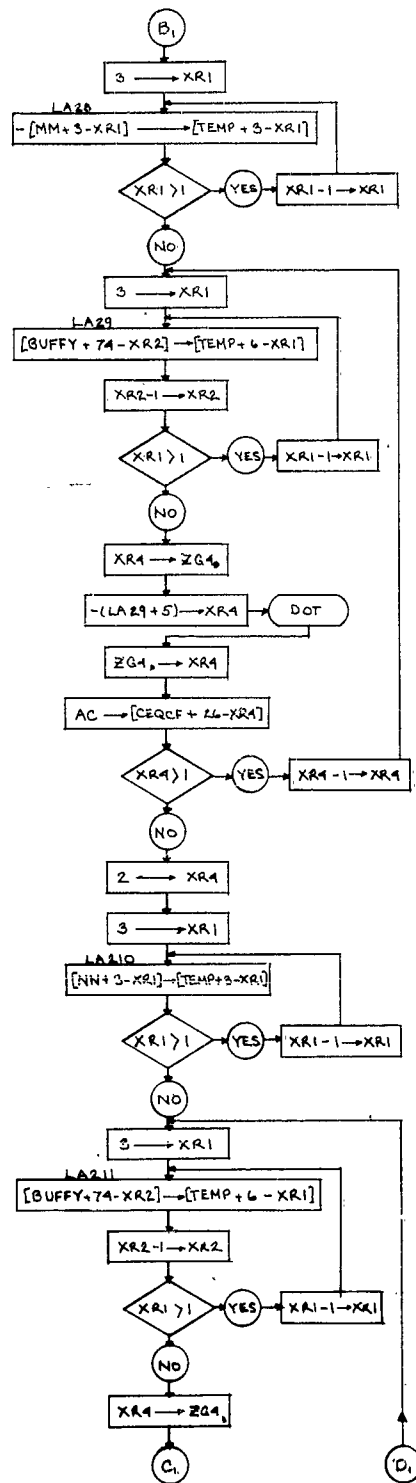
$$(N_{21}' - N_{22}') \text{ " " } NN + 1$$

$$(N_{22}' - N_{20}') \text{ " " } NN + 2$$

$$-M_{20} \text{ TRANSFERRED TO TEMP} + 0$$

$$-M_{21} \text{ " " } TEMP + 1$$

$$-M_{22} \text{ " " } TEMP + 2$$



1ST LOOP

$t_{11}^{(U)}$ TRANSFERRED TO TEMP+3
 $t_{22}^{(U)}$ " " TEMP+4
 $t_{31}^{(U)}$ " " TEMP+5

2ND LOOP

$t_{11}^{(U)}$ TRANSFERRED TO TEMP+3
 $t_{22}^{(U)}$ " " TEMP+4
 $t_{31}^{(U)}$ " " TEMP+5

$$AC = -M_{22}t_{11}^{(U)} - M_{21}t_{21}^{(U)} - M_{23}t_{31}^{(U)} \quad AC = -M_{22}^{(U)}t_{11} - M_{21}^{(U)}t_{21} - M_{23}^{(U)}t_{31} \\ (=dI_{1X}) \quad (=dI_{1Y})$$

dI_{1X} STORED IN CEQCF+24 dI_{1Y} STORED IN CEQCF+25

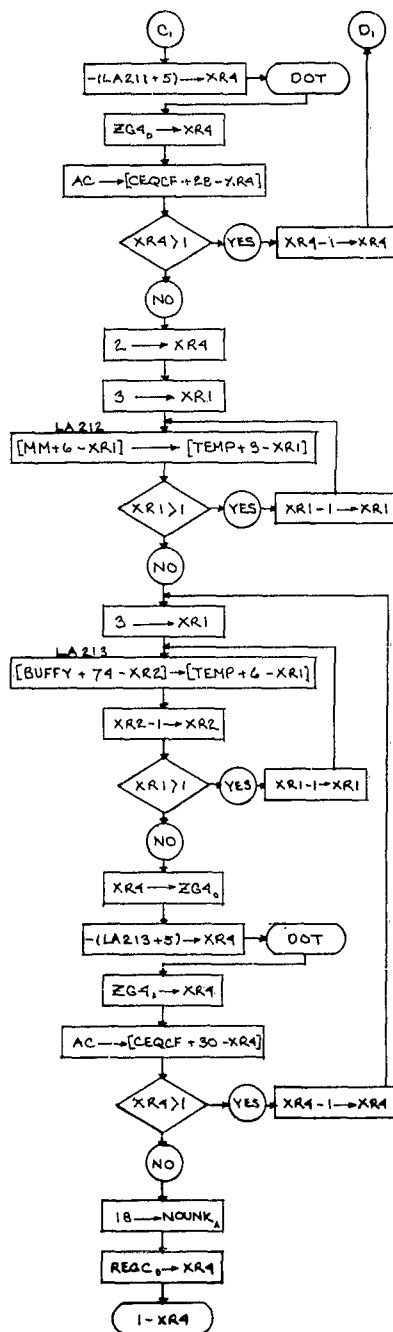
$(N_{2X}' - N_{2X})$ TRANSFERRED TEMP+0
 $(N_{2Y}' - N_{2Y})$ " " TEMP+1
 $(N_{2Z}' - N_{2Z})$ " " TEMP+2

1ST LOOP

$t_{11}^{(W)}$ TRANSFERRED TO TEMP+3
 $t_{22}^{(W)}$ " " TEMP+4
 $t_{31}^{(W)}$ " " TEMP+5

2ND LOOP

$t_{11}^{(W)}$ TRANSFERRED TO TEMP+3
 $t_{22}^{(W)}$ " " TEMP+4
 $t_{31}^{(W)}$ " " TEMP+5



$$AC = (N_{25}^{(1)} - N_{25}^{(2)})t_{11}^{(1)} + (N_{25}^{(1)} - N_{25}^{(2)})t_{21}^{(1)} + (N_{25}^{(1)} - N_{25}^{(2)})t_{31}^{(1)} \quad (=dI_{25})$$

$$AC = (N_{25}^{(1)} - N_{25}^{(2)})t_{11}^{(2)} + (N_{25}^{(1)} - N_{25}^{(2)})t_{21}^{(2)} + (N_{25}^{(1)} - N_{25}^{(2)})t_{31}^{(2)} \quad (=dI_{25})$$

dI_{25} STORED IN CEQCF+26

dI_{25} STORED IN CEQCF+27

$M_{25}^{(1)}$ TRANSFERRED TO TEMP+0
 $M_{25}^{(2)}$ " " TEMP+1
 $M_{25}^{(3)}$ " " TEMP+2

1st LOOP

2nd LOOP

$t_{11}^{(3)}$ TRANSFERRED TO TEMP+3
 $t_{21}^{(3)}$ " " TEMP+4
 $t_{31}^{(3)}$ " " TEMP+5

$t_{11}^{(4)}$ TRANSFERRED TO TEMP+3
 $t_{21}^{(4)}$ " " TEMP+4
 $t_{31}^{(4)}$ " " TEMP+5

$$AC = M_{25}^{(1)}t_{11}^{(1)} + M_{25}^{(2)}t_{21}^{(1)} + M_{25}^{(3)}t_{31}^{(1)} \quad (=dI_{25})$$

$$AC = M_{25}^{(1)}t_{11}^{(2)} + M_{25}^{(2)}t_{21}^{(2)} + M_{25}^{(3)}t_{31}^{(2)} \quad (=dI_{25})$$

dI_{25} STORED IN CEQCF+28

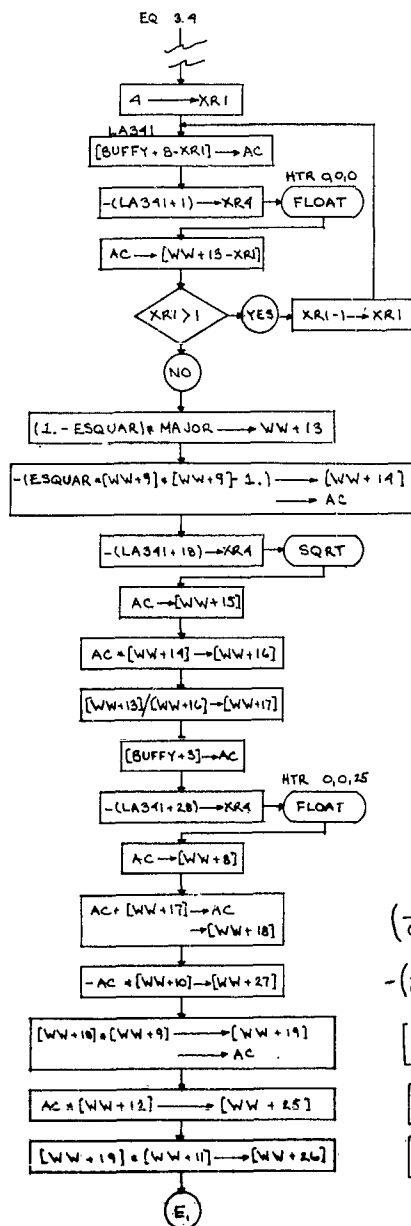
dI_{25} STORED IN CEQCF+29

NOUNK₁₈ = 18

ADDITIONS TO EQ3 & EQ4

IN CALLING SEQUENCE

	PHOTO	1	2	3	1*	2*	3*
SQNO	36	30	24	18	12	6	
EQ2	36	30	24	18	12	6	
SQNOA	15	13	11	9	7	5	
NOUNK	6	6	6	6	6	6	

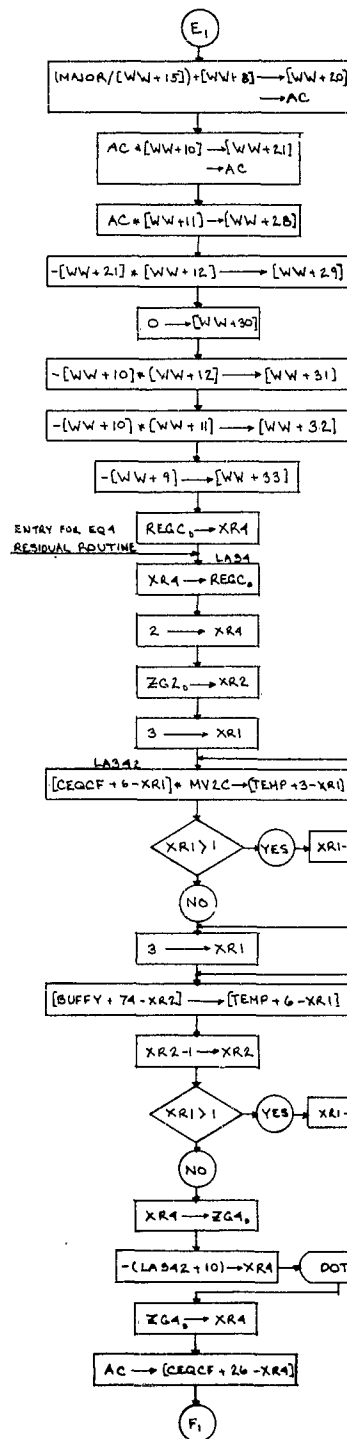


SIN ϕ FLOATED AND STORED IN WW+9
 COS ϕ " " " " WW+10 (FLT)
 SIN γ " " " " WW+11
 COS γ " " " " WW+12

ESQUAR = e^2 (FLT)
 MAJOR = a (FLT)
 $a(1-e^2)$ PLACED IN WW+13 (FLT)
 $(1-e^2 \sin^2 \phi)$ PLACED IN WW+14 (FLT)

$(1-e^2 \sin^2 \phi)^{1/2}$ PLACED IN WW+15 (FLT)
 $(1-e^2 \sin^2 \phi)^{3/4}$ " " WW+16 (FLT)
 $\frac{a(1-e^2)}{(1-e^2 \sin^2 \phi)^{3/4}}$ " " WW+17 (FLT)

h PLACED IN WW+8 (FLT)
 $\left(\frac{a(1-e^2)}{(1-e^2 \sin^2 \phi)^{3/4}} + h \right)$ PLACED IN WW+18 (FLT)
 $-\left(\frac{a(1-e^2) \cos \phi}{(1-e^2 \sin^2 \phi)^{3/4}} + h \cos \phi \right)$ " " WW+27 (FLT)
 $\left[\frac{a(1-e^2) \sin \phi}{(1-e^2 \sin^2 \phi)^{3/4}} + h \sin \phi \right]$ " " WW+19 (FLT)
 $\left[\frac{a(1-e^2) \sin \phi \cos \gamma}{(1-e^2 \sin^2 \phi)^{3/4}} + h \sin \phi \cos \gamma \right]$ " " WW+25 (FLT)
 $\left[\frac{a(1-e^2) \sin \phi \sin \gamma}{(1-e^2 \sin^2 \phi)^{3/4}} + h \sin \phi \sin \gamma \right]$ " " WW+26 (FLT)



$$\left[\frac{a}{(1 - e^2 \sin^2 \phi)^{3/2}} + h \right] \text{ PLACED IN } WW + 20 \text{ (FLT)}$$

$$\left[\frac{a \cos \phi}{(1 - e^2 \sin^2 \phi)^{3/2}} + h \cos \phi \right] \text{ " " } WW + 21 \text{ (FLT)}$$

$$\left[\frac{a \cos \phi \sin \lambda}{(1 - e^2 \sin^2 \phi)^{3/2}} + h \cos \phi \sin \lambda \right] \text{ " " } WW + 22 \text{ (FLT)}$$

$$-\left[\frac{a \cos \phi \sin \lambda}{(1 - e^2 \sin^2 \phi)^{3/2}} + h \cos \phi \sin \lambda \right] \text{ " " } WW + 29 \text{ (FLT)}$$

$$0 \text{ " " } WW + 30$$

$$-\cos \phi \cos \lambda \text{ " " } WW + 31 \text{ (FLT)}$$

$$-\cos \phi \sin \lambda \text{ " " } WW + 32 \text{ (FLT)}$$

$$-\sin \phi \text{ " " } WW + 33 \text{ (FLT)}$$

EQ 3

$$\begin{aligned} &B_{002} V_{ec} \text{ PLACED IN } TEMP + 0 \\ &B_{001} V_{ec} \text{ " " } TEMP + 1 \\ &B_{002} V_{ec} \text{ " " } TEMP + 2 \end{aligned}$$

1ST LOOP

$$\begin{aligned} t_{11}^{(0)} &\text{ TRANSFERRED TO } TEMP + 3 \\ t_{12}^{(0)} &\text{ " " } TEMP + 4 \\ t_{13}^{(0)} &\text{ " " } TEMP + 5 \end{aligned}$$

$$\begin{aligned} AC &= A_{002} V_{ec} t_{11} + A_{001} V_{ec} t_{12} \\ &+ A_{002} V_{ec} t_{13} \quad (=dI_{HY}) \\ dI_{HY} &\text{ PLACED IN CEQCF + 29} \end{aligned}$$

2ND LOOP

$$\begin{aligned} t_{12}^{(0)} &\text{ TRANSFERRED TO } TEMP + 3 \\ t_{11}^{(0)} &\text{ " " } TEMP + 4 \\ t_{13}^{(0)} &\text{ " " } TEMP + 5 \end{aligned}$$

$$\begin{aligned} AC &= A_{002} V_{ec} t_{11} + A_{001} V_{ec} t_{12} \\ &+ A_{002} V_{ec} t_{13} \quad (=dI_{HY}) \\ dI_{HY} &\text{ PLACED IN CEQCF + 25} \end{aligned}$$

EQ 4

$$\begin{aligned} &-B_{002} V_{ec} \text{ PLACED IN } TEMP + 0 \\ &-B_{001} V_{ec} \text{ " " } TEMP + 1 \\ &-B_{002} V_{ec} \text{ " " } TEMP + 2 \end{aligned}$$

1ST LOOP

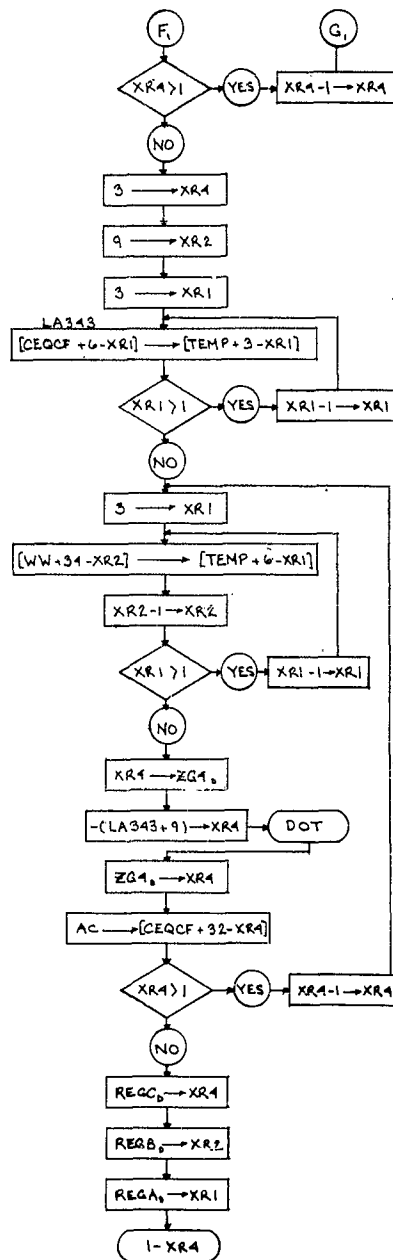
SAME AS FOR EQ 3

$$\begin{aligned} AC &= -V_{ec}(B_{002} t_{11} + A_{001} t_{12} + A_{002} t_{13}) \\ &\quad (=dI_{HY}) \\ dI_{HY} &\text{ PLACED IN CEQCF + 29} \end{aligned}$$

2ND LOOP

SAME AS FOR EQ 3

$$\begin{aligned} AC &= -V_{ec}(B_{002} t_{11} + A_{001} t_{12} + A_{002} t_{13}) \\ &\quad (=dI_{HY}) \\ dI_{HY} &\text{ PLACED IN CEQCF + 25} \end{aligned}$$



EQ 3

- δ_{012} TRANSFERRED TO TEMP+0
 - δ_{011} " " TEMP+1
 - δ_{012} " " TEMP+2

12th LOOP

$$AC = (-\delta_{012}) \left[\frac{\partial(1-e^2)\sin\phi\cos\gamma}{(1-e^2\sin^2\phi)^{3/2}} + h\sin\phi\cos\gamma \right] + (-\delta_{011}) \left[\frac{\partial(1-e^2)\sin\phi\sin\gamma}{(1-e^2\sin^2\phi)^{3/2}} + h\sin\phi\sin\gamma \right] + (-\delta_{012}) \left[\frac{\partial(1-e^2)\cos\phi}{(1-e^2\sin^2\phi)^{3/2}} + h\cos\phi \right] = d\phi$$

$d\phi$ STORED IN CEQCF + 29

2nd LOOP

$$AC = (-\delta_{012}) \left[\frac{\partial\cos\phi\sin\gamma}{(1-e^2\sin^2\phi)^{3/2}} + h\cos\phi\sin\gamma \right] + (-\delta_{011}) \left[\frac{\partial\cos\phi\cos\gamma}{(1-e^2\sin^2\phi)^{3/2}} + h\cos\phi\cos\gamma \right] + 0 = d\gamma$$

$d\gamma$ STORED IN CEQCF + 30

3rd LOOP

$$AC = (-\delta_{012}) [\cos\phi\cos\gamma] + (\delta_{011}) [-\cos\phi\sin\gamma] + (\delta_{012}) [-\sin\phi] = dh$$

dh STORED IN CEQCF + 31

EQ 4

δ_{011} TRANSFERRED TO TEMP+1
 δ_{011} " " TEMP+2
 δ_{012} " " TEMP+3

12th LOOP

$$AC = d\phi$$

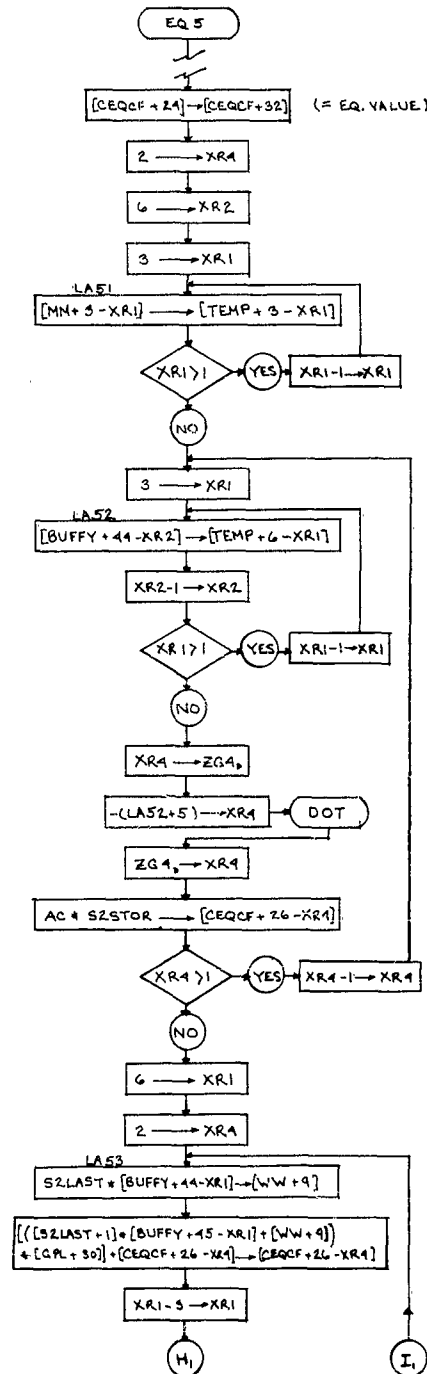
$d\phi$ STORED IN CEQCF + 29

2nd LOOP

$$AC = d\gamma$$

$d\gamma$ STORED IN CEQCF + 30

ADDITIONS TO EQ 5



M_{1x} TRANSFERRED TO TEMP+0
 M_{1y} " " TEMP+1
 M_{1z} " " TEMP+2

1ST LOOP

t_{11}^w TRANSFERRED TO TEMP+3
 t_{12}^w " " TEMP+4
 t_{13}^w " " TEMP+5

2ND LOOP

t_{11}^w TRANSFERRED TO TEMP+3
 t_{12}^w " " TEMP+4
 t_{13}^w " " TEMP+5

$$AC = M_{1x}t_{11} + M_{1y}t_{12} + M_{1z}t_{13}$$

$$AC = M_{1x}t_{11} + M_{1y}t_{12} + M_{1z}t_{13}$$

$$[\alpha_1 a_{1x} - \beta_1 a_{1y}] [M_{1x}t_{11} + M_{1y}t_{12} + M_{1z}t_{13}]$$

STORED IN CEQCF+24

$$[\alpha_1 a_{1x} - \beta_1 a_{1y}] [M_{1x}t_{11} + M_{1y}t_{12} + M_{1z}t_{13}]$$

STORED IN CEQCF+25

$\alpha_1 t_{11}$ STORED IN WW+9

$\alpha_1 t_{12}$ STORED IN WW+9

$$\alpha_1 (\alpha_1 t_{11} - \beta_1 t_{12}) + [\alpha_1 a_{1x} - \beta_1 a_{1y}]$$

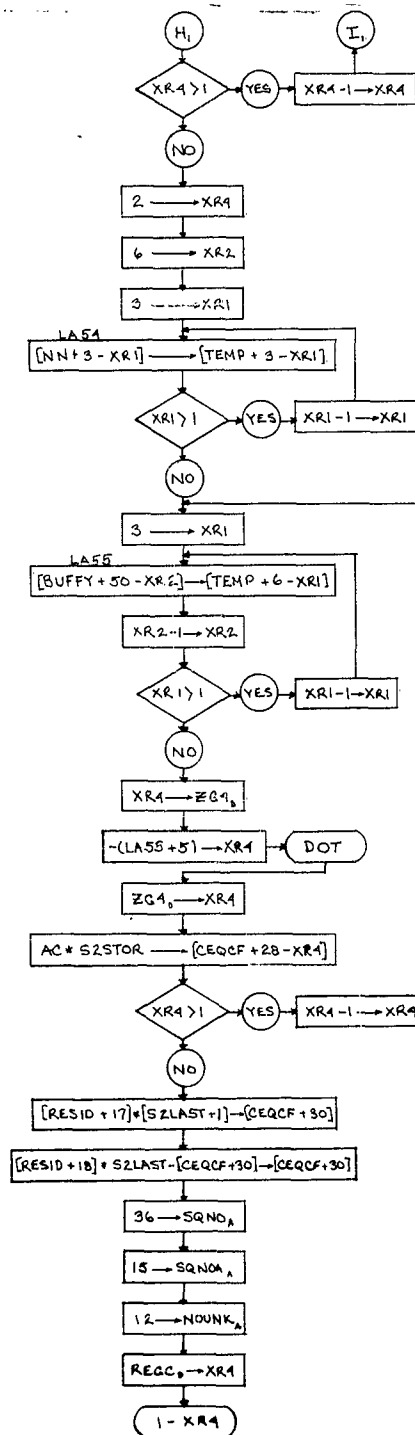
$$[M_{1x}t_{11} + M_{1y}t_{12} + M_{1z}t_{13}]$$

$$= dI_{1x} \text{ PLACED IN CEQCF+24}$$

$$\alpha_1 (\alpha_1 t_{12} - \beta_1 t_{13}) + [\alpha_1 a_{1x} - \beta_1 a_{1y}]$$

$$[M_{1x}t_{11} + M_{1y}t_{12} + M_{1z}t_{13}]$$

$$= dI_{1y} \text{ PLACED IN CEQCF+25}$$



N_{11} TRANSFERRED TO TEMP + 0
 N_{11} " " TEMP + 1
 N_{12} " " TEMP + 2

1ST LOOP

$t_{11}^{(H)}$ TRANSFERRED TO TEMP + 3
 $t_{11}^{(H)}$ " " TEMP + 4
 $t_{11}^{(H)}$ " " TEMP + 5

$$AC = [N_{11}t_{11}^{(H)} + N_{11}t_{11}^{(H)} + N_{11}t_{11}^{(H)}]$$

$$[AB_{11} - \beta_{11}] [N_{11}t_{11}^{(H)} + N_{11}t_{11}^{(H)} + N_{11}t_{11}^{(H)}] = dI_{11} \text{ PLACED IN CEQCF + 26}$$

$$-\beta [R_{11} + \alpha, \beta_{11}] \text{ PLACED IN CEQCF + 30}$$

$$\alpha [R_{11} + \alpha, \beta_{11}] + \beta [R_{11} + \alpha, \beta_{11}] = d\lambda \text{ PLACED IN CEQCF + 30}$$

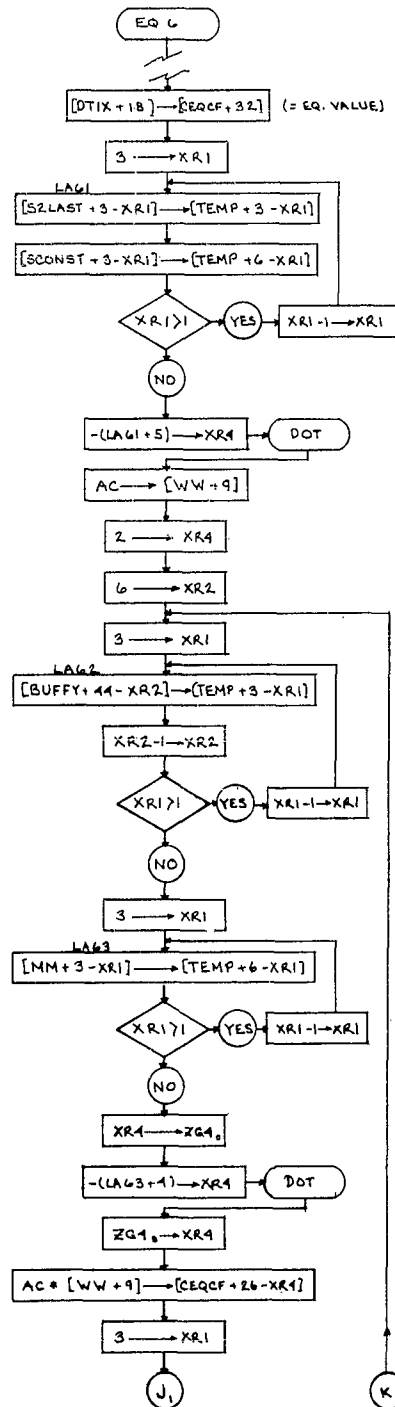
2ND LOOP

$t_{11}^{(H)}$ TRANSFERRED TO TEMP + 3
 $t_{11}^{(H)}$ " " TEMP + 4
 $t_{11}^{(H)}$ " " TEMP + 5

$$AC = [N_{11}t_{11}^{(H)} + N_{11}t_{11}^{(H)} + N_{11}t_{11}^{(H)}]$$

$$[AB_{11} - \beta_{11}] [N_{11}t_{11}^{(H)} + N_{11}t_{11}^{(H)} + N_{11}t_{11}^{(H)}] = dI_{11} \text{ PLACED IN CEQCF + 27}$$

ADDITIONS TO EQ 6



δ TRANSFERRED TO TEMP + 0 (= K)
 δ " " TEMP + 1 (= μ)
 ϵ " " TEMP + 2 (= ν)
 θ_{12} " " TEMP + 3
 θ_{17} " " TEMP + 4
 θ_{12} " " TEMP + 5

$[K\theta_{12} + \mu\theta_{17} + \nu\theta_{12}]$ PLACED IN AC, STORED IN WW + 9

1ST LOOP

$t_{12}^{(0)}$ TRANSFERRED TO TEMP + 0
 $t_{12}^{(1)}$ " " TEMP + 1
 $t_{12}^{(2)}$ " " TEMP + 2

2ND LOOP

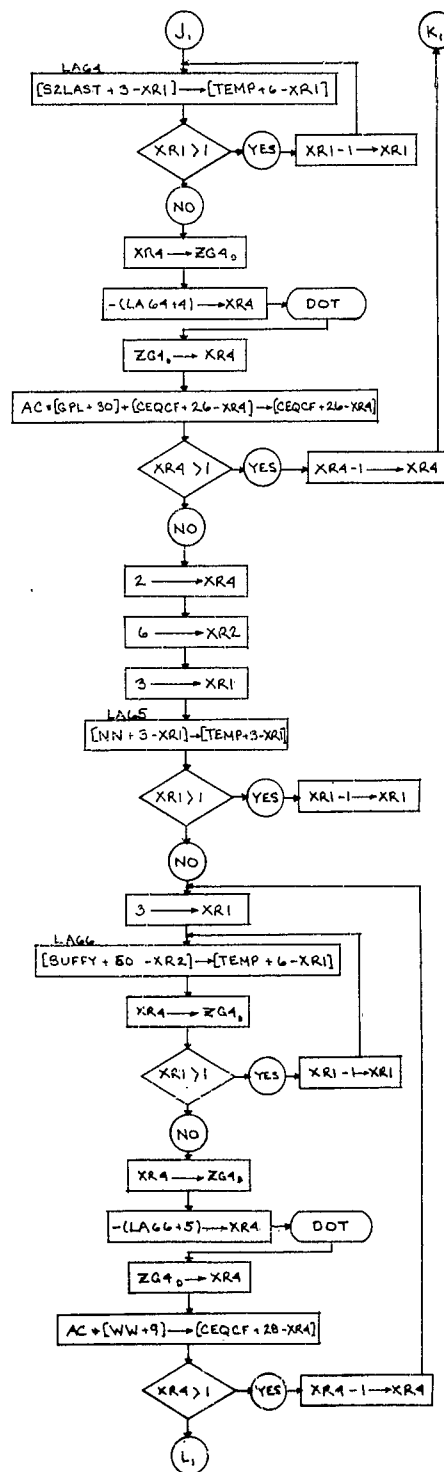
$t_{12}^{(0)}$ TRANSFERRED TO TEMP + 0
 $t_{12}^{(1)}$ TEMP + 1
 $t_{12}^{(2)}$ TEMP + 2

M_{12} TRANSFERRED TO TEMP + 3
 M_{17} " " TEMP + 4
 M_{12} " " TEMP + 5

SAME

$$AC = M_{12}t_{12}^{(0)} + M_{17}t_{12}^{(1)} + M_{12}t_{12}^{(2)}$$

$$CEQCF + 21 = \left([K\theta_{12} + \mu\theta_{17} + \nu\theta_{12}] + [M_{12}t_{12}^{(0)} + M_{17}t_{12}^{(1)} + M_{12}t_{12}^{(2)}] \right)$$



K TRANSFERED TO TEMP+3

μ " " TEMP+4

V " " TEMP+5

$$AC = K t_{11}^W + \mu t_{21}^W + V t_{31}^W$$

$$\begin{pmatrix} \delta_1 [K t_{11}^W + \mu t_{21}^W + V t_{31}^W] \\ + [K \delta_{11} + \mu \delta_{21} + V \delta_{31}] \\ [M_{11} t_{11}^W + M_{21} t_{21}^W + M_{31} t_{31}^W] \end{pmatrix}$$

= dI₁₂ STORED IN CEQCF+24

= dI₁₂ STORED IN CEQCF+25

N₁₂ TRANSFERED TO TEMP+0

N₁₄ " " TEMP+1

N₁₆ " " TEMP+2

1ST LOOP

2ND LOOP

t₁₁^W TRANSFERED TO TEMP+3

t₂₁^W " " TEMP+4

t₃₁^W " " TEMP+5

t₁₁^W TRANSFERED TO TEMP+3

t₁₂^W " " TEMP+4

t₁₃^W " " TEMP+5

$$AC = N_{11} \cdot t_{11}^W$$

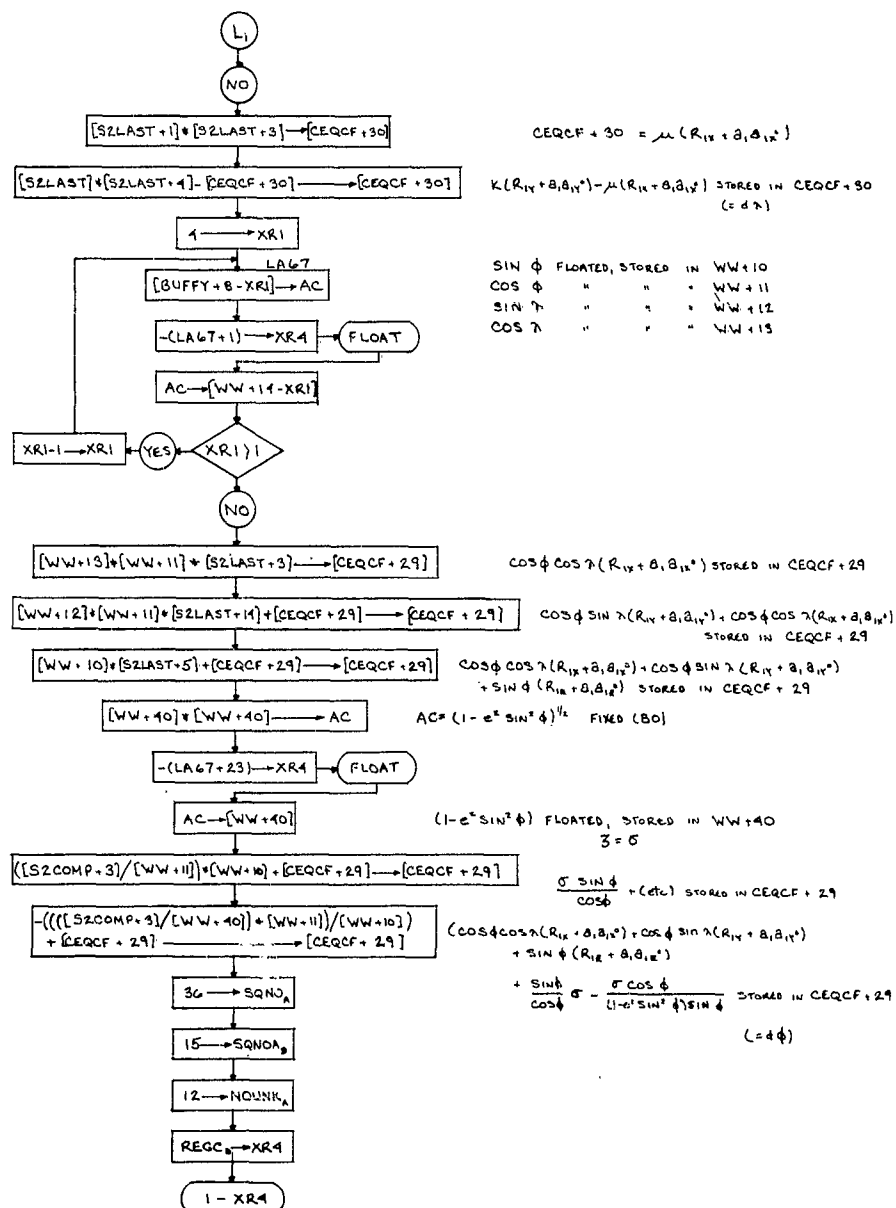
$$\begin{pmatrix} [K \delta_{11} + \mu \delta_{21} + V \delta_{31}] \\ [N_{11} t_{11}^W + N_{12} t_{12}^W + N_{13} t_{13}^W] \end{pmatrix}$$

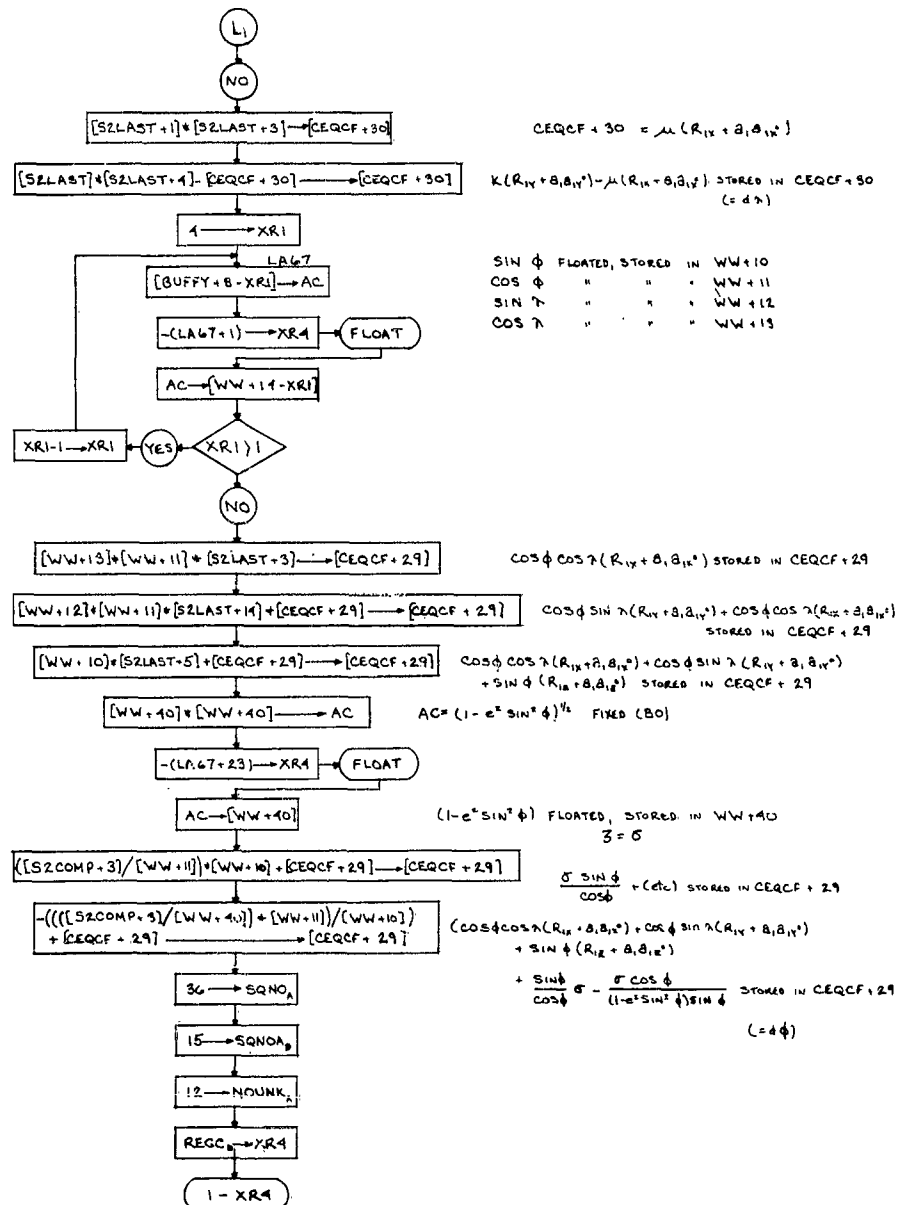
STORED IN CEQCF+26 (= dI₂₁)

$$AC = N_{11} \cdot t_{11}^W$$

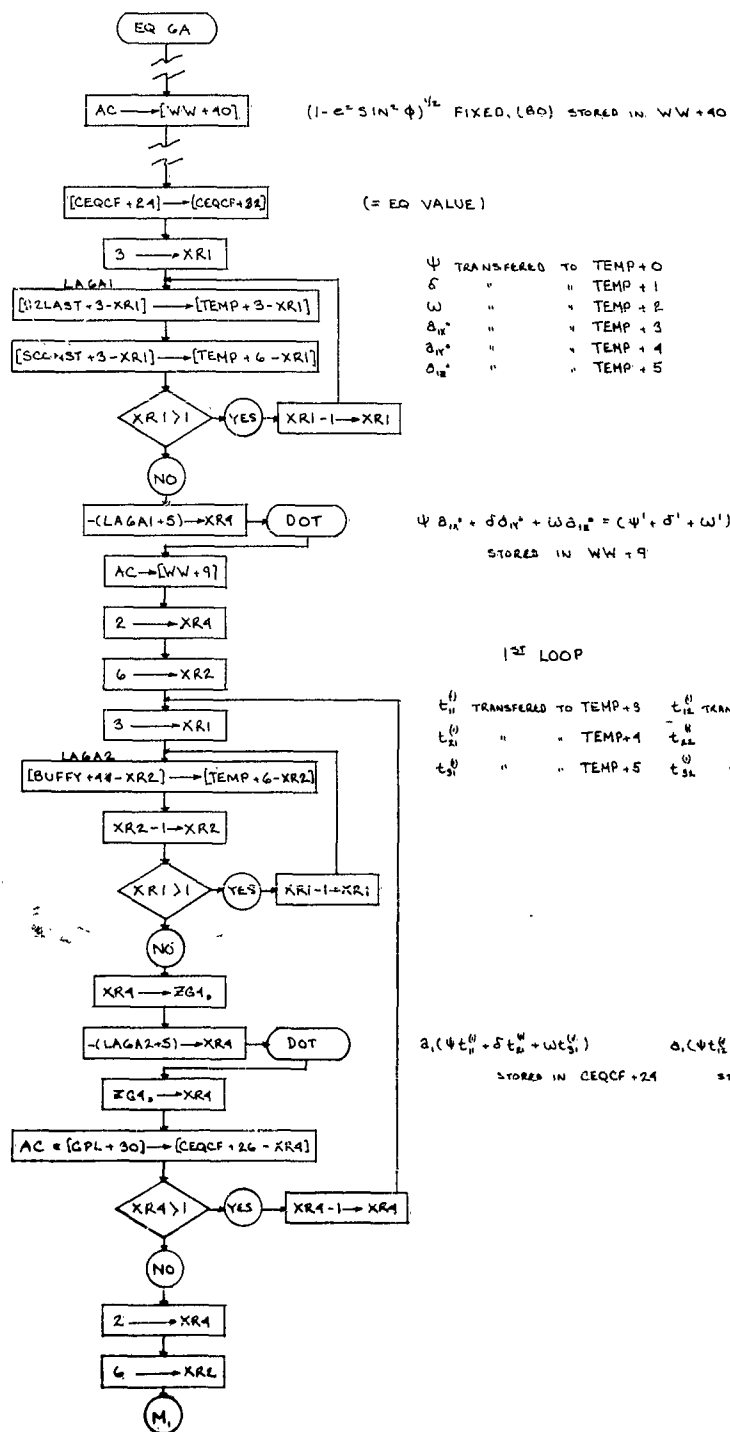
$$\begin{pmatrix} [K \delta_{11} + \mu \delta_{21} + V \delta_{31}] [N_{11} t_{11}^W \\ N_{12} t_{12}^W + N_{13} t_{13}^W] \end{pmatrix}$$

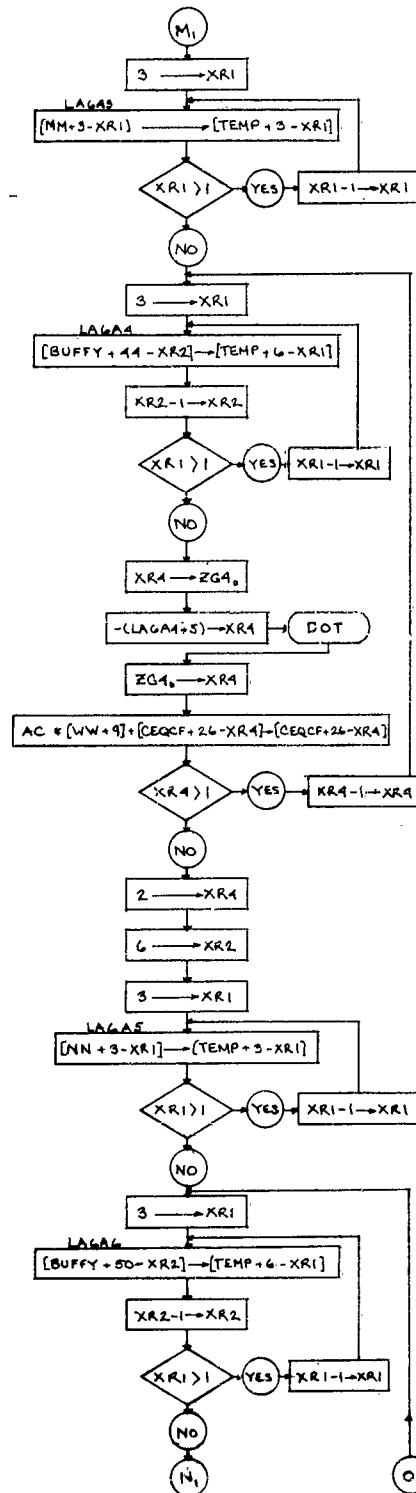
STORED IN CEQCF+27 (= dI₂₁)





ADDITIONS TO EQ 6A





M_{1x} TRANSFERRED TO TEMP+0
 M_{1y} " " TEMP+1
 M_{1z} " " TEMP+2

1st LOOP

2nd LOOP

$t_{11}^{(1)}$ TRANSFERRED TO TEMP+3
 $t_{22}^{(1)}$ " " TEMP+4
 $t_{33}^{(1)}$ " " TEMP+5

$t_{12}^{(1)}$

$AC = M_{1x} \cdot t_{11}^{(1)}$

$AC = M_{1x} \cdot t_{12}^{(1)}$

$(\psi' + \delta' + \omega') (M_{1x} t_{11}^{(1)} + M_{1y} t_{22}^{(1)} + M_{1z} t_{33}^{(1)}) + a_1 (t_{12}^{(1)} + t_{21}^{(1)} + \omega t_{31}^{(1)}) + \omega t_{31}^{(1)}$
 $= \delta I_{1x}$ STORED IN CEQCF+24

$(\psi' + \delta' + \omega') (M_{1x} t_{12}^{(1)} + M_{1y} t_{22}^{(1)} + M_{1z} t_{32}^{(1)}) + a_1 (t_{12}^{(1)} + t_{21}^{(1)} + \omega t_{31}^{(1)}) + \omega t_{31}^{(1)}$
 $= \delta I_{1y}$ STORED IN CEQCF+25

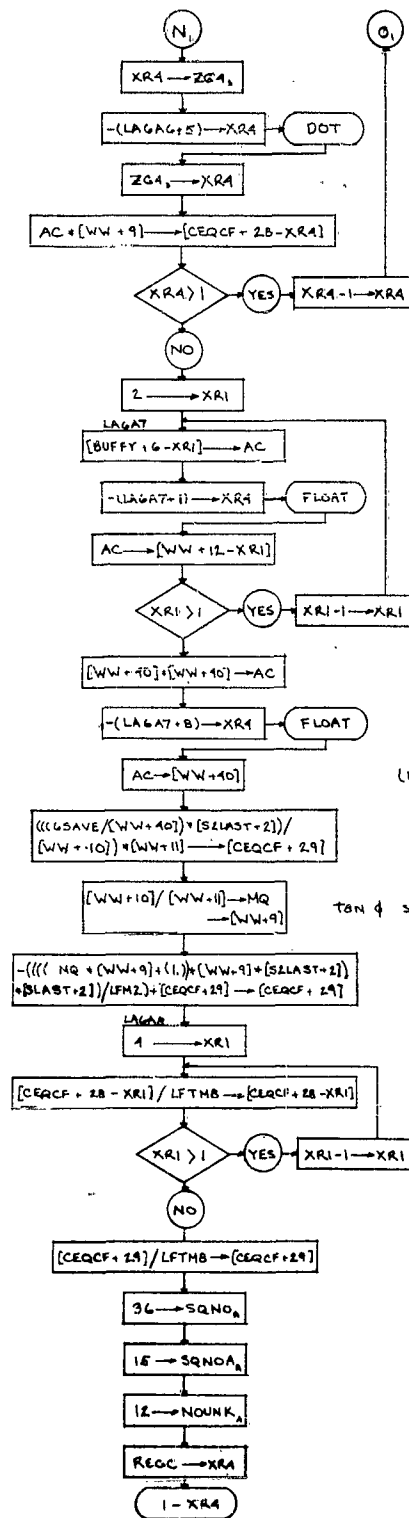
N_{1x} TRANSFERRED TO TEMP+0
 N_{1y} " " TEMP+1
 N_{1z} " " TEMP+2

1st LOOP

2nd LOOP

$t_{11}^{(2)}$ TRANSFERRED TO TEMP+0
 $t_{22}^{(2)}$ " " TEMP+1
 $t_{33}^{(2)}$ " " TEMP+2

$t_{1x}^{(2)}$ TRANSFERRED TO TEMP+0
 $t_{2x}^{(2)}$ " " TEMP+1
 $t_{3x}^{(2)}$ " " TEMP+2



$$AC = N_1 \cdot t_{11}^{(u)}$$

$$AC = N_1 \cdot t_{12}^{(u)}$$

$$(\psi' + \delta' + \omega) [N_{11} t_{11}^{(u)} + N_{12} t_{12}^{(u)} + N_{13} t_{13}^{(u)}] \quad (\psi' + \delta' + \omega) [N_{11} t_{11}^{(u)} + N_{12} t_{12}^{(u)} + N_{13} t_{13}^{(u)}]$$

$$= dI_{2x} \text{ STORED IN CEQCF+26}$$

$$= dI_{2y} \text{ STORED IN CEQCF+27}$$

$$\sin \phi \text{ FLOATED, STORED IN WW+10}$$

$$\cos \phi \text{ " " " WW+11}$$

$$(1 - e^2 \sin^2 \phi), \text{ FLOATED, STORED IN WW+40}$$

$$\frac{\partial e^2 \cos \phi \omega}{(1 - e^2 \sin^2 \phi)^{3/2}} \text{ STORED IN CEQCF+29}$$

$$\tan \phi \text{ STORED IN WW+9}$$

$$= \tan \frac{(1 + \tan^2 \phi) \omega^2}{-2} + \frac{\partial e^2 \cos \phi \omega}{(1 - e^2 \sin^2 \phi)^{3/2}} (= d\phi)$$

$$dI_{1c} \text{ DIVIDED BY } 10^8 \text{ STORED IN CEQCF+24}$$

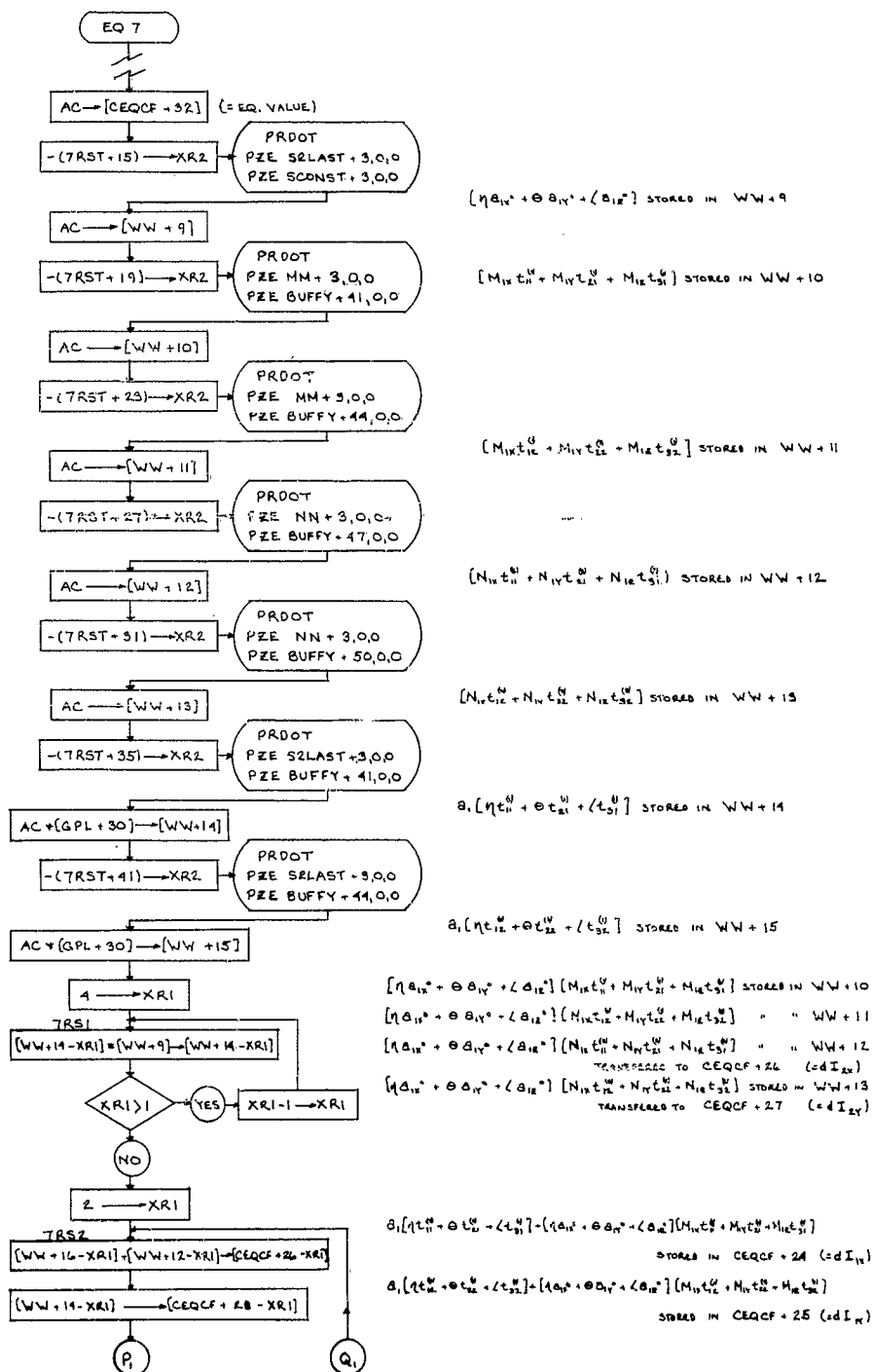
$$dI_{1x} \text{ " " " " CEQCF+25}$$

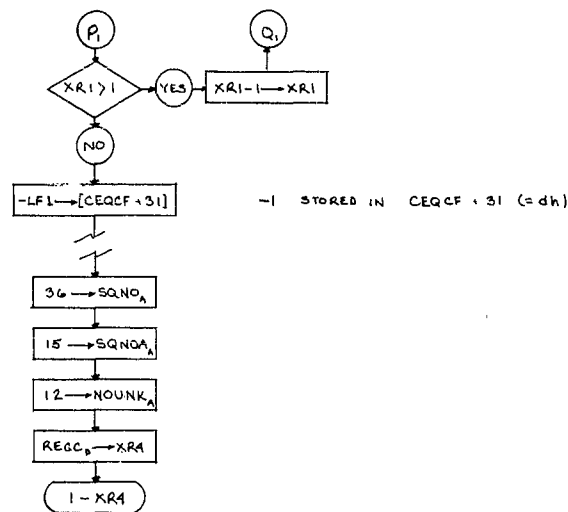
$$dI_{1y} \text{ " " " " CEQCF+26}$$

$$dI_{1z} \text{ " " " " CEQCF+27}$$

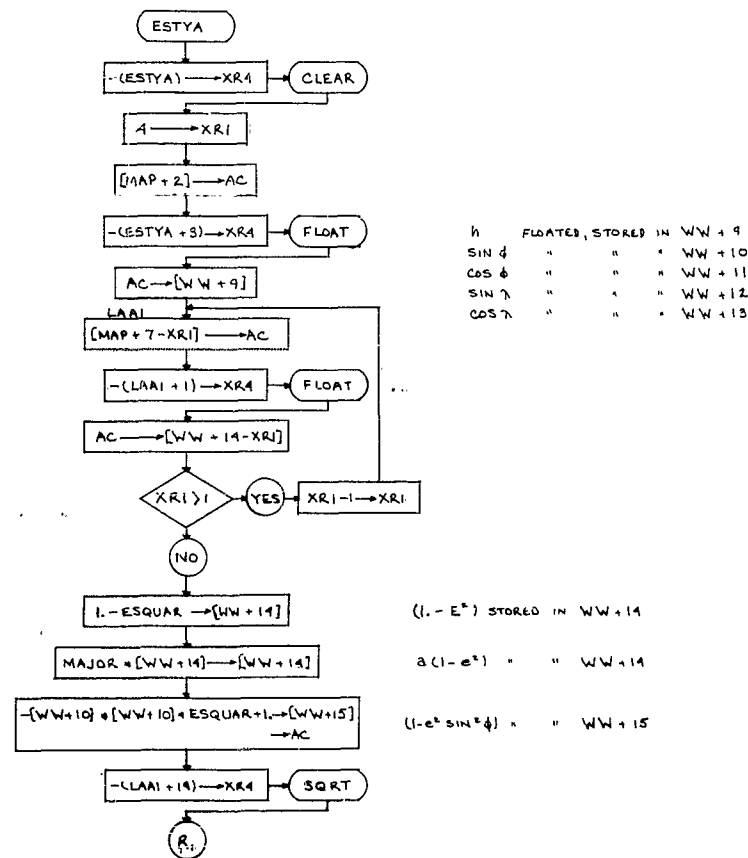
$$d\phi \text{ DIVIDED BY } 10^8 \text{ STORED IN CEQCF+29}$$

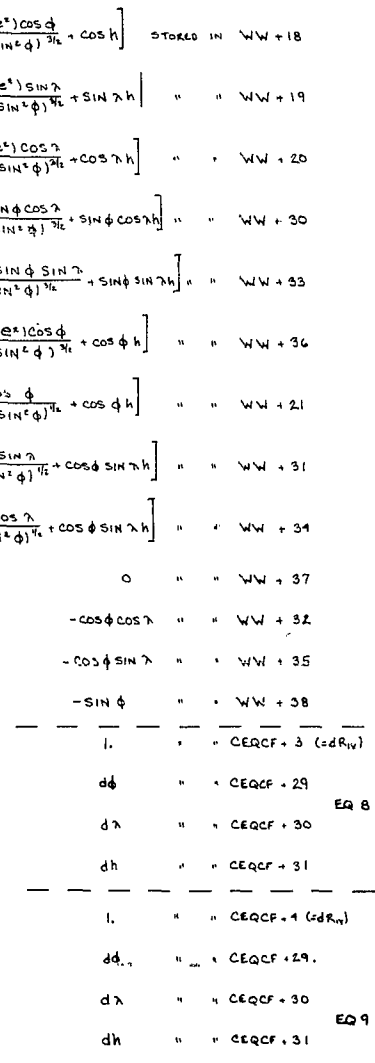
ADDITIONS TO EQ 7

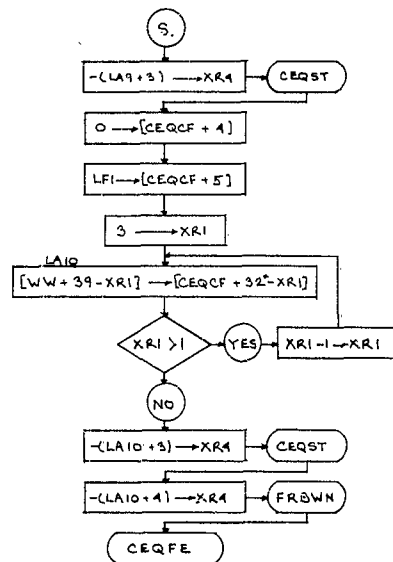




EQ 8, 9, 10

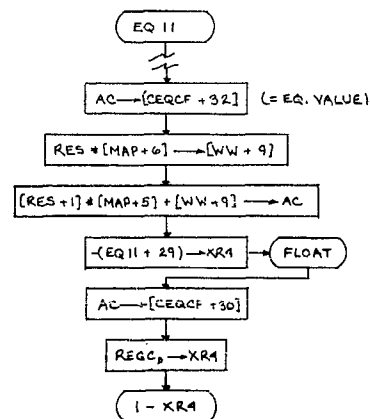






1.	STORED IN	CEQCF + 5 (= dR ₁₈)	
dφ		CEQCF + 29	
dγ (=0)		CEQCF + 30	EQ 10
dη		CEQCF + 31	

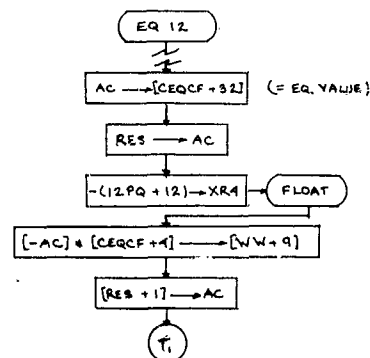
ADDITIONS TO EQ 11



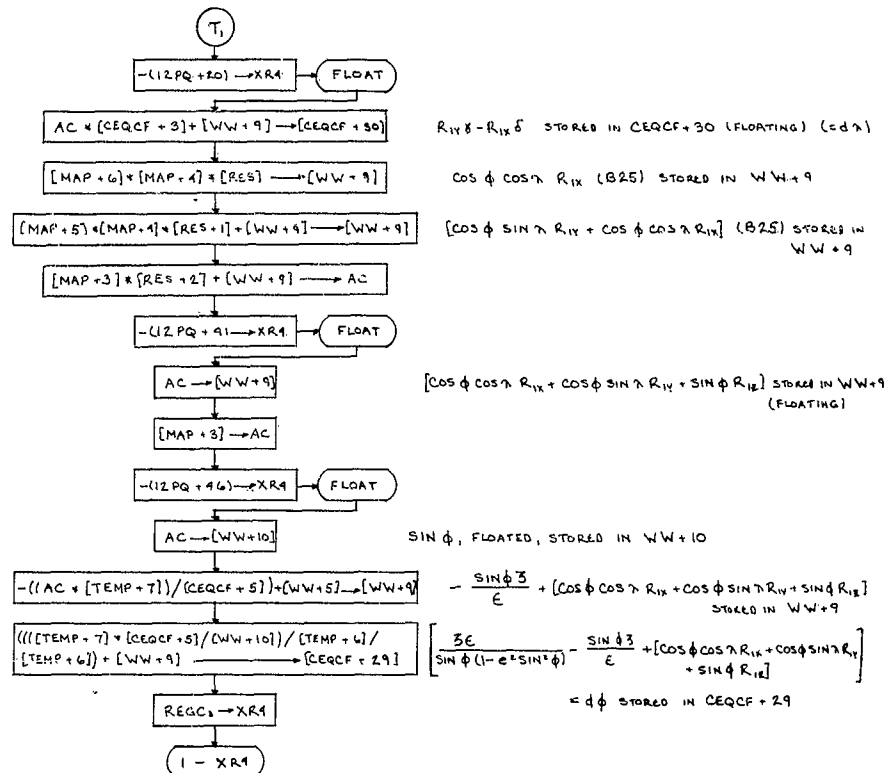
$R_{18} \cos \gamma$ (B25) STORED IN WW+9

$[R_{18} \cos \gamma + R_{18} \sin \gamma]$ FLOATED, STORED IN CEQCF+30 (= dγ)

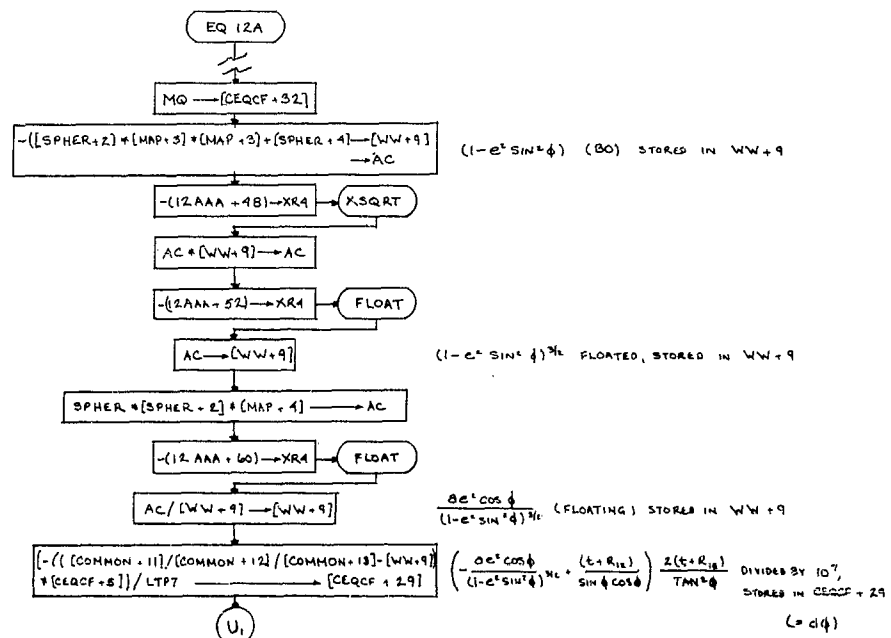
ADDITIONS TO EQ 12

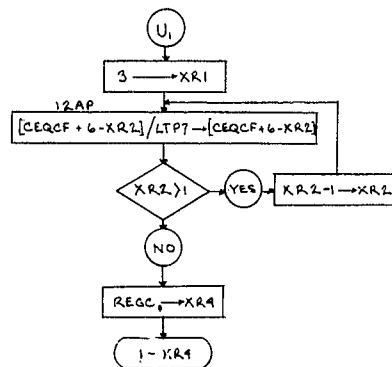


$-R_{18} \delta$ FLOATED, STORED IN WW+9



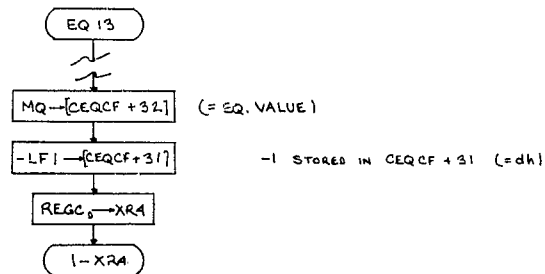
ADDITIONS TO EQ 12A

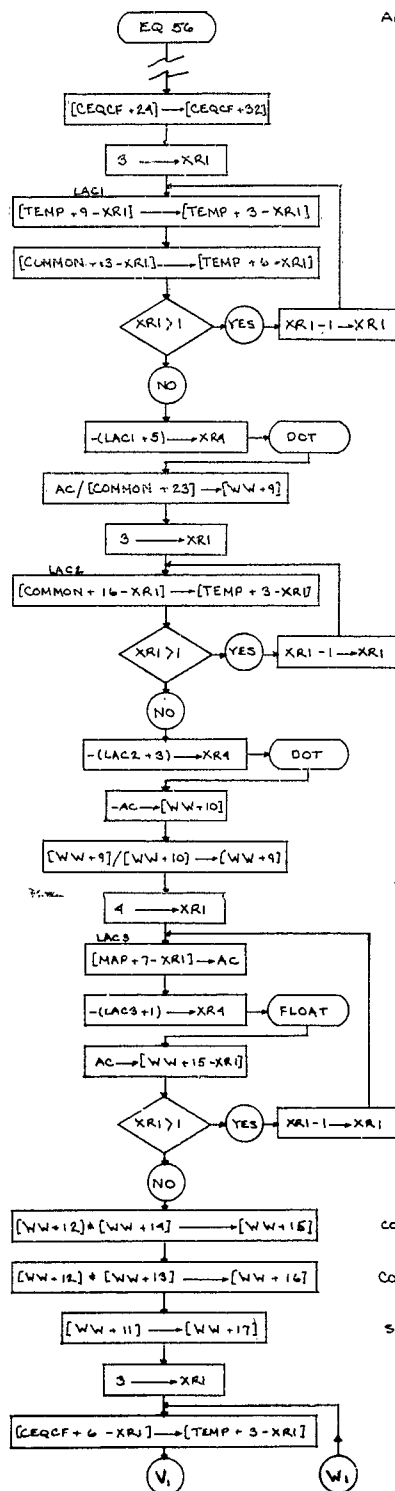




dR_{1x} DIVIDED BY 10^9 , STORED IN CEQCF + 3
 dR_{1y} " " " " " CEQCF + 4
 dR_{1z} " " " " " CEQCF + 5

ADDITIONS TO EQ 13





ADDITIONS TO EQ 56

$(A_i^* + C_i^*)_x$ TRANSFERRED TO TEMP + 0
 $(A_i^* + C_i^*)_y$ " " TEMP + 1
 $(A_i^* + C_i^*)_z$ " " TEMP + 2
 E_x " " TEMP + 3
 E_y " " TEMP + 4
 E_z " " TEMP + 5

$$\frac{-(E_x(A_i^* + C_i^*)_x + E_y(A_i^* + C_i^*)_y + E_z(A_i^* + C_i^*)_z)}{C_E}$$
 STORED IN WW + 9
 (= -V_i)

K_x^* TRANSFERRED TO TEMP + 0
 K_y^* " " TEMP + 1
 K_z^* " " TEMP + 2

$-(K_x^* E_x + K_y^* E_y + K_z^* E_z)$ STORED IN WW + 10 (= -K)

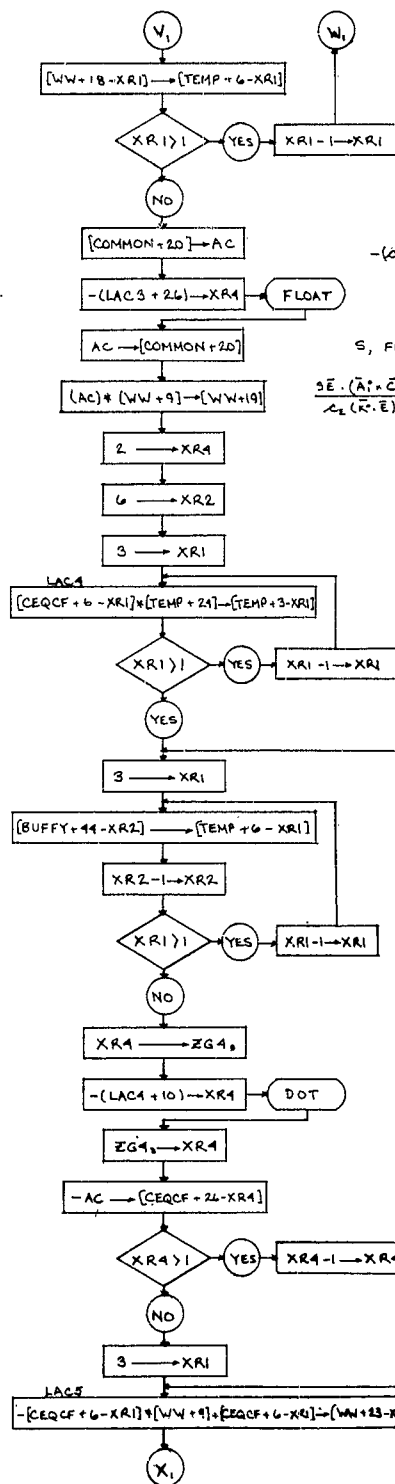
$$\frac{\bar{E} \cdot (\bar{A}_i^* + C_i^*)}{\bar{A}_i^* \cdot \bar{E}}$$
 STORED IN WW + 9 (= $\frac{V_i}{K}$)

SIN ϕ FLOATED AND STORED IN WW + 11
 COS ϕ " " " WW + 12
 SIN γ " " " WW + 13
 COS γ " " " WW + 14

COS ϕ COS γ STORED IN WW + 15 (N₂²)

COS ϕ SIN γ " " WW + 16 (N₁²)

SIN ϕ " " WW + 17 (N₃²)



$-C_{EX}$ TRANSFERRED TO TEMP
 $-C_{EX}$ " " TEMP+1
 $-C_{EX}$ " " TEMP+2
 N_{EX} " " TEMP+3
 N_{EX} " " TEMP+4
 N_{EX} " " TEMP+5

$$-(C_{EX} \cdot N_{EX} + C_{EX} \cdot N_{EX} + C_{EX} \cdot N_{EX}) \frac{\bar{E} \cdot (\bar{A}_1 + \bar{C}_1)}{C_1 \cdot (\bar{K} \cdot \bar{E})} \text{ STORED IN WW+18} \\ \left(= \frac{-V_1}{K} (\bar{C}_1 \cdot \bar{N}) \right)$$

S, FLOATED, STORED IN COMMON+20

$$\frac{\partial \bar{E} \cdot (\bar{A}_1 + \bar{C}_1)}{C_1 \cdot (\bar{K} \cdot \bar{E})} \text{ STORED IN WW+19} \left(= \frac{\partial V_1}{K} \right) \left(= -(\bar{E} \cdot \bar{N}) \frac{V_1}{K} \right)$$

$-C_{EX} \cdot V_{EX}$ STORED IN TEMP
 $-C_{EX} \cdot V_{EX}$ " " TEMP+1
 $-C_{EX} \cdot V_{EX}$ " " TEMP+2

1ST LOOP

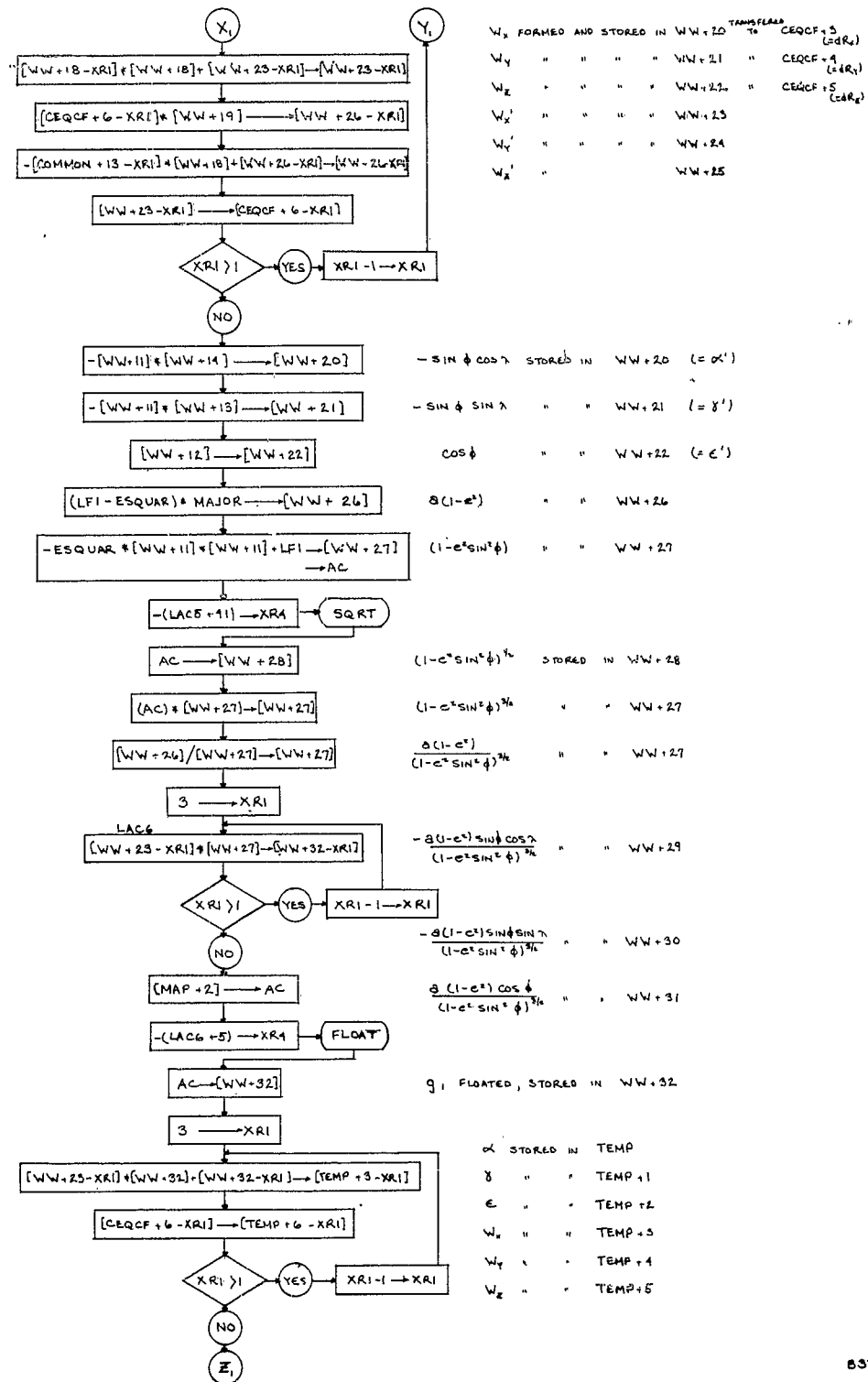
2ND LOOP

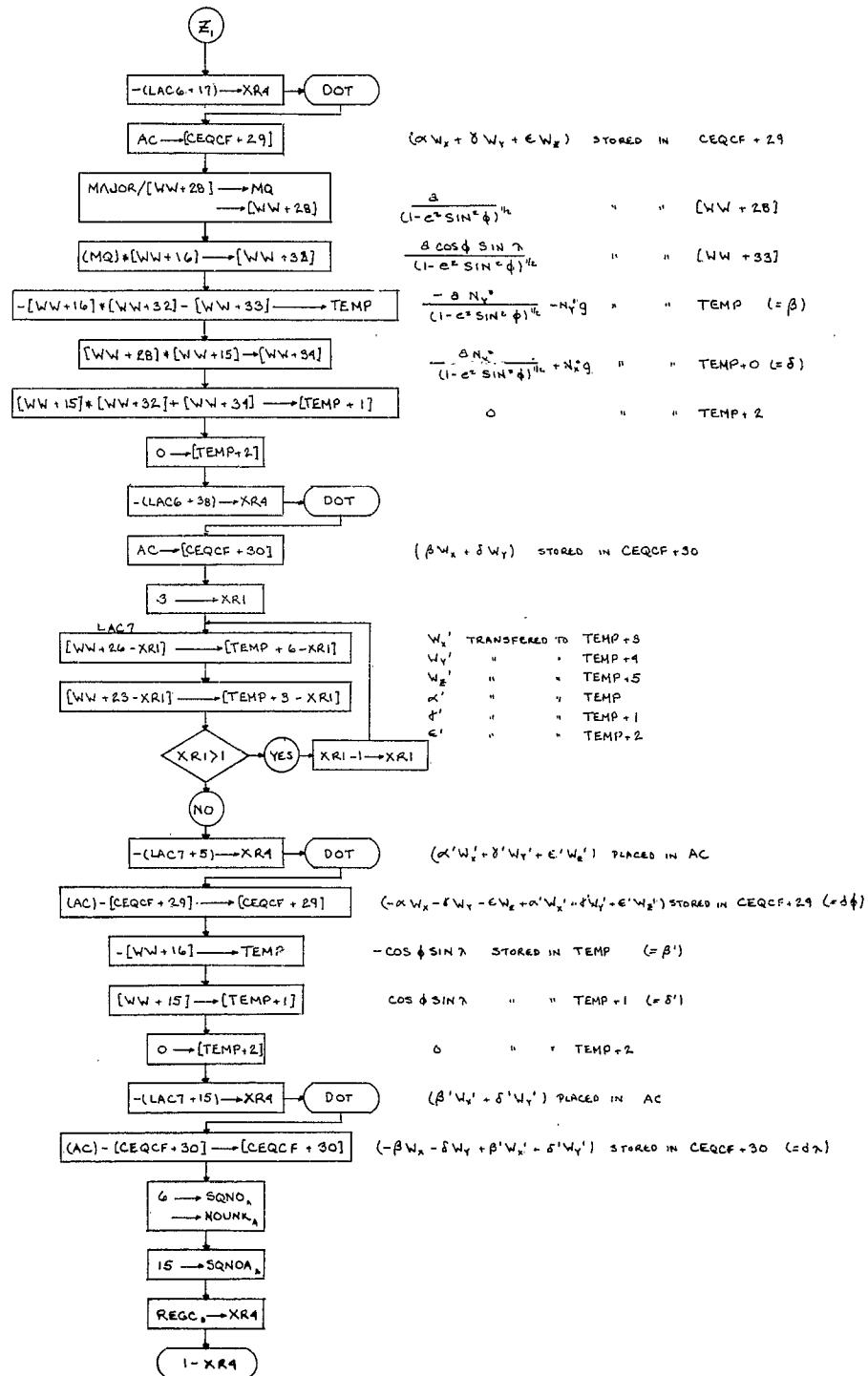
t_{EX}^H TRANSFERRED TO TEMP+3
 t_{EX}^H " " TEMP+4
 t_{EX}^H " " TEMP+5

t_{EX}^H TRANSFERRED TO TEMP+3
 t_{EX}^H " " TEMP+4
 t_{EX}^H " " TEMP+5

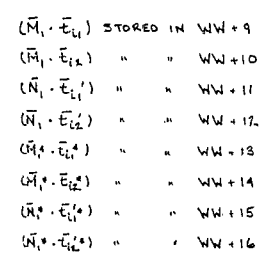
$$[(\bar{C}_1 \cdot V_{EX}) \cdot t_{EX}^H] (= dI_{EX}) \text{ STORED IN CEQCF+24}$$

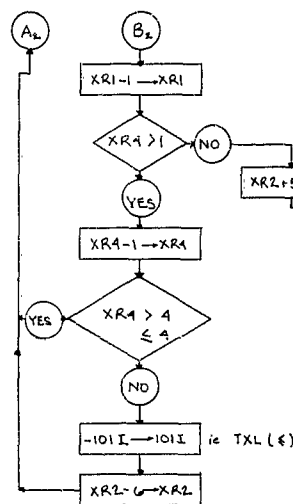
$$[(\bar{C}_1 \cdot V_{EX}) \cdot t_{EX}^H] (= dI_{EX}) \text{ STORED IN CEQCF+25}$$



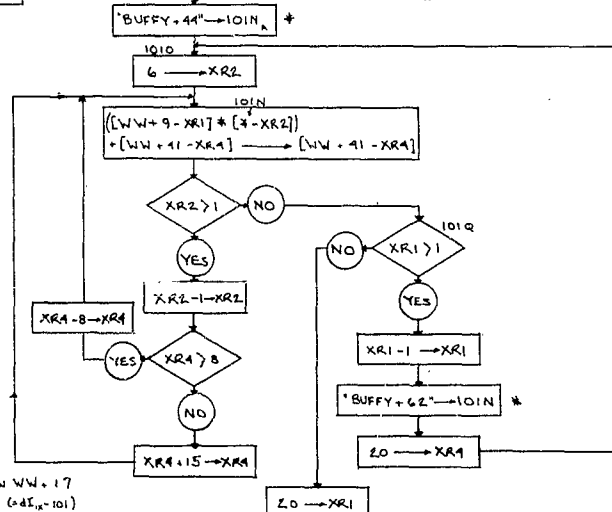


ADDITIONS TO EQ 101, 102, 103

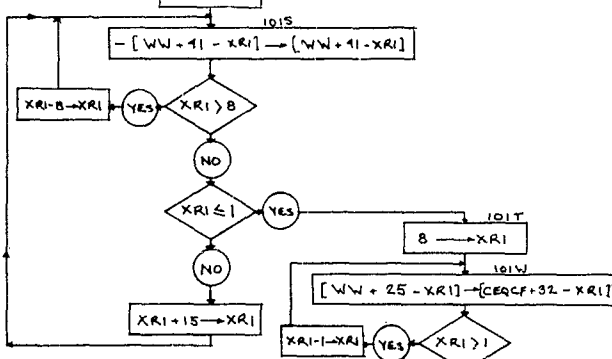




$A_{11}^* (\bar{M}_1, \bar{E}_{11})$ STORED IN WW + 17
 $A_{12}^* (\bar{M}_1, \bar{E}_{12})$ " " WW + 18
 $A_{13}^* (\bar{M}_1, \bar{E}_{13})$ " " WW + 19 (= dI_{xx} - 101)
 $A_{14}^* (\bar{M}_1, \bar{E}_{14})$ " " WW + 20 (= dI_{xy} - 101)
 $A_{15}^* (\bar{M}_1, \bar{E}_{15})$ " " WW + 21
 $A_{16}^* (\bar{M}_1, \bar{E}_{16})$ " " WW + 22
 $A_{17}^* (\bar{M}_1, \bar{E}_{17})$ " " WW + 23 (= -dI_{xx} - 101)
 $A_{18}^* (\bar{M}_1, \bar{E}_{18})$ " " WW + 24 (= -dI_{xy} - 101)
 $A_{19}^* (\bar{M}_1, \bar{E}_{19})$ " " WW + 25
 $A_{20}^* (\bar{M}_1, \bar{E}_{20})$ " " WW + 26
 $A_{21}^* (\bar{M}_1, \bar{E}_{21})$ " " WW + 27 (= dI_{xx} - 102)
 $A_{22}^* (\bar{M}_1, \bar{E}_{22})$ " " WW + 28 (= dI_{xy} - 102)
 $A_{23}^* (\bar{M}_1, \bar{E}_{23})$ " " WW + 29
 $A_{24}^* (\bar{M}_1, \bar{E}_{24})$ " " WW + 30
 $A_{25}^* (\bar{M}_1, \bar{E}_{25})$ " " WW + 31 (= -dI_{xx} - 102)
 $A_{26}^* (\bar{M}_1, \bar{E}_{26})$ " " WW + 32 (= -dI_{xy} - 102)
 $A_{27}^* (\bar{M}_1, \bar{E}_{27})$ " " WW + 33
 $A_{28}^* (\bar{M}_1, \bar{E}_{28})$ " " WW + 34
 $A_{29}^* (\bar{M}_1, \bar{E}_{29})$ " " WW + 35 (= dI_{xx} - 103)
 $A_{30}^* (\bar{M}_1, \bar{E}_{30})$ " " WW + 36 (= dI_{xy} - 103)
 $A_{31}^* (\bar{M}_1, \bar{E}_{31})$ " " WW + 37
 $A_{32}^* (\bar{M}_1, \bar{E}_{32})$ " " WW + 38
 $A_{33}^* (\bar{M}_1, \bar{E}_{33})$ " " WW + 39 (= -dI_{xx} - 103)
 $A_{34}^* (\bar{M}_1, \bar{E}_{34})$ " " WW + 40 (= -dI_{xy} - 103)

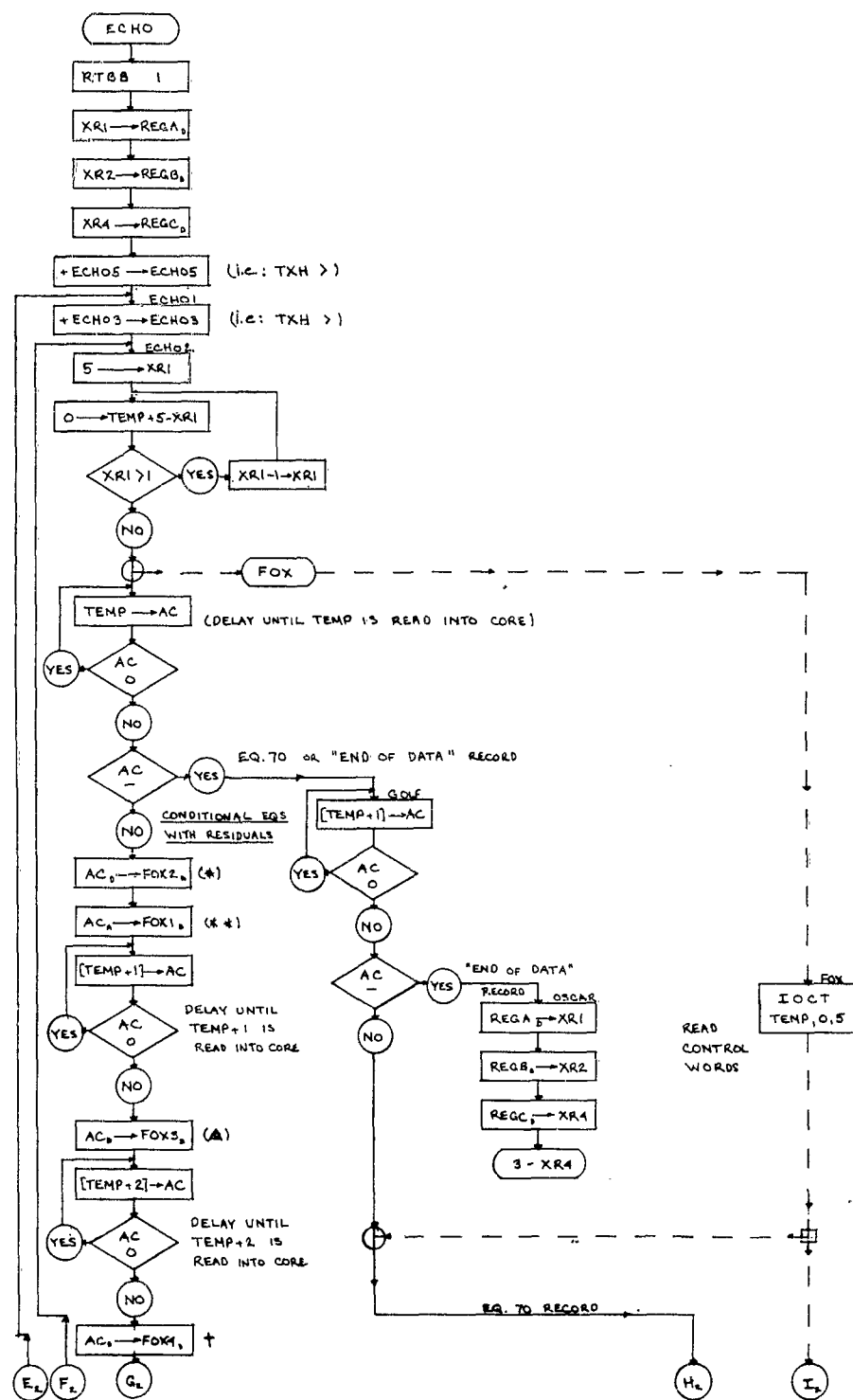


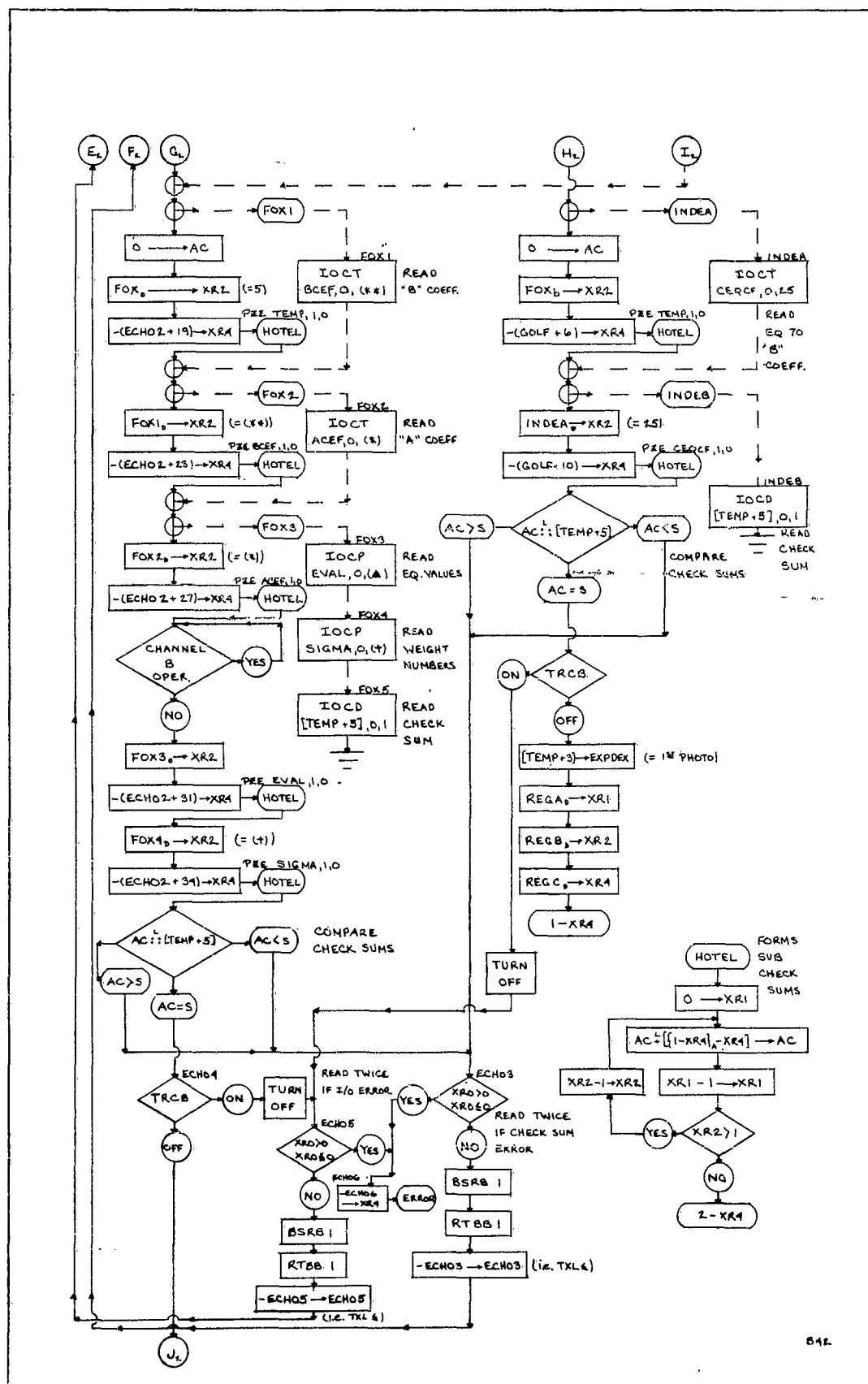
$B_{11}^* A_{12}^* (\bar{M}_1, \bar{E}_{11})$ STORED IN WW + 17
 (= dI_{xx} - 101)
 $B_{12}^* A_{12}^* (\bar{M}_1, \bar{E}_{12})$ " " WW + 25
 (= dI_{xx} - 102)
 $B_{13}^* A_{12}^* (\bar{M}_1, \bar{E}_{13})$ " " WW + 33
 (= dI_{xx} - 103)
 $B_{14}^* A_{12}^* (\bar{M}_1, \bar{E}_{14})$ " " WW + 18
 (= dI_{xy} - 101)
 $B_{15}^* A_{12}^* (\bar{M}_1, \bar{E}_{15})$ " " WW + 26
 (= dI_{xy} - 102)
 $B_{16}^* A_{12}^* (\bar{M}_1, \bar{E}_{16})$ " " WW + 34
 (= dI_{xy} - 103)
 $B_{17}^* A_{12}^* (\bar{M}_1, \bar{E}_{17})$ " " WW + 21
 (= -dI_{xx} - 101)
 $B_{18}^* A_{12}^* (\bar{M}_1, \bar{E}_{18})$ " " WW + 29
 (= -dI_{xx} - 102)
 $B_{19}^* A_{12}^* (\bar{M}_1, \bar{E}_{19})$ " " WW + 37
 (= -dI_{xx} - 103)
 $B_{20}^* A_{12}^* (\bar{M}_1, \bar{E}_{20})$ " " WW + 22
 (= -dI_{xy} - 101)
 $B_{21}^* A_{12}^* (\bar{M}_1, \bar{E}_{21})$ " " WW + 30
 (= -dI_{xy} - 102)
 $B_{22}^* A_{12}^* (\bar{M}_1, \bar{E}_{22})$ " " WW + 38
 (= -dI_{xy} - 103)

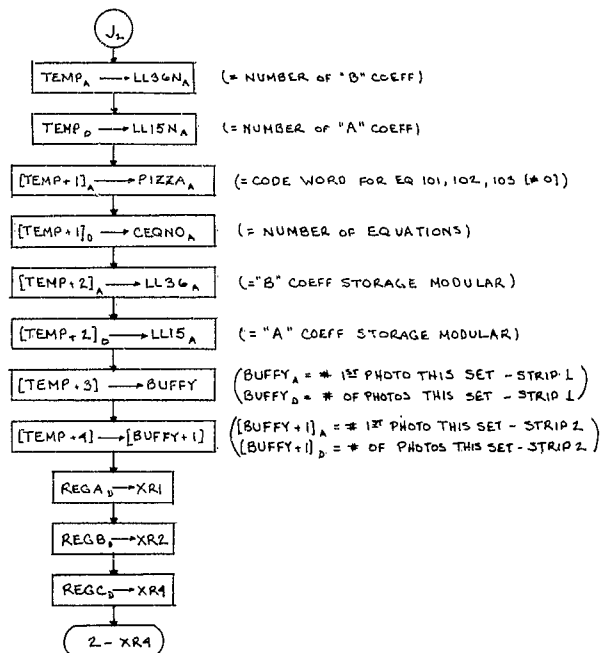


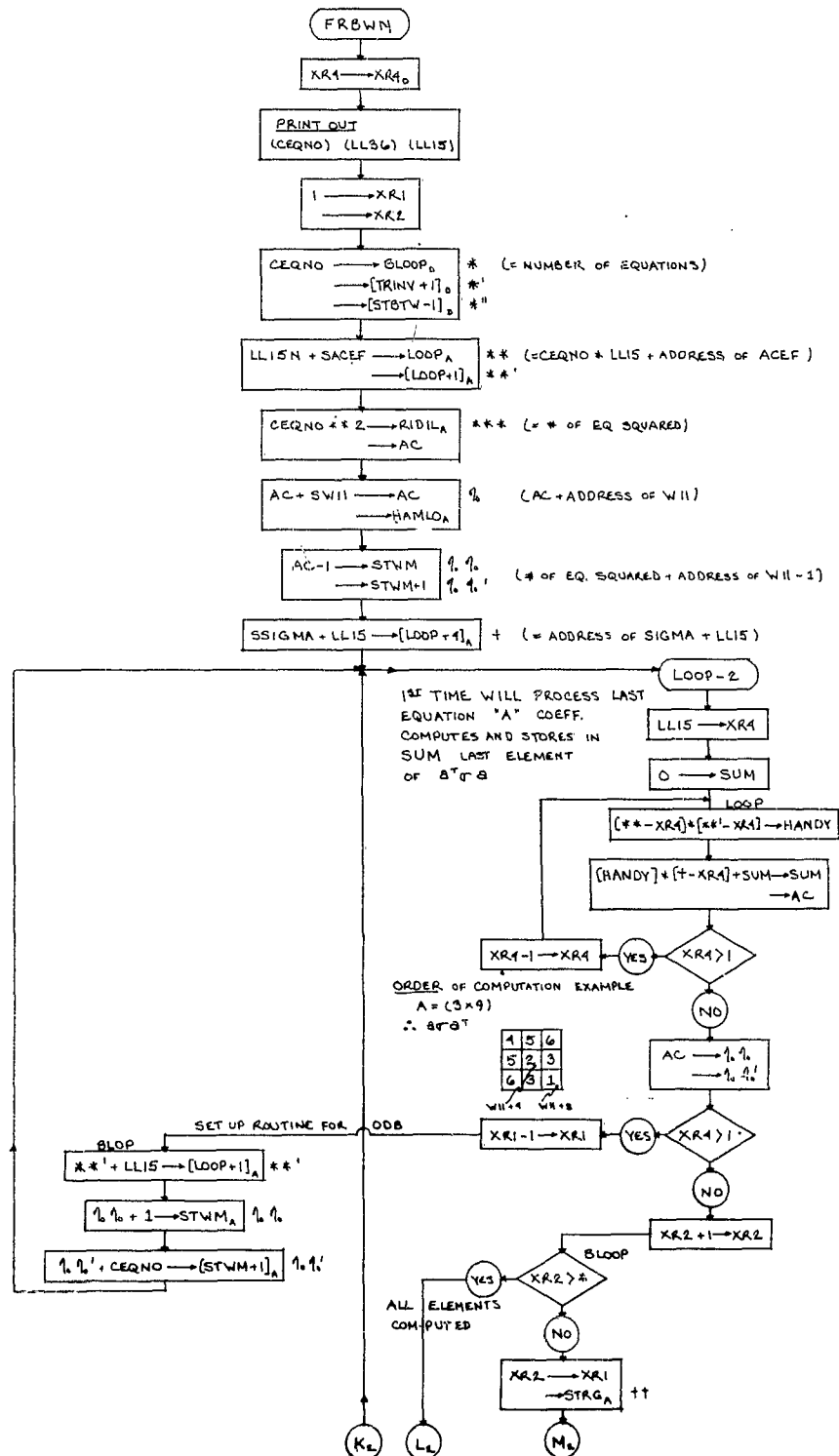
SUMMARY

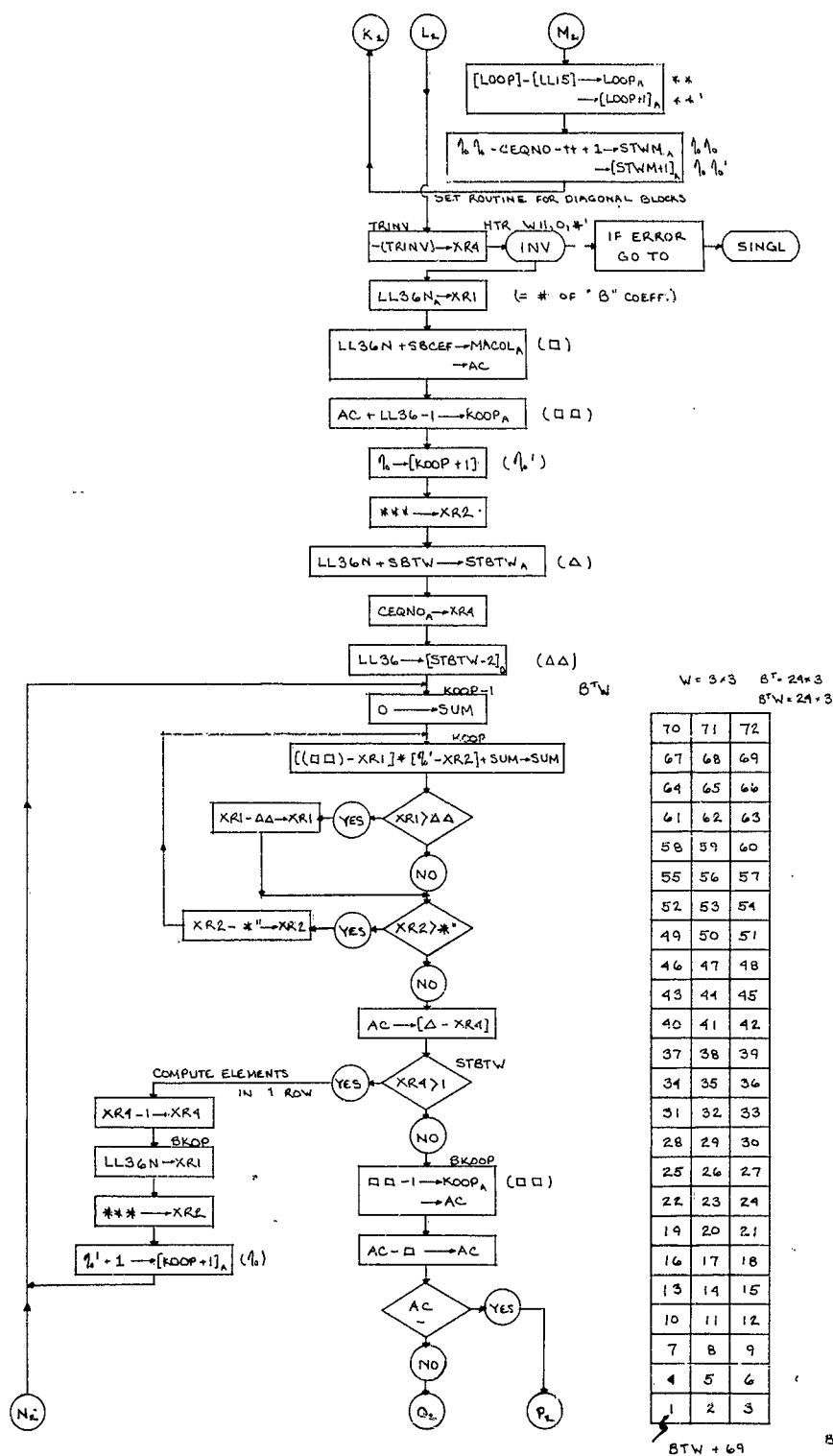
101 "A" COEFF IN CEQCF, 21 TO CEQCF + 31
 102 " " " " WW + 25 = WW + 32
 103 " " " " WW + 33 = WW + 40

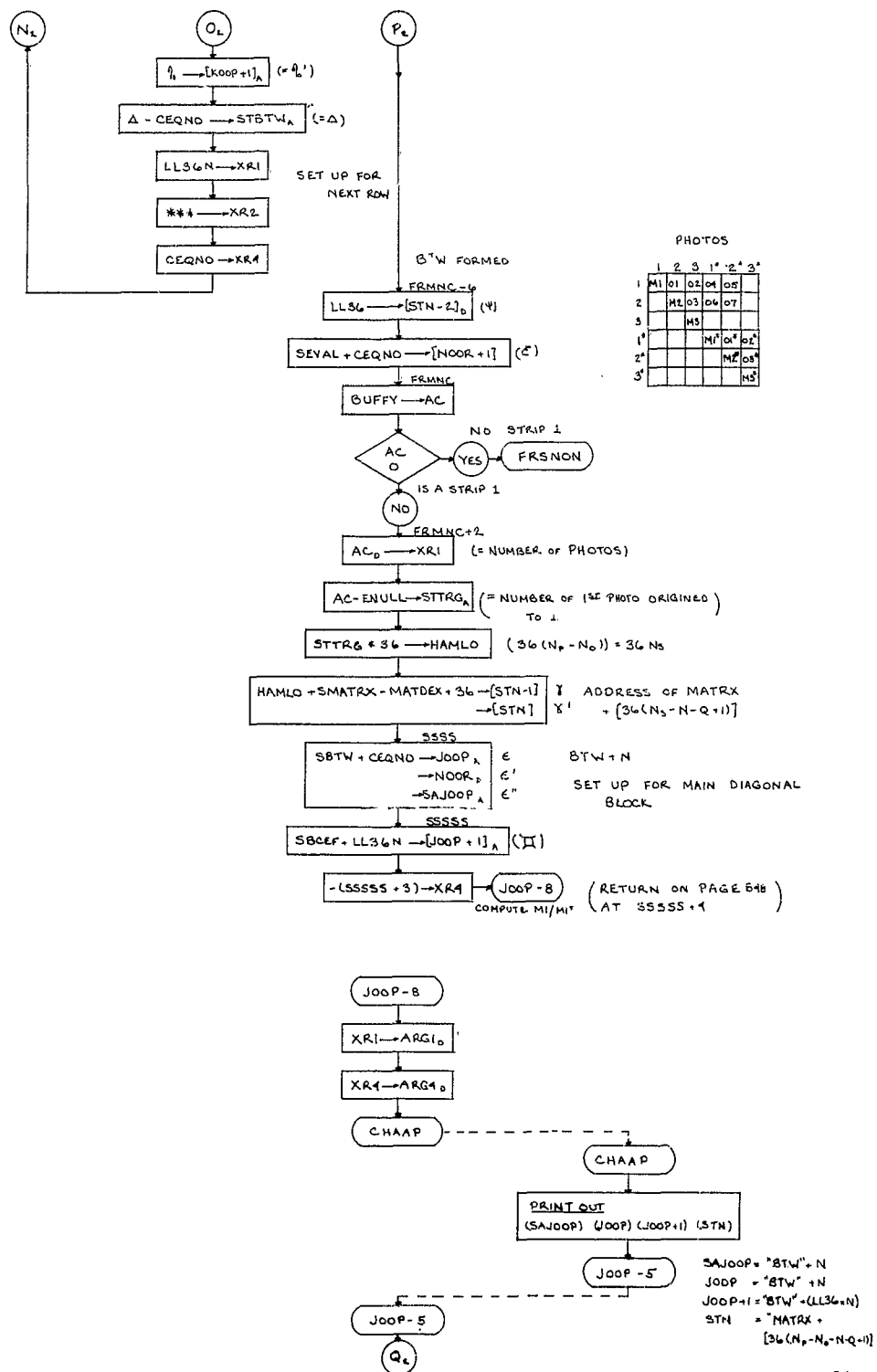


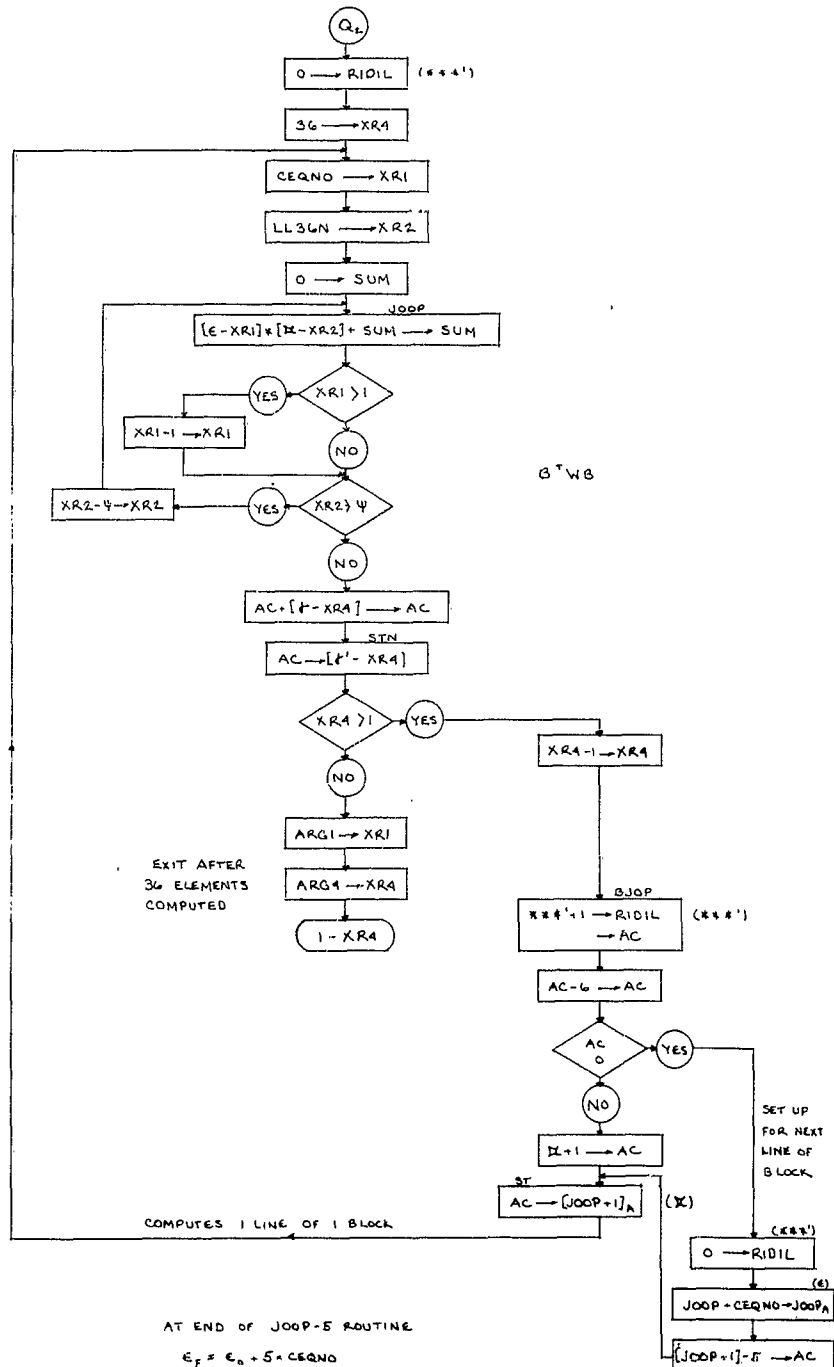


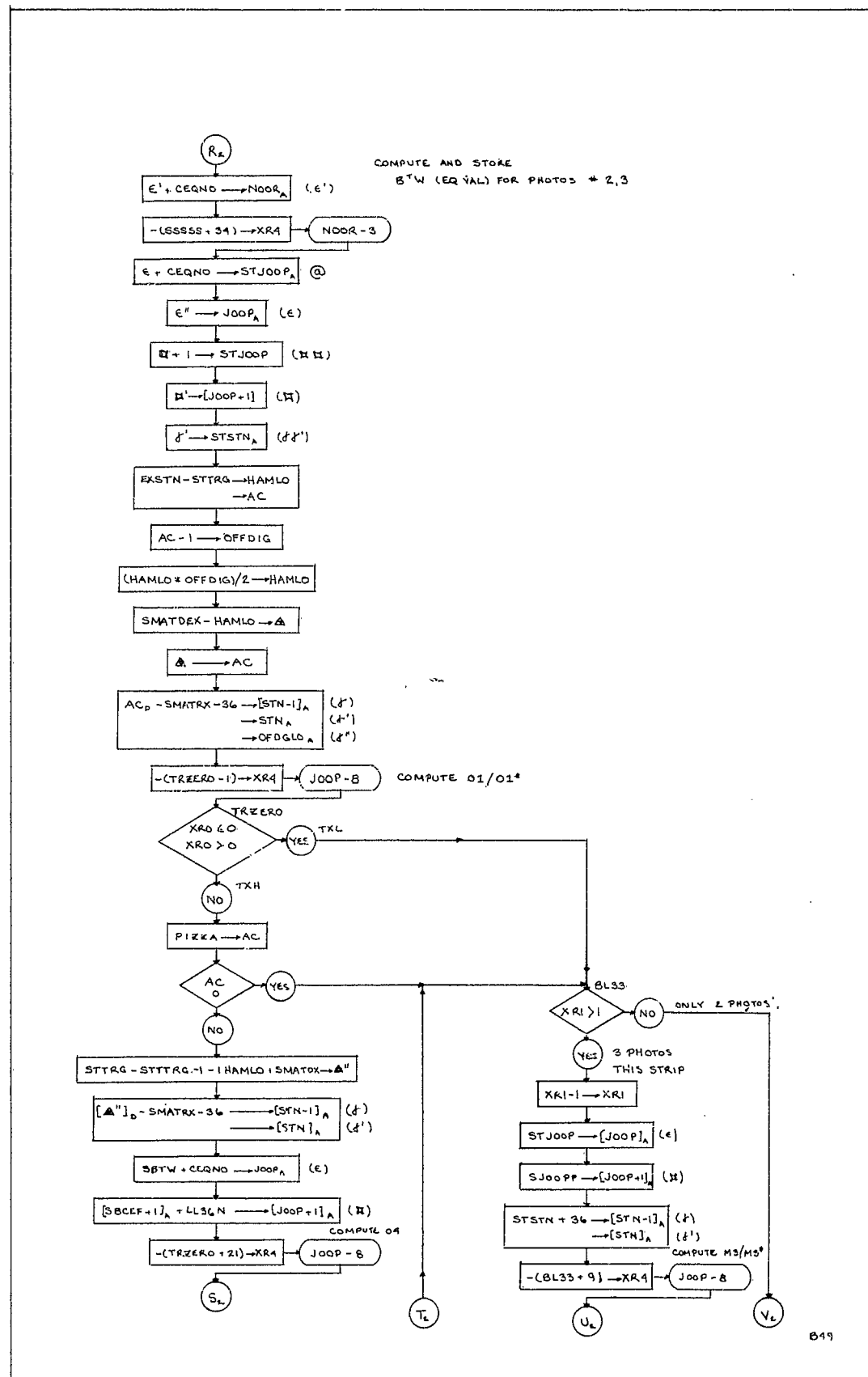


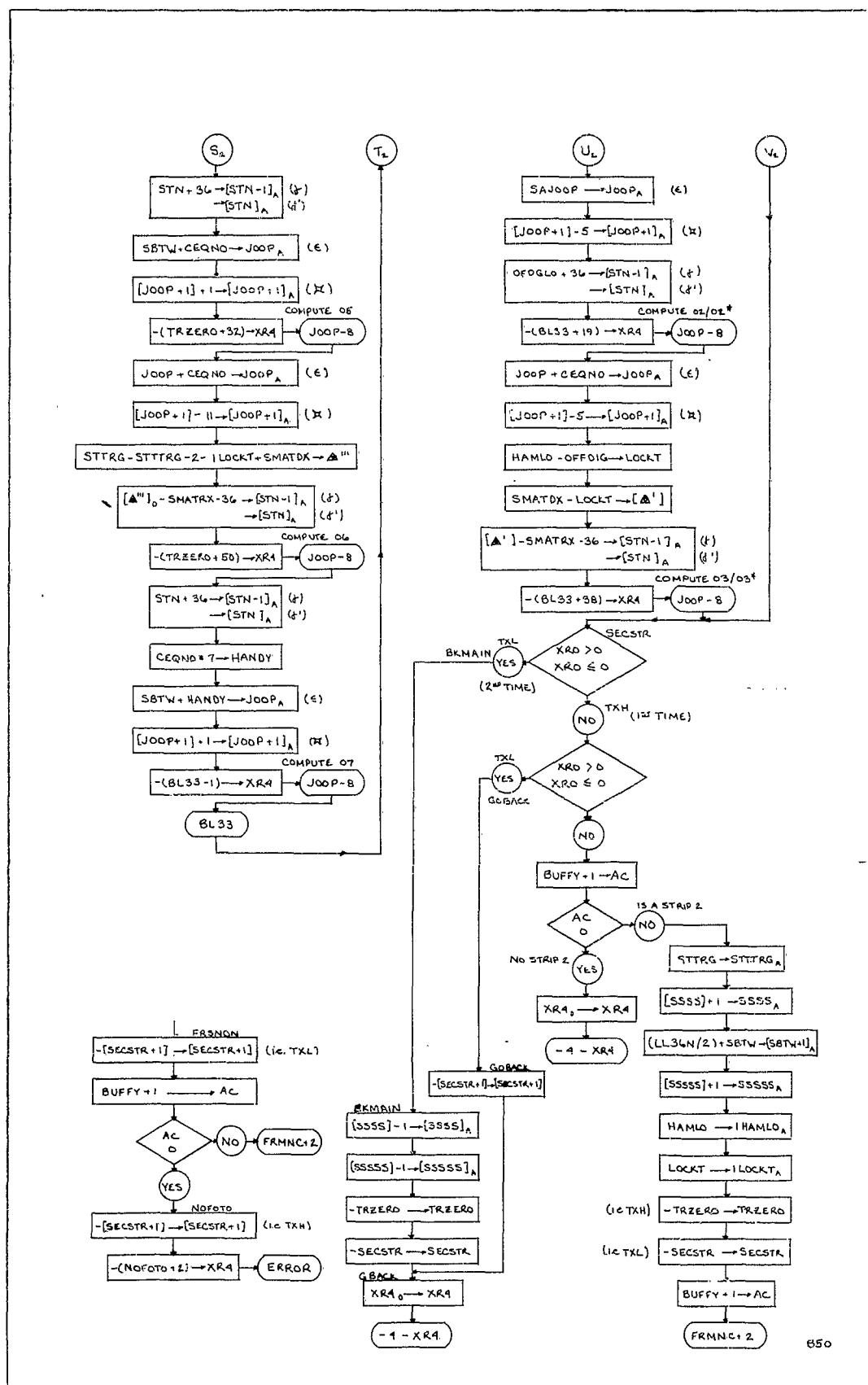












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ANALYTICAL AERIAL TRIANGULATION ERROR ANALYSIS AND
APPLICATION OF COMPENSATING EQUATIONS TO
THE GENERAL BLOCK TRIANGULATION AND ADJUSTMENT PROGRAM

FINAL TECHNICAL REPORT
VOLUME 2

Civil Engineering Systems Laboratory
Department of Civil Engineering
Massachusetts Institute of Technology
Cambridge, Massachusetts

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Further information concerning this project may be obtained from Mr. R. D. Esten, Chief, Photogrammetry Division, U. S. Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency, Fort Belvoir, Virginia, telephone EDgewater 9-5500, ext. 62140.

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