DEUCE Programme No. 360 (ZC14)

Brick Assembly.

SUMMARY.

A programme is described for using standard N.P.L. bricks as subroutines without recourse to G.I.P. The programme is a development of the R.A.E. Assembly Scheme (ZC11), but fewer restrictions are placed on the bricks acceptable and additional testing and restore control facilities have been included. One instruction only is needed to enter the assembly routine from the main programme and standard library copies of bricks may be used unaltered.

Because of their length the Operating Instructions are given on foolscap sheets instead of the usual cards.

DEUCE Programme No. 360 (2014)

Brick Assembly.

OPERATING INSTRUCTIONS.

Read-In Order.

Brick Assembly Programme (which includes "Clear Drum"). Cards 0-17.
Parameter card for 1st brick having
$(q-1)P_1 + mP_5 + (r-1)P_{22}$ for each section (see below)

P_1 on row 9.

Brick 1.
Parameter card : P_1 on row 9.
Brick 2.
.
.
.
Parameter card with P_{32} but no P_1 on row 9.
Master Programme. (punched with marker No. X P_{10} on row X of 1st card of each triad).

Restore control card (to start programme at a given link) No. 18.
Data.

Failure.

12-24 X if no D.L. number is punched on row X of first card of any triad read by the assembly programme. One shot tries to re-read the card on which failure occurred.

NOTE: If no P_1 is present on row 9 of a parameter card, the programme clears and enters 1_0 with the reader called. The programme may alternatively be started by reading into D.L.1, after reading the master programme, instructions which call down 14/13 into D.L.12 and fetch the first part of the master programme.

Restore Control.

(1) From the Reader.

Read in "Synchronize with P_{31} clock track" (ZP34) followed by the following one-card programme which plants a link from the card and obeys it:

Y	1, 15-31, 0, 28
X	BLANK
0	BLANK
1	BLANK
2	1, 16-16, 0, 22
3	1, 13-30, 0, 28
4	1, 8-24, 0, 28
5	1, 4-24, 0, 28
6	1, 0-11, 13, 28 X
7	LINK
8	1, 11-12, 2, 29, 28
9	1, 11-1, 1, 25, 24 P_{64}

Row					
Y	1	15-31		0	28
X	~~1~~	~~13-30~~		~~0~~	~~28~~
0	~~1~~	~~4-24~~		~~0~~	~~28~~
1	~~1~~	~~16-16~~		~~0~~	~~28~~
2	1	8-24		0	28
3	1	0-11		13	28 X
4	(LINK)				
5	1	11-12	2	29	28
6	1	11-1	1	25	24
7-9	Blank				

BLANK.

P64

This device is also useful for starting a programme from a given link.

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OPERATING INSTRUCTIONS CONT'D.

(ii) Using Manual Control.

Stop Machine.
External tree on.
15-31 ch 0 cont T.T.
15-30 ch 0 cont T.T.
1 11-1 cont T.T.

Cont. T.C.I. until, 1, 1-1 appears on instruction staticisers.

Ext tree off.
Machine on normal.

(These instructions are identical with those for G.I.P. restore control except that 15/15 is fetched instead of 14/15).

The machine now stops on 0-12 X, the last link obeyed by the machine having been displayed on the O.S. A new link may now be injected from the I.D. - a one shot continues from this link.
If a P_{32} is set in addition to the injected link, the machine will stop on 11-1. A further one shot continues the programme until the next cue is about to be obeyed when it will stop on 0-14 (see below).

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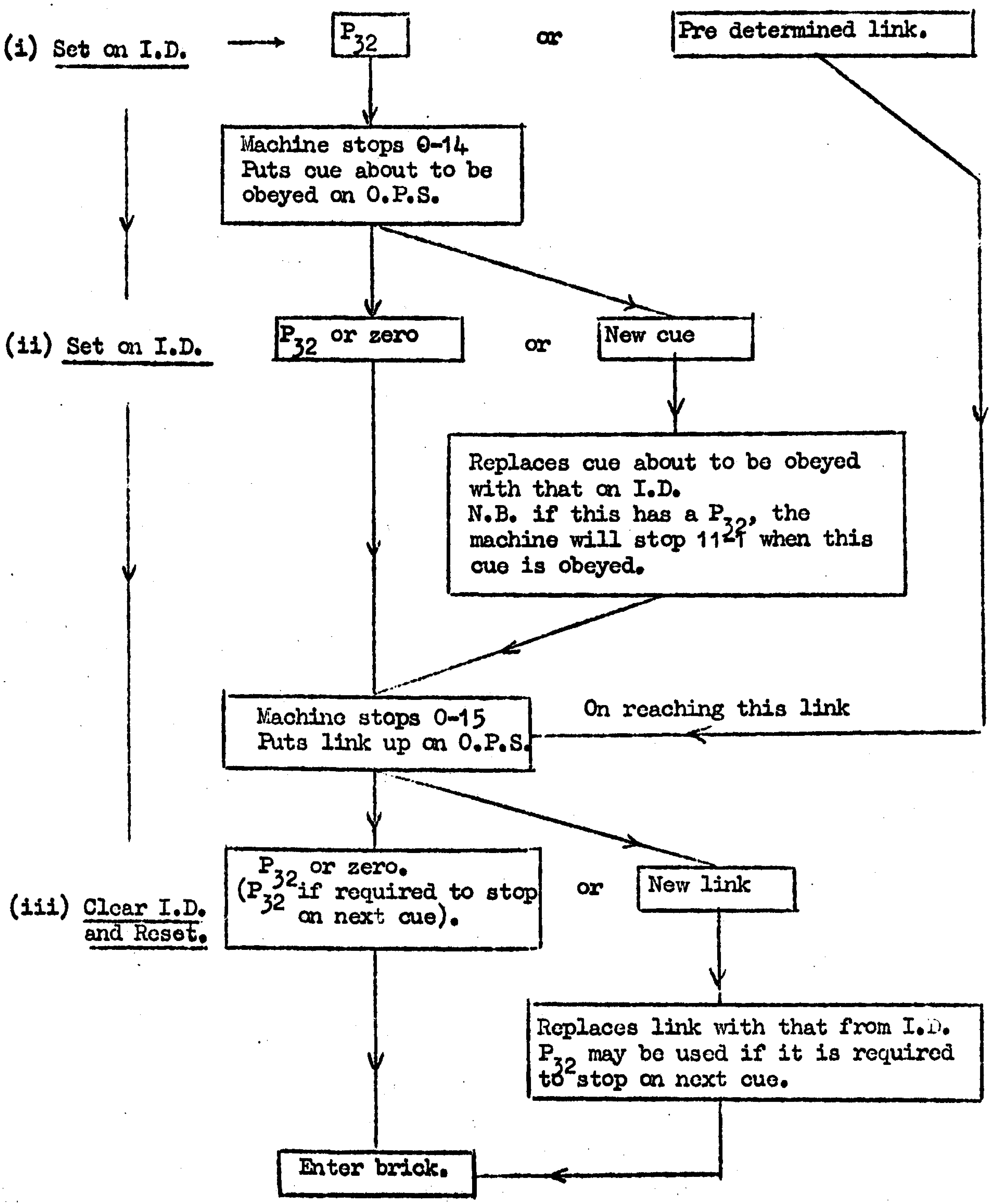
OPERATING INSTRUCTIONS CONT'D

Programme Testing Facilities.

Provision is made for

(1) stopping the machine when a link pre-set on the I.D. is reached.

(2) Stopping and examining the current cue and link just before obeying each brick.



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OPERATING INSTRUCTIONS CONT'D

"Track Assembly" Section.

This reads in standard scheme B bricks (with or without an initial card) and writes each section onto the drum starting from a track specified by a parameter card. Blank tracks are left where D.L.'s are missing, but D.L.'s may be in any order except that the lowest numbered must be last.

e.g. A 3-section brick whose highest D.L. numbers are 7, 4, 2 would need 7+4+2 = 13 tracks of drum storage.

The parameter card has, on row i (i = Y, X, 0, ..., 8)

$$(q_i-1)P_1 + m_i P_5 + (r_i-1)P_{22}$$

m_i is the number of the track to which the highest numbered D.L. of the ith section is to be placed.

r_i is the total number of tracks (including blanks) in this section.

q_i is the lowest D.L. number in the section. (This is normally 1).

Successive rows from Y to 8 may have parameters for up to 11 sections of a brick.
Row 9 is punched with a P_1 if a further parameter card is to follow (to read in the next brick). Row 9 will also have a P_{32} if no initial card is present with the brick. This enables other sections of programme to be read using Track Assembly.
A marker No. XP_{10} on row X of each triad must be punched for such tracks, counting backwards along the track numbers.
e.g. to read a programme (without initial card) to 15/0, 1, 2, 3.
Set P_{32} on row 9 of parameter card
Set $240 P_5 + 3P_{22}$ on row Y, all other rows blank.
Punch $4P_{10}$, $3P_{10}$, $2P_{10}$, $1P_{10}$ on row X of 1st card of the respective triads of programme.

Master Programme.

This must set code words for each brick to be obeyed and also any parameters needed for the brick. The code words (as in ZC11) are

(i) A Cue. $NP_2 + mP_5 + tP_{17} + (r-1) P_{22} + tP_{26}$
This is used to call down r tracks of brick from track m to m + r -1 into D.L.'s r to 1 and enter N_t. (Blank tracks are not transferred to the high speed store except possibly to D.L.1.)

NOTE: All brick sections must be treated as separate bricks when using this scheme.
m and (r-1) are the same numbers as used for the track assembly parameters.

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OPERATING INSTRUCTIONS CONT'D.

(ii) A Link: $N'P_2 + m'P_5 + t'P_{17} + (r'-1)P_{22} + t'P_{26}$

This is used at the end of a brick (or section) to fetch r' tracks of the main routine from track m' onwards and enter N'_t. It is usually advantageous, especially between sections of a multi-section brick, to bring down one track only of the master programme (to D.L.1). The tracks are brought down from m', (m' + 1) ... into consecutive D.L.'s ending with D.L.1.

Temporary stores 14, 15 and $21_{2,3}$ are preserved in 12_{18-21} between bricks : other stores are unaltered by the assembly routine.

After setting cue and link in $21_{2,3}$ and any parameters in $18_{0,1,2}$ for the brick, the master routine must obey 12-1 (32 m.c.) and enter 1_{26}.

"Fetch Tracks" Sections.

This programme, stored on 15/13 and 15/14, interprets the cue on entry from the master programme, and stores the link on the drum. It also sets back temporary stores 14, 15 and 21 from D.L.12.

After the brick, the link is interpreted to re-fetch the main programme.

Programme Operation.

Master Programme.	Plant cue and link in $21_{2,3}$. Plant parameters in $18_{0,1,2}$. 12-1 (32 m.c.) and enter 1_{26}.
Interpretive Routine.	Fetch Track programme is called to D.L.1 and cue used to fetch brick. Link is stored on 15/13, m.c.17. T.S. replaced from 12.
Brick.	Brick obeyed : ends 12-1 (32 mc.) leading to 1_{30}
Interpretive Routine.	15/13 fetched to D.L.1 and 12_{16-28} T.S.'s are stored in 12 and 15/14 recalled. Link is used to refetch main programme.
Master Programme.	Plant cue and link for next brick in $21_{2,3}$ etc.

The interpretive routine and restore control sections occupy tracks 15/13-15, all other tracks being available for the Master Programme and bricks.

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Brick Assembly.

OP RATING INSTRUCTIONS CONT'D

Conditions to be Satisfied by Bricks.

The conditions imposed on the bricks usuable by Brick Assembly, slightly less restrictive then those for G.I.P. are:

(i) 12_{29-31} must be preserved at the end of the bricks: the rest of D.L.12 may be used but only 12_{0-15} will be carried over unaltered between bricks or sections.

(ii) No punching in Col. 54.

(iii) Brick must end 12-1 (32 m.c.) leading to 1_{30}.

(iv) D.L. filler instructions must be punched and the lowest numbered D.L. placed last in each section.

Bricks need not be preceded by an initial card. It can be assumed (as in G.I.P.) that temporary stores and D.L.'s not overwritten by the new brick (or section) are preserved between bricks (sections). 12_{16-31} will not however be carried over unchanged.

Use of I.D.

AP_1 may be set on the I.D. without affecting the operation of brick assembly. A P32 will stop the programme before each brick is obeyed.

~~Ay~~ Anything else set on the I.D. will be regarded as a present link and the programme will waste time bringing down an extra track to compare the I.D with the link currently in use by the programme. It is advantageous therefore, in order to save operating time, to use the P_1 position only for any externally set markers used in the main routine.

DESCRIPTION.

This programme is similar to the R.A.E. scheme in that a cue and link are placed for each brick : many of the ideas in ZC11 (R.A.E. Programme changing routine) have been retained. Some disadvantages of ZC11 have however been obviated . These are:-

(i) The assumptions that the delay line numbers in a brick must be consecutive (in reverse order) ending with D.L.1.

(ii) The necessity for planting cue modifiers in multi-sectional bricks.

(iii) Non-preservation of unchanged temporary stores and delay lines between brick sections.

In the present programme standard Scheme B bricks may be used unaltered; however, n storage tracks are used on the drum for a brick whose highest D.L. number is n - it is clear that if less than n delay lines are actually used by the brick some of this storage will be wasted. (This is also true in the R.A.E. scheme).

The assembly routine is advantageously used instead of G.I.P. in large permanent programmes where the extra programming effort needed is worth while in order to save operating time on the machine. Time is saved between bricks, particularly when they are small, and when operating on small matrices - in such cases G.I.P. interpretive time is comparable to computing time within the bricks.

It is not suggested that 'one-off' jobs which may be programmed very quickly using G.I.P. should use the techniques described in this report.

Some timing comparisons have been carried out between G.I.P. and the assembly scheme.

(i) 10 multiplications of (1 x 1) matrices and punch result.

Scheme B : 48 secs.
Brick Assembly : 21 secs.
Interpretive Time saved per operation $= \frac{48-21}{31} = .87$ secs.

(ii) 100 operations using a specially prepared one-track brick (in this case practically all the time shown is used for interpreting codes).

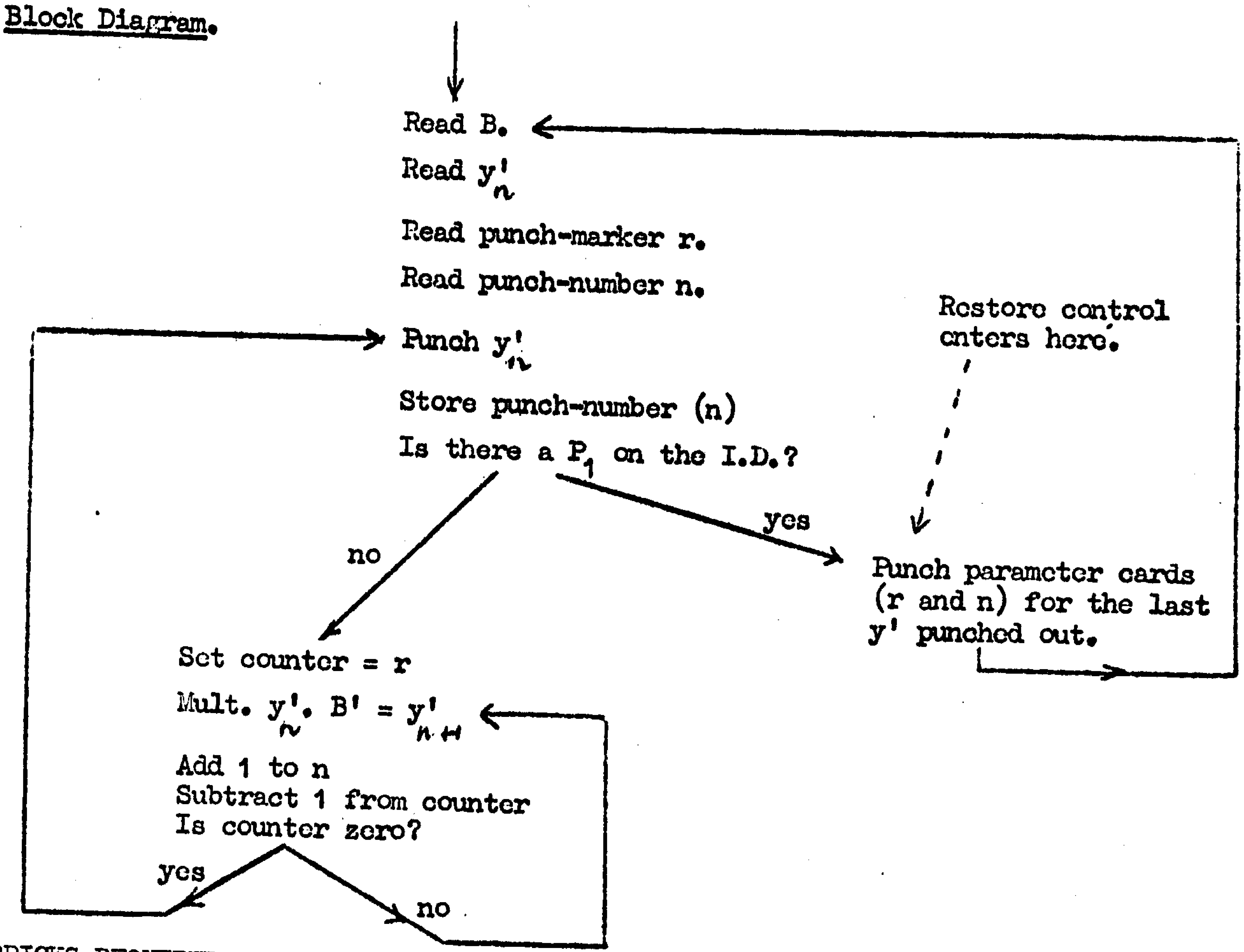
Scheme B : 114 secs.
Brick Assembly : 30 secs.
Time saved per section interpretation $= \frac{114-30}{100} = .84$ secs.

EXAMPLE

This programme successively replaces a row vector y'_n by the vector y'_{n+1} formed by post-multiplying y'_n by the transpose of a square matrix B. Resulting vectors are punched out at every rth step (r being specified initially by a parameter card) and numbered with the step number n, (the initial value of n is specified by a second parameter card). A block diagram is given below.

The flow diagram and coding for this example are included at the end of this report.

Block Diagram.



BRICKS REQUIRED.

1. Read Binary Matrix (LR07B) D.L.'s 3, 2, 1; entry 1_{30}.
2. Punch Binary Matrix (LP05B) D.L.'s 3, 2, 1; entry 2_0.
3. Matrix Mult. (fast)(LM08B) Section I D.L.'s 4,3,2,1; entry 1_{31}
   Section II D.L.'s 9,8,7,6,5,4,3,1; entry 1_{30}
   Section III D.L.'s 5,4,3,1; entry 1_{30}

USE OF DRUM.

15/13-15	Brick Assembly.
15/0	Main Programme (3 tracks)
14/5	LR07B
14/2	LP05B
13/13	LM08B (Section III)
13/4	LM08B (Section II)
13/0	LM08B (Section I)
11/2	B ($\ngtr$ 30 tracks)
11/0	y'

ARRANGEMENT OF CARDS.

Brick Assembly.

Parameter card 1.

LM08B (I)

LM08B (II)

LM08B (III)

Parameter card 2.

LP05B

Parameter card 3.

LR07B.

Parameter card 4.

Main Routine. *

1 card Programme for entry in D.L.1. Link = 1, 15/2 0(0) 0

Parameter cards are punched as follows

Card 1. Y row. $0P_1 + 0.P_5 + 13P_9 + 3P_{22}$
X row. $0P_1 + 4.P_5 + 13P_9 + 8P_{22}$
0 row. $0P_1 + 13.P_5 + 13P_9 + 4P_{22}$
9 row. P_1

Card 2. Y row. $0P_1 + 2P_5 + 14P_9 + 2P_{22}$
9 row. P_1

Card 3. Y row. $0P_1 + 5P_5 + 14P_9 + 2P_{22}$
9 row. P_1

Card 4. Y row. $0P_1 + 0P_5 + 15P_9 + 2.P_{22}$
9 row. P_{32}.

*NOTE: The triads of the main routine have no filler instructions but are punched on the X-rows of the 1st cards of the triads as follows.

The triad for 15/0 :- $3P_{10}$

The triad for 15/1 :- $2P_{10}$

The triad for 15/2 :- $1P_{10}$

The order of the triads is unimportant provided that the triad for the highest-numbered track (punched with $1.P_{10}$ on the X-row) is stacked last.
A convenient preset link in the restore control programme (punched on row 4 of the last card) is as follows:-

2 15/0. 5(1)5.

(see Block Diagram and Flow Diagram).

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Date

Sheet No. 56/11051

Deuce Programme NO. 360 (2C14) (Nst 1198)

Brick Assembley.

... for example in the report.

D.L. 1 Track 15/2

Card Nos.

mc	NIS	S	D	C	W	T	
0	1	1	18		0	1	
1	1	12	24		0	1	
2	11/2 PS						
3	1	1	21	2	1	26	
4	1	0	2		23	6	X
5	1	9	24		0	2	
6	1	14	5		30(2)	30	
7	1	15	2		8(0)	8	
8	1	1	18		0	1	
9	1	15	31	1	0	5	
10	11/0 PS						
11	1	1	21	2	1	18	
12	1	2	24		0	30	X
13	1	0	2		15	22	X
14	1	14	5		30(2)	30	
15	1	15	1		1(1)	1	
16	1	2	11	1	0	31	
17	1	1	30	1	0	0	
18	1	1	21	2	4	11	
19	1	3	1	1	13	11	
20	1	1	21	2	0	9	
21							
22	1	13	4		30(8)	30	
23	1	16	2		18(0)	18	
24	1	13	13		30(4)	30	
25	1	15	0		28(4)	28	
26							
27							
28							
29	PP7				Space		
30	NPS				Space		
31	1	12	1	1	26	25	

D.L. 1 Track 15/1

Card Nos.

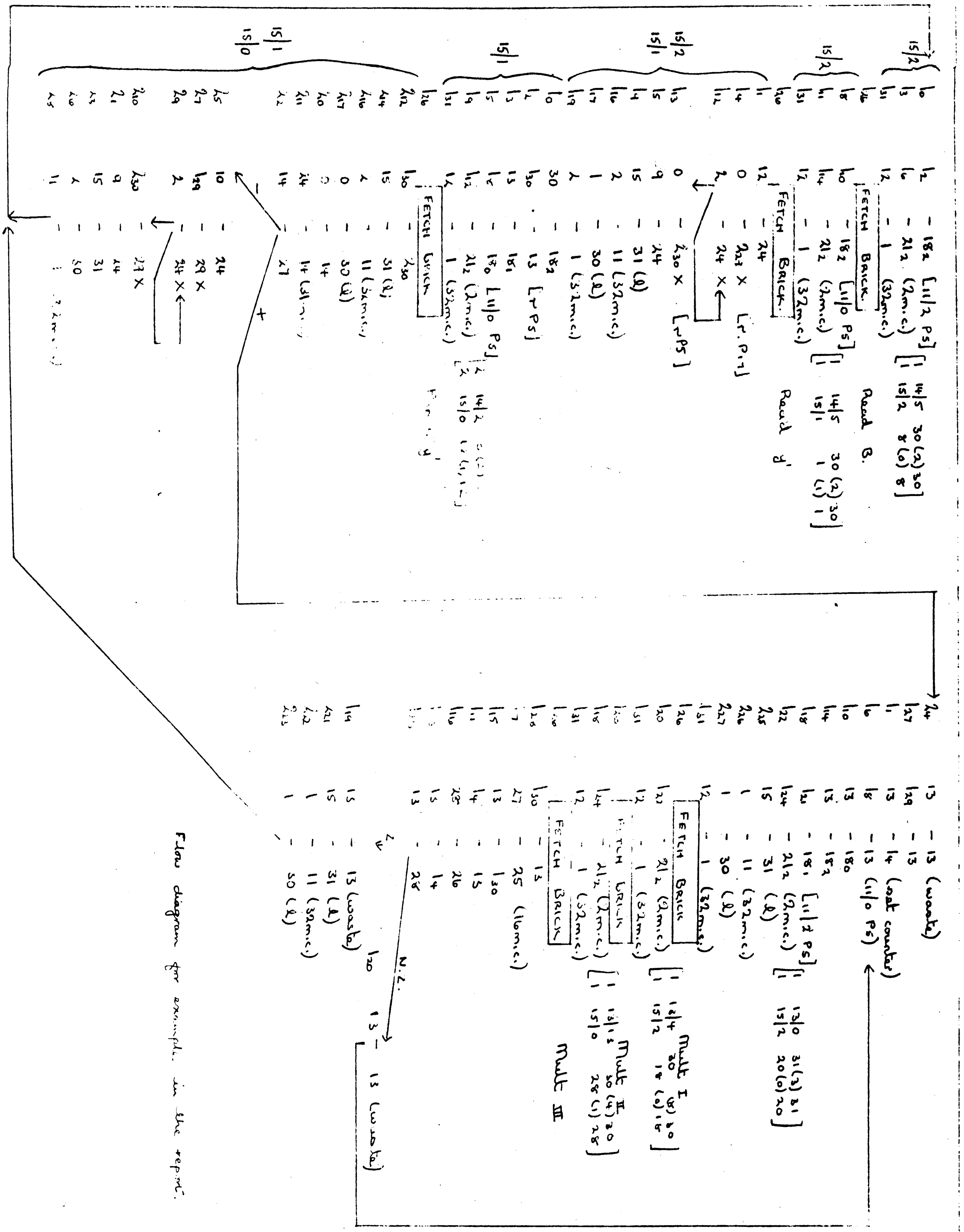
mc	NIS	S	D	C	W	T
0	1	30	18		0	0
1	1	13	1		1	3
2	1	1	13		26	31
3	1	13	18		0	0
4	Counter.					
5	1	1	18		1	2
6	1	1	13		0	2
7	1	27	25	1	23	6
8	11/0 PS					
9	1	1	21	2	1	20
10	1	13	18		0	2
11	1	1	13		23	3
12	2	14	5		0 (2)	0
13	2	15	0		12(1)	12
14	1	13	18		2	2
15	1	13	1		13	26
16	1	28	26		0	5
17						
18	1	1	18		1	2
19	2	13	13		0	0
20	1	13	13		0	16
21	11/2 PS					
22	2	1	21	2	0	1
23	1	13	1		11	1
24	1	13	0		31(3)	31
25	1	15	2		20(0)	20
26	1	13	28		0	23
27	1	1	13		0	4
28	1	1	13		0	9
29	PP17					
30	NPS					
31	1	12	1	1	26	25

D.L. 2 Track 15/0

Card Nos.

mc	NIS	S	D	C	W	T	
0	2	0	14		0	9	
1	2	9	24		0	0	
2	2	14	27		0	0	
3	2	15	31		0	1	
4	1	13	13		0	21	
5	2	10	24		0	0	
6	2	2	30		0	0	
7	2	1	29		20	0	X
8	1	11	1	1	23	22	
9	2	2	24		0	30	X
10	2	2	29		18	21	X
11	2	24	14	1	23	21	
12	2	1	2		16	0	
13							
14	2	15	31	1	0	0	
15							
16	2	2	11	1	0	31	
17	2	0	30	1	0	13	
18							
19							
20							
21	2	15	31	1	0	31	
22	2	1	11	1	0	31	
23	1	1	30	1	0	7	
24							
25	2	15	31	1	0	31	
26	2	1	11	1	0	31	
27	1	1	30	1	0	2	
28							
29							
30							
31							

Y X 0 1 2 3 4 5 6 7 8 9 Y X 0 1 2 3 4 5 6 7 8 9 Y X 0 1 2 3 4 5 6 7 8 9



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FLOW DIAGRAM FOR DEUCE PROGRAMME NO. 360 (ZC14+)

Brick Assembly.

Date
Drawn by
Sheet of 56/11052

	D.L. 2	Track	Card Nos.						D.L. 1	Track	Card Nos.					
MC	MB	S	D	C	W	T		MC	MB	S	D	C	W	T		
																Y
	2	0	2	ℓ	26	25	X		1	0	1	ℓ	26	25	X	X
	2	0	2		30	31	X		1	0	1		30	31	X	0
	1	0	2		30	31	X		1	0	1		30	0	X	1
0	2	0	14		0	0	X	0	BLANK.							2
1	2	1	21	ℓ	0	2		1	1	12	24		0	3		3
2	2	25	14		0	5		2	0	21	0	ℓ	0	0		4
3	1	4	11	ℓ	1	0		3	2	0	30	ℓ	0	0		5
4	2	14	28		0	0		4	4	0	31	ℓ	0	26		6
5	2	25	22		0	1	X	5	0	21	0	ℓ	0	0		7
6	2	9	24		0	2		6	1	30	3	ℓ	0	31		8
7	2	23	14	ℓ	2	6		7	1	1	13		0	1		9
8	2	23	14	ℓ	1	4		8	1	3	14		0	11		Y
9	1	27	26		0	3		9	2	14	5		0 (3)	11		X
10	2	12	24		0	11	X	10	1	0	14		0	16	X	0
11	1	1	25		2	29		11	1	28	25		0	0		1
12	2	14	27		0	8		12	1	01	18		1	9		2
13	2	14	13		0	2		13	1	13	20		1	2		3
14	2	25	22		0	0		14	1	19	26		0	10		4
15	1	14	23		0	4	X	15		$P_{17,24}$						5
16	2	2	15		0	2		16	1	1	15		0	1		6
17	2	15	14		0	0		17	1	1	15		1	3		7
18	4	0	4		30	31	X	18		P_{5-13}						8
19	1	23	14	ℓ	0	4		19	2	25	21		0	3		9
20	2	15	4	ℓ	0	31		20		P_{1-4}						Y
21	1	1	4		8	11		21	2	23	14	ℓ	19	22		X
22	1	13	13		0	5	X	22	1	25	19		0	24		0
23	2	24	20		0	5		23	1	20	28		0	1		1
24	1	23	14	ℓ	17	1		24	2	27	22	ℓ	0	31		2
25	2	21	16		0	0		25	2	14	15		0	1		3
26	1	20	13		0	0		26	2	13	18		0	30		4
27	2	16	21		0	0		27	1	25	22		0	15		5
28	2	21	14		1	3		28	0	15	0	ℓ	0	0		6
29	2	2	15		0	1	X	29	1	2	24		0	30	X	7
30	2	1	20		8	26		30	3	8	8		0	23		8
31		P_{10-13}						31	2	0	4		30	2	X	9

1_1 12 - 24
1_6 30 - 3 (32 m.c.)
1_7 1q - 13 [2, 14-3, 0, (5) 11]
1_{10} 0 - 14 X
1_{28} 13 - 0
Q_{30} (1_9 14 - 30)
2_{11} 1_{15} - 25 ($P_{17,22}$)

2_{12} 14 - 27 (deducted card)
2_{22} 13 - 13 X
1_{24} 2 - 24 X
1_{30} 8 - 8

2_{23} 24 - 20_3
2_{30} 1_8 - 20_2 [1, 3-14, 0, 11.]
1_{20} Z → 2_{20} 20_2 - 13
1_{28} 13 - 0
Q_{30} (1_8 30 - 1+)
1_{11} 28 - 25
1_{13} 13 - 20_2
1_{17} 1_{20} - 15 [P_{1-4}]
1_{22} 25 - 19_2
1_{16} 1_{14} - 15 [P_{5-13}]
1_{19} 25 - 21_3
2_{24} 23 - 14 (17 m.c.)
1_{27} 25 - 22_3
1_{12} 21_3 - 28

Z / N.Z.

1_{23} 20_3 - 28 1_{26}
Z
1_0

1_{24} 27 - 22_2 (32 m.c.)
→ 2_{25} 21_3 - 16 (m+r) P_5]
→ 2_{27} 16 - 21_3
→ 2_{29} 2_{31} - 13 X [P_{10-13}]
2_{10} 0 - 14 X
2_2 25 - 14
2_4 14 - 28

Z. / N.Z.

2_6 9 - 24 Fail: Filler instruction zero
2_{15} 12 - 24 X

→ 2_1 23 - 14 (m.c.)
2_{15} 14 - 23_3 X
1_{21} 23 - 14 (4 m.c.)
2_{13} 14 - 13
2_{17} 15 - 14
2_{19} 23 - 14 (5 m.c.)
1_{25} 14 - 15
2_{28} 21_3 - 14
2_1 1_3 - 21_3 (2 m.c.) [2, 0-30 ℓ 0, 0 / 4 0-31 ℓ 0 26]
2_5 25 - 22_3 X
2_8 23 - 14 (4 m.c.)
2_{14} 25 - 22_2
2_{16} 2_{18} - 15 [4, 0-4, 30, 31, X]
2_{20} 15 - 4 (32 m.c.)
2_{21} 1_{31} - 4_{31} [2, 0-4, 20, 2, X]
1_2 21_2 - 0
Q_4 (a - 31 (ℓ)
4_0 0 - 4_0 X
4_{31} 0 - 4_{31} X
2_3 4 - 11 (32 m.c.)
1_5 21_3 - 0
Q_7 (6 - 30 (ℓ)
2_9 27 - 26
1_{14} 19_2 - 26
1_{26} 13 - 28
2_{26}

N.Z. / Z

→ 2_{26}

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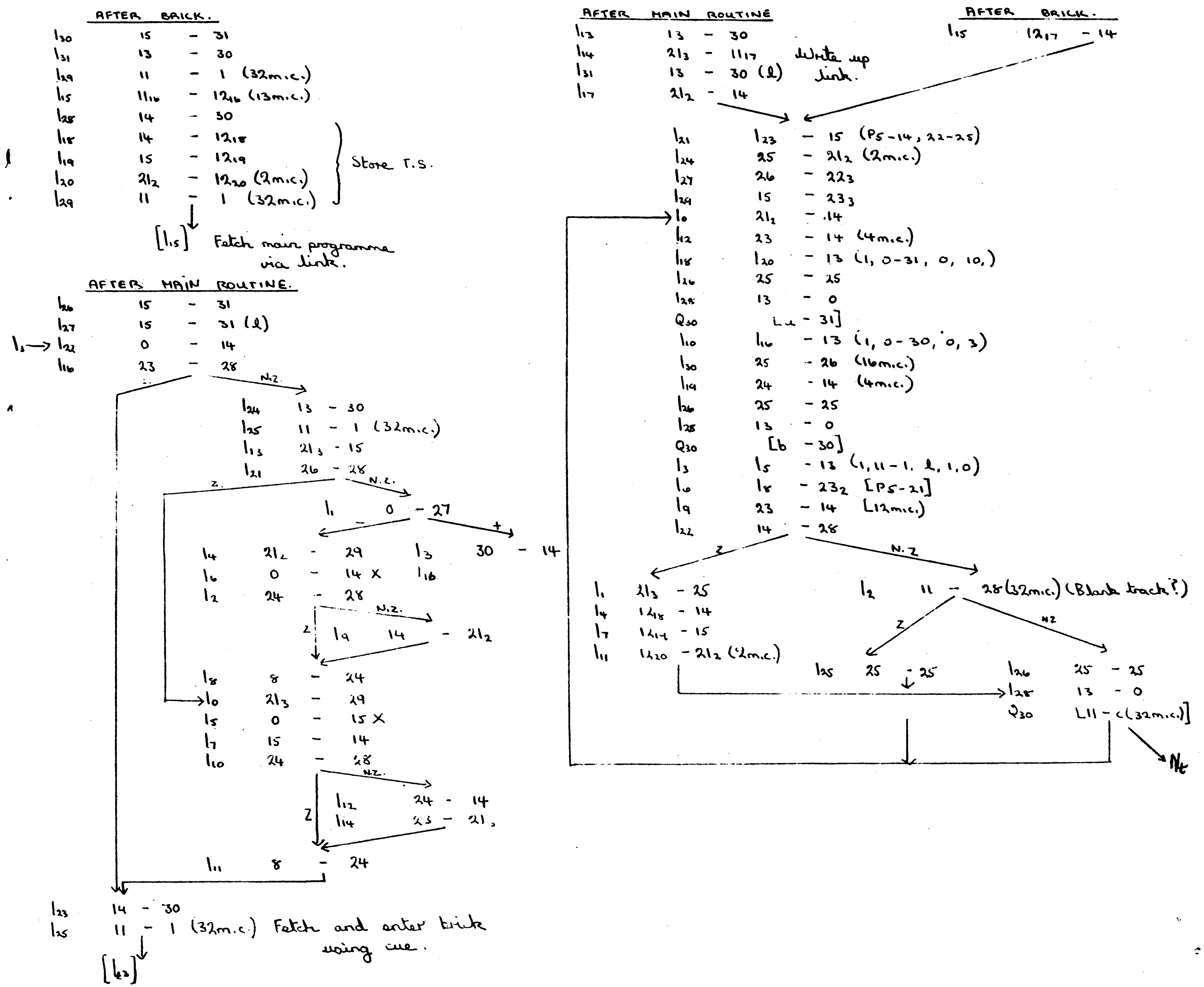
2508/29

FLOW DIAGRAM FOR [illegible] PROGRAMME No. 360 (ZC14)

Brick Assembly.

Date:
File Ref. NS E 1198
Sheet Ref. 56/11053



NELSON RESEARCH LABORATORIES,
THE ENGLISH ELECTRIC CO. LTD.,
STAFFORD, ENGLAND.

FLOW DIAGRAM FOR DEUCE PROGRAMME NO. 360(ZC14)

Brick Assembly.

Date
File Ref. NSt 1199
Ref. 56/11054

Deuce Programme No. 360 (ZC14) (NS k 1198)

Brick Assembly

D.L. 1 Track 15/13

Card Nos.

mc	NIS	S	D	C	W	T	
			3				
0	1	21	29		1	3	
1	1	0	27		0	0	
2	1	24	28		0	4	
3	1	30	14		0	11	
4	1	21	29		0	0	
5	1	0	15		0	0	X
6	1	0	14		0	26	X
7	1	15	14		0	1	
8	1	8	24		0	22	
9	1	14	21		1	29	
10	1	24	28		0	31	
11	1	8	24		0	10	
12	1	24	14		0	0	
13	1	21	15		0	6	
14	1	23	21		1	27	
15	1	11	12	l	31	11	
16	1	23	28		0	5	
17			LI	N	K		
18	1	14	12		30	31	
19	1	15	12		30	31	
20	1	21	12	d	30	7	
21	1	26	28		0	9	
22	1	0	14		0	24	
23	1	14	30		0	0	
24	1	13	30		0	31	
25	1	11	1	l	19	18	
26	1	15	31		0	31	
27	1	15	31	l	0	25	
28	1	14	30		0	20	
29	1	11	1	l	17	16	
30	1	15	31		0	31	
31	1	13	30		0	28	

D.L. Track 15/14

Card Nos.

mc	NIS	S	D	C	W	T	
			2				
0	1	21	14		0	10	
1	1	21	25		0	1	
2	1	11	28	l	22	21	
3	1	1	13		0	1	
4	1	12	14		12	1	
5	1	11	1	l	1	0	
6	1	1	23		0	1	
7	1	12	15		10	2	
8		P5-21					
9	1	23	14	l	0	11	
10	1	1	13		4	18	
11	1	12	21	l	7	15	
12	1	23	14	l	1	4	
13	1	13	30		0	31	
14	1	31	11		1	15	
15	1	12	14		0	4	
16	1	0	30		0	3	
17	1	21	14		1	2	
18	1	1	13		0	6	
19	1	24	14	l	2	5	
20	1	0	31		0	10	
21	1	1	15		0	1	
22	1	14	28		0	9	
23		P5-14,	22-25				
24	1	25	21	d	0	1	
25	1	25	25		0	5	
26	1	25	25		0	0	
27	1	26	22		0	0	
28	0	13	0	l	0	0	
29	1	15	23		0	1	
30	1	25	26	l	4	19	
31	1	13	30	l	0	16	

D.L. Track 15/15

Card Nos.

mc	NIS	S	D	C	W	T		
								Y
			1					X
								0
								1
0	1	13	30		0	1		2
1	1	11	12	l	13	28		3
2	1	11	1	l	25	24		4
3	1	11	29		12	28		5
4	1	1	1		0	26		6
5	1	1	1		0	25		7
6	1	1	1		0	24		8
7	1	1	1		0	23		9
8	1	1	1		0	22		Y
9	1	1	1		0	21		X
10	1	1	1		0	20		0
11	1	1	1		0	19		1
12	1	1	1		0	18		2
13	1	1	1		0	17		3
14	1	1	1		0	16		4
15	1	1	1		0	15		5
16	1	1	1		0	14		6
17	1	1	1		0	13		7
18	1	1	1		0	12		8
19	1	1	1		0	11		9
20	1	1	1		0	10		Y
21	1	1	1		0	9		X
22	1	1	1		0	8		0
23	1	1	1		0	7		1
24	1	1	1		0	6		2
25	1	1	1		0	5		3
26	1	1	1		0	4		4
27	1	1	1		0	3		5
28	1	1	1		0	2		6
29	1	1	1		0	1		7
30	1	1	1		0	0		8
31	1	0	12		16	1	X	9