

Customer Engineering
1401 Pocket Reference Manual

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ISSUE

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CODES

1401 BCD CODE

Digit	Zone			
	NO	A	B	AB
NO	b	c	-	&
1	1	/	J	A
2	2	S	K	B
21	3	T	L	C
4	4	U	M	D
4 1	5	V	N	E
42	6	W	O	F
421	7	X	P	G
8	8	Y	Q	H
8 1	9	Z	R	I
8 2	0	-	!	?
8 21	#	.	\$	-
84	∅	%	∅	□
84 1	:	=)	(
842	>	'	:	<
8421	√	"	△	≠

ADDRESS CODES

Position	Bits	Value
HUNDREDS	A	1K
	B	2K
	AB	3K
UNITS	A	4K
	B	8K
	AB	12K
TENS	Tag Bits	Index Reg
	A	87-89
	B	92-94
	AB	97-99

ARITH ZONE BITS

Bits	Sign (Units)	Overflow (High Order)
NONE	--	0 . 4
A	--	1 . 5
B	—(STD)	2 . 6
AB	—(STD)	3 . etc.

QUI-BINARY CODE

Digit	Q0	B1
0	Q0	B0
1	Q1	B1
2	Q2	B0
3	Q2	B1
4	Q4	B0
5	Q4	B1
6	Q6	B0
7	Q6	B1
8	Q8	B0
9	Q8	B1

C-BIT GENERATOR

Digit Bits	Parity of			Cd	WM	Cz	Generate C-bit
	WM Bits	Zone Bits	Total Bits				
Odd	Odd	Even	Even	Cd	WM	Cz	Yes
Even	Even	Even	Even	Cd	WM	Cz	Yes
Even	Odd	Odd	Even	Cd	WM	Cz	Yes
Odd	Even	Odd	Even	Cd	WM	Cz	Yes

**MACHINE FEATURE INDEX
CODES FOR ALD'S**

MFI	FEATURE	MFI	FEATURE
APF	Advanced Program	M8	800 BPI Density
BA	Basic	MD	Multiply Divide
BSR	1210 Bank Sorter Reader	MR	Move Record
BSR	Data Transmission	NNU	No Num. Print Control
BT	Bit Test	NPF	No Print Storage
CH	Column Binary	NU	Num. Print Control
CF	Card Feed — 1404	OV	Overlap
CFC	Card Feed Comp.	OVR	Overlap — R/P
CM	Attachments Circuitry	OVRP	Overlap — PFR
CW	Compressed Tape	OVT	Overlap — Tape
DH	Dual Hopper	PF	Print Storage
DR	Drums	PT	Paper Tape Adapter
DS	Dual Speed Carriage	RAM	Disc Storage
EE	Expanded Print Edit	RP	Punch Feed Read
FP	Read Punch Release	SS	Sense Switches
HL	Hi-Lo-Equal Compare	1K	1.4 K Storage Only
IN	Indexing	2K	2 K Storage Only
INQ	Inquiry Station	4K	4 K Storage Only
IO	Input/Output	8K	8 K Storage Only
IOA	Input/Output	12K	12 K Storage Only
IOC	Input/Output Com.	1M	1.4 K Stor. & Above
LST	Low speed Tape	2M	2 K Storage & Above
M0	Any Tape Drive	4M	4 K Storage & Above
M2	729 II or V	8M	8 K Storage & Above
M3	7330	12M	12 K. Stor. & Above
M4	729 IV or VI	16M	16 K Storage
M6	729 II/V or IV/VI	100	100 Print Positions
		132	Add. Print Control

OPERATION CODES

1	Read
2	Print
3	Print-Read
4	Punch
5	Read-Punch
6	Print-Punch
7	Print-Read-Punch
8	Read Release
9	Punch Release
A	Add
B	Branch
C	Compare
D	Move Digit
E	Edit
F	Form Control
H	Store B Star
K	Stacker Select
L	Load
M	Move
N	No Op
P	Move Record
Q	Store A Star
S	Subtract
U	Unit Control
V	Branch — WM or Zone
W	Branch — Bit Equal
X	Move — Insert Zeros
Y	Move Zone
Z	Move Zero Suppress
.	Stop
□	Clear Wordmark
/	Clear Storage
,	Set Wordmark
%	Divide
#	Modify Address
@	Multiply
?	Zero and Add
!	Zero and Subtract

d MODIFIERS

d CHARACTERS FOR BRANCH

IIIId

d-Character	Branch On
b	Unconditional
9	Carriage Channel #9
@	Carriage Channel #12
A	"Last Card" Switch (Sense Switch A)
B	Sense Switch B*
C	Sense Switch C*
D	Sense Switch D*
E	Sense Switch E*
F	Sense Switch F*
G	Sense Switch G*
K	End of Reel * **
L	Tape Transmission Error*
N	Access Inoperable*
?	Reader Error if I/O Check Stop Switch is off**
!	Punch Error if I/O Check Stop Switch is off**
P	Printer Busy (print storage feature)*
+	Print Error if I/O Check Stop Switch is off**
/	Unequal Compare (B ≠ A)
*	Inquiry Clear*
Q	Inquiry Request*
R	Printer Carriage Busy (print storage feature)*
S	Equal Compare (B = A)*
T	Low Compare (B < A)*
U	High Compare (B > A)*
V	Read-Write Parity Check or Read-Back Check Error*
W	Wrong-Length Record*
X	Unequal-Address Compare*
Y	Any Disk-Unit Error Condition*
Z	Overflow**
%	Processing Check with Process Check Switch off**

*Special feature.

**Conditions tested are reset by a BRANCH IF INDICATOR ON instruction.

d CHARACTERS FOR BRANCH IF WORDMARK OR ZONE

VIIIBBBd

d-Character	Condition
I	Wordmark
2	No zone (No-A, No-B-bit)
B	12-zone (AB-bits)
K	11-zone (B, No-A-bit)
S	Zero-zone (A, No-B-bit)
3	Either a wordmark, or no zone
C	Either a wordmark, or 12-zone
L	Either a wordmark, or 11-zone
T	Either a wordmark, or zero-zone

d CHARACTERS FOR FORM CONTROL

Fd

d	Immediate skip to	d	Skip after print to
1	Channel 1	A	Channel 1
2	Channel 2	B	Channel 2
3	Channel 3	C	Channel 3
4	Channel 4	D	Channel 4
5	Channel 5	E	Channel 5
6	Channel 6	F	Channel 6
7	Channel 7	G	Channel 7
8	Channel 8	H	Channel 8
9	Channel 9	I	Channel 9
0	Channel 10	?	Channel 10
#	Channel 11	.	Channel 11
@	Channel 12	□	Channel 12

d	Immediate space	d	After print-space
J	1 space	/	1 space
K	2 spaces	S	2 spaces
L	3 spaces	T	3 spaces

DIAGNOSTIC FUNCTION TEST SET-UP

SENSE SWITCH CONTROL

B on Tight loop
 C on Print Correct
 D on 1 card loop
 E on Error stop
 *F on Perform
 *F off Bypass
 **F on PAR Mode
 G on Adv Prog

SETUP DIGITS

Storage Location	Char	Control
**1251	1	2K
	2	12K
	4	4K
	5	16K
	8	8K
1252	1	Print Titles
**1298	1	Overlap
**1299	1	Reader
	4	Punch
	M	Tape
	R	Paper Tape Reader
	W	Paper Tape Punch
	2	1412
	9	1419

*Applies to old style DFT's (0060, etc.) only.

**Applies to new style DFT's (1C01, etc.) only.

TAPE SELECTION DIGITS

Storage Location	Digit	Run DFT
1254	1	Copy Test Tape
*1255	1	Sense Switches
**1255	1	Carriage
1256	1	Col Binary
1257	1	Indexing
1258	1	Mult/Div
1259	1	Hi-Lo-Eq
1261	1	Print
*1261	1	Carriage
**1261	3	Num. Print
*1262	1	Ripple Punch
*1263	1	Ripple Read (Detail Cards needed)
1264	1	Modify Address
*1265	1	Core Worst 1.4K
	2	2K
	4	4K
	8	8K
	-	12K
	&	16K
**1265	1	Core Worst
*1268	4	Tape
*1268	1	Tape VRC
**1268	1	Tape
1269	1	IRG
1270	1	Comp Tape
1271	1	Branch on Error
1272	1	PFR
1273-4	B1#	Perform/Bypass Block *(Enter 4 in 1329 & 1332)
1273-6	DFT#	Perform/Bypass DFT
**1277	1	Run DFT only
	2	Bypass DFT
	3	Run Block only
	4	Bypass Block
**1278	1	Stacker Select
**1279	1	Read Release

*Applies to old style DFT's (0060, etc.) only.

**Applies to new style DFT's (1C01, etc.) only.

STOP CONDITIONS

ALL STOPS

- A. The Address Register light indicates the cycle just completed.
- B. The Storage Address Register contains the address of the cycle just completed.
- C. If in I cycles, the Instruction Length indicates the I cycle just completed.

SYSTEM STOP WITH PROCESS ERROR

- A. A Register light
 - 1. A Register out of parity
 - 2. stops at the end of the next cycle
- B. B Register light
 - 1. B Register out of parity
 - 2. stops at the end of the same cycle
- C. Logic Unit light
 - 1. Adder output validity
 - 2. stops at the end of the next cycle
- D. Op Register light
 - 1. Op Register parity or validity
 - 2. not checked during I op
- E. Storage Address Register light
 - 1. parity or validity check of the serial lines
 - 2. stops at the end of the cycle that storage is addressed, for an error in the units or tens position
 - 3. stops at the end of the next cycle after storage is addressed, for an error in the hundreds position (also includes wrap around condition)

SMS INFORMATION

THE CONDUCTING TRANSISTOR ALWAYS CONTROLS THE LINE

BASE VOLTAGE WITH UNIT CONDUCTING

COLLECTOR LOADS BY CAP CODES

Family	Inputs	Base	Level	Cap Code	Circuits			
					01	02	03	04
CEE	CDEL	L	+U	VA	Yes	No	No	No
	BNPQ	B	+U	VB	Yes	Yes	Yes	Yes
	FGHK	H	+U	VN	Yes	Yes	No	No
CG	BC	TP9	+U	VP	Yes	Yes	Yes	Yes
	FG	TP8	+U	VU	Yes	No		
	DE	TP2	+U	VV	Yes	No	No	
CH	BC	TP9	-T	VW	Yes	Yes	No	
	FG	TP8	-T	WF	No	No		
	DE	TP2	-T	WV	Yes	Yes		
CJ	DEFG	G	+U	WW	Yes	Yes	Yes	
	ABC	TP3	+U	YC	Yes	Yes		
CK	DEFG	G	-T	YG	Yes	No	No	No
	ABC	TP3	-T	ZT	Yes	Yes	No	No
CQ	EN	N	+U	ZV	Yes	Yes	Yes	Yes
	BF	B	+U	2JMX	Yes	Yes		
CR	EN	N	-T	3JMX	No	No		
	BF	B	-T	4JMX	Yes	Yes		
CY	ABC	A	+U	VOLTAGE PINS J Ground K Minus 6 L Plus 6 M Minus 12 N Plus 30 (Special) Q Plus 6M R Minus 12M				
	DEP	P	+U					
JG	BC	TP9	+U					
	FG	TP8	+U					
	DE	TP2	+U					
JH	DEFG	C	+U					
	ABC	TP3	+U					

COMPONENT TESTING

Most defective components can be located by using an ohmmeter to check for an open or shorted condition. Be sure to consider parallel components when testing with an ohmmeter. An excellent method of determining the correct readings is to compare the readings of an identical, good card with those of the defective card.

The transistor is considered as a back-to-back diode. Check the forward and reverse resistance of each diode with an ohmmeter adjusted to X100 ohm scale. The forward-to-reverse resistance ratio should be 10. Emitter-to-collector resistance should be the same as the reverse resistance.

Test diodes with an ohmmeter in the same way transistors are tested.

MINIMUM INPUT VOLTAGES TO CONTROL TRANSISTORS

C, V and Z lines undefined

AND's and OR's

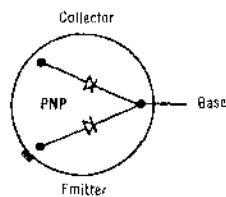
Plus N	0.4	Minus N	-0.4
Plus P	-5.6	Minus P	-6.4
Plus R	5.6	Minus R	0.2
Plus S	-0.2	Minus S	-5.6
Plus T	1.4	Minus T	-0.7
Plus U	-5.3	Minus U	-7.4
Plus Y	-0.6	Minus Y	-5.8

CW and IZ Triggers

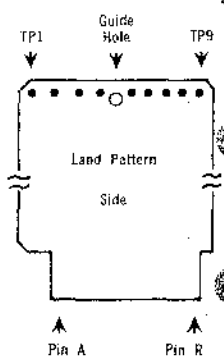
Plus T	1.4	Minus T	-0.7
Plus U	-0.5	Minus U	-7.4

AR and AS Triggers

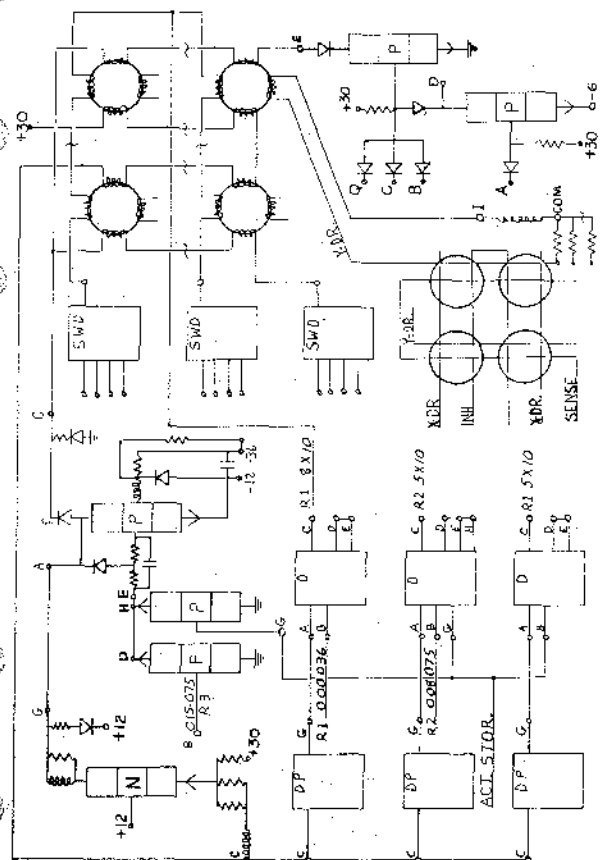
Plus S	-0.2	Minus S	-5.6
Set pulse 2.6 volt shift			

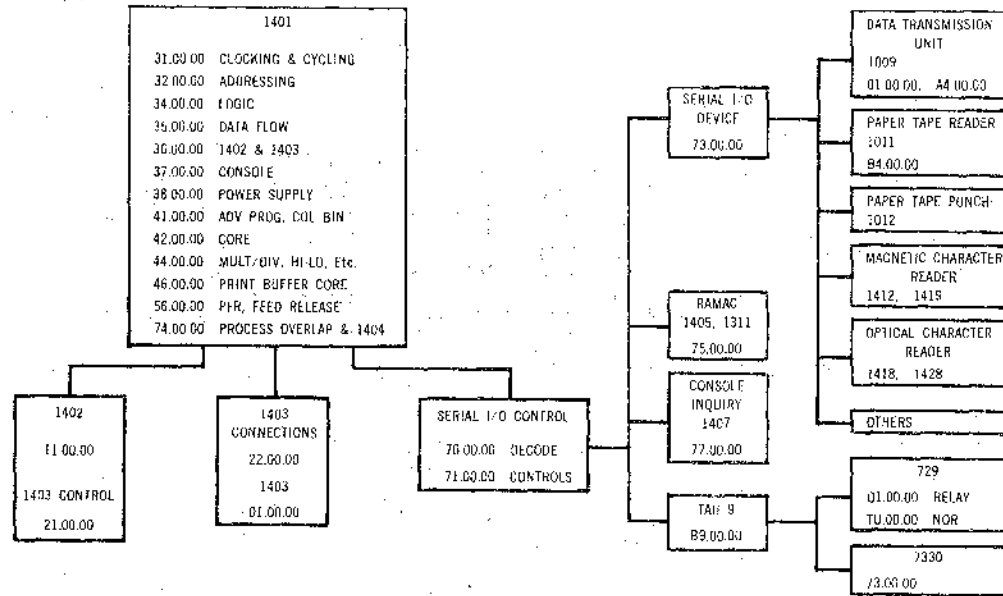


Transistor Connections



CORE-COMPOSITE



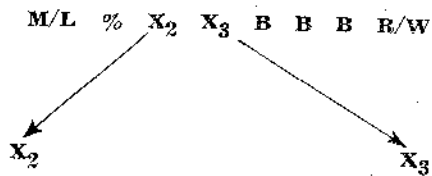


ALD DESIGNATION BY LOGIC FLOW

01A1 CACHE 42.00.00	01A2 CONSOLE 37.00.00	01A3 DATA FLOW 35.00.00	01A4 PR BUFFER 45.00.00	02A1 I/O CONTR 71.00.00 TAU CONTR 89.00.00	02A2 I/O DECODE 75.00.00 SER I/O 73.00.00	02A3 POWER SUPP 38.00.00	02A4 POWER SUPP 38.00.00
01B1 OP WEG 35.00.00 CARRIAGE 35.00.00 OPTIONS 41-58	01B2 CLOCKING & CYCLING 31.00.00	01B3 TIMI 31.00.00 LOGIC 34.00.00	01B4 READ PUNCH 36.00.00	02B1 OVERLAP 74.00.00	02B2 TAU (00XA) 89.00.00	02B3 TAU (00XB) 89.00.00	02B4 TAU (00XC) 89.00.00
01A5 CARRIAGE 46.00.00	01A6 PRINT 36.00.00	01A7 ADDRESSING 32.00.00	01A8 ADDRESSING 32.00.00 ADV DECODE 42.00.00	02A5 POWER SUPP 38.00.00	02A6 POWER SUPP 38.00.00	02A7 MULT DIV 44.00.00	02A8 MULT DIV 44.00.00
01B5 HAM'R BR 36.00.00	01B6 CIRCUIT 31.00.00 LOGIC 34.00.00 A & B etc. 35.00.00	01B7 RD PCH CTR 36.00.00 PFR 56.00.00	01B8 CABELLS	02B5 CABELLS	02B6 ADV PROG 41.00.00 COMP WORK 44.00.00	02B7 MULT DIV 44.00.00	02B8 1404 74.00.00

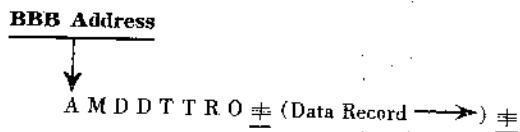
ALD DESIGNATION BY GATE LOCATION

I/O INSTRUCTION FORMAT



Char	Function	Char	Function
U	Even Parity Tape	1-6	Tape Unit 1-6
B	Odd Parity Tape		
C	Compressed Tape		
D	1009 - Tele-Processing®	1	
P	1011 - Paper Tape Reader	1	
S	1412 - Sorter Reader	1	
T	1401 - Console Inquiry	0	
F	1405 - RAMAC®	0	Seek
		1	Single Record
		2	Full Track
		3	Write Check
		4	Write Address

Data field format for RAMAC®



OPERATION OBJECTIVES

1 READ

- A. Energize the Read clutch
- B. Read card 9 edge first
 1. row by row (9, 8, 7, etc.)
 2. store in 80 row bit cores
- C. Keep track of digit time in A Reg.
 1. complement Add A Reg C-bit
 2. position 000 to store digit time
 3. 3 B cycles at 9 time (one cycle to clear 000)
 4. 2 B cycles 8-12 time
- D. Scan out row bit cores into 001-080 of storage
 1. between reading rows
 2. 80 B cycles
 3. inhibit A Reg if hole read
 4. combine with previous hole read in same column
- E. I/E change after 12 time
 1. all scans complete

2 PRINT (with print storage)

- A. Transfer
 1. transfer 1401 storage positions 201-332 to print storage positions 001-132
 2. I/E change
 - a. print transfer end
- B. Print
 1. option each hammer 48 times
 - a. once for each possible character
 2. 49 print scans
 - a. 48 to option hammers
 - b. 1 for error checking
 - c. each print scan contains 3 sub scans
 3. 144 sub scans to option hammers
 - a. each sub scan options 1/3 of the hammers
 - b. sub scan one starts with hammer one and options every 3rd hammer

- c. sub scan two starts with hammer two and options every 3rd hammer
- d. sub scan three starts with hammer three and options every 3rd hammer
- 4. print scan end on 49th scan
 - a. print scan 49
 - b. print storage address 132
- 5. automatic single space after print

3 PRINT-READ

- A. Print is executed first
- B. Read clutch energized after print scan 40

4 PUNCH

- A. Energize the punch clutch
- B. Keep track of digit time in A Reg
 - 1. 3 B cycles at 12 time (one cycle to clear 100)
 - 2. 2 B cycles 11-9 time
 - 3. force adder carry and B bit to A Reg for zone time only
 - 4. position 100 to store digit time
- C. Scan out storage positions 101-180 each digit time
 - 1. 80 B cycles
 - 2. fire punch magnets if punch decode
 - 3. 13 punch scans—12 for punching & 1 to finalize checking
- D. I/E change
 - 1. after 9 time
 - 2. last address (180)

5 READ-PUNCH

- A. Read and punch simultaneously
- B. The first one calling for a scan causes the other to wait until scan completed

6 PRINT-PUNCH

- A. Print is executed first
- B. Punch clutch energized after print scan 32

7 PRINT-READ-PUNCH

- A. Print is executed first
- B. Punch clutch energized after print scan 32
- C. Read clutch energized after print scan 40
 - 1. punch and read operations are executed simultaneously
 - 2. the first one calling for a scan causes the other to wait until scan completed

8 READ-RELEASE

- A. Immediate read clutch energization
- B. Release the 1401 for processing
- C. Read op must occur before 9 time (20 ms)

9 PUNCH RELEASE

- A. Immediate punch clutch energization
- B. Release the 1401 for processing
- C. Punch op must occur before 12 time (35 ms)

A ADD

- A. Analyze sign
 - 1. one A and B cycle
 - a. no modification
 - b. no adding
 - 2. analyze A & B Reg signs
 - a. determine if true or complement
 - b. if complement make B field sign standard
- B. True add
 - 1. 2nd B cycle (first add cycle)
 - a. transfer B Reg zone (sign)
 - 2. add A and B Registers (digits)
 - 3. B cycle -- B Reg wm
 - a. add zones for overflow
 - b. I/E change
- C. Complement add
 - 1. 2nd B cycle (first add cycle)
 - a. transfer B Reg zone (standard sign)
 - b. force a carry for units position
 - 2. complement Add A Reg to B Reg plus carry (digits)

3. B cycle — B Reg wm
 - a. no carry - recomplement
 - b. carry - I/E change

D. Recomplement

1. reverse scan
 - a. eliminate A cycles
 - b. modify plus one
 - c. scan for B-bit in B Reg (units position-sign)
2. 2nd forward scan
 - a. readdress each position reading into A Reg on the first cycle and force 82 C to storage
 - b. on second cycle read out the 82 C and complement add the A Reg
3. I/E change
 - a. B Reg wm

B BRANCH

A. B III

1. read out A star for next instruction unconditionally

B. B III d

1. read out A star for next instruction if d character condition met

C. B III BBB d

1. read out A star for next instruction if B character at B address is the same as the d character

C COMPARE

A. The A and B fields are compared bit by bit

1. B equal A (optional)
2. B unequal A (standard)
3. B greater than A (optional)
4. B less than A (optional)

B. If B field longer than A field, causes unequal and B less than A, regardless of data

D MOVE DIGIT

- A. One A and B cycle (one character I/E change)

- B. Move the digit of A field to B field
- C. Retain B field zone

E EDIT

- A. Control word must be loaded into B field prior to Edit op
- B. Merge A field into B field control word in place of zeros and blanks
- C. Cycling under control of control word

F FORM CONTROL

A. Four types of program operations.

1. space before print (immediate space)
 - a. d character includes B-bit only
2. space after print
 - a. d character includes A-bit only
3. skip before print (immediate skip)
 - a. d character includes no zones
4. skip after print
 - a. d character includes A-bit and B-bit

H STORE B STAR (Optional)

- A. Stores B star address into A field
 1. 3 A cycles (no B cycles)
 2. read B star address into A Reg and inhibit to storage

K STACKER SELECT

A. Read

1. card just read, selects according to d character
2. must be given within 10 ms after read operation completed
3. read error will override and card will feed into the NR pocket

B. Punch

1. card just punched selects according to d character
2. must be given prior to next punch instruction
3. punch error will override and card will feed into NP pocket

L LOAD

- A. Transfer entire A field into the B field including the wordmark
- B. B field wordmarks are ignored
- C. I/E change with A field wordmark

M MOVE

- A. Transfer the A field characters to the B field excluding the wordmark
- B. Wordmarks are retained in their respective fields
- C. I/E change with either A or B field wordmark

N NO OPERATION

- A. Activate execute eliminate
- B. Used to step over an area of storage and to retain continuity of the program

P MOVE RECORD (Optional)

- A. Similar to a move operation except a wordmark does not end operation
- B. Reverse scanned — modify plus one
- C. I/E change with A field record-mark or group-mark wordmark

Q STORE A STAR (Optional)

- A. One dummy cycle between Iop and II to transfer the A star to the B star
- B. Stores B star address into A field
 1. 3 A cycles (no B cycles)
 2. read B star address into A Reg and inhibit to storage

S SUBTRACT

- A. Same as add

U UNIT CONTROL

- A. The A address selects a particular unit which will perform the function denoted by the d character
- B. This instruction used with tape and serial I/O

V BRANCH — WORDMARK AND/OR ZONE

- A. Read out A star for next instruction if B field character meets the d character requirement

W BRANCH IF BIT EQUAL (Optional)

- A. Read out A star for next instruction if B field character contains any bit that the d character contains

X EXPAND COMPRESSED TAPE (Optional)

- A. Similar to a move operation in data transfer
- B. Zeros are inserted in numerical fields under control of the mode change and sign of numerical field
- C. I/E change with group-mark wordmark

Y MOVE ZONE

- A. One A and B cycle (one character I/E change)
- B. Move the zone of A field to B field
- C. Retain B field digit

Z MOVE ZERO SUPPRESS

- A. Forward scan
 1. same as a move operation except:
 - a. a wordmark is forced in units position
 - b. B field wordmarks are ignored
 - c. A field wordmark causes a reverse scan
- B. Reverse scan
 1. eliminate all wordmarks
 2. eliminate zeros to the left of first numeric digit
 3. I/E change with wordmark in units position

STOP

- A. Cause delta process to reset at the end of I phase
- B. Turn on indicator in stop switch

CLEAR WORDMARK

- A. One A and B cycle (one character I/E change)
- B. Remove wordmark from A and B addresses
- C. Retain data characters

/ CLEAR STORAGE

- A. Eliminate A cycles
- B. Inhibit C-bits only to storage
- C. I/E change with a borrow from hundreds position during modify

SET WORDMARK

- A. One A and B cycle (one character I/E change)
- B. Force a wordmark in A and B addresses
- C. Retain data characters

% DIVIDE (Optional)

A. Function

1. divide the dividend (low order of B field) by the divisor (A field) and develop the quotient in the high order of the B field
 - a. the dividend is reduced by once or twice the divisor
 - b. division starts with the high order position of the dividend
 - c. remainder is left in the low order of the B field

B. Rules

1. the length of the B field is equal to the number of digits in the divisor and dividend plus one
2. the A field must be defined with a wordmark
3. the dividend must have standard sign and zeros must be in high order of B field

4. the units of the quotient is the address of the units of the dividend, minus length of divisor minus one

MODIFY ADDRESS (Optional)

A. Gives the ability to add two addresses

B. Requires 3 A cycles and 3 or 5 B cycles

1. first cycle adds digits and zones. Any zone carry is lost but a digit carry is taken forward
2. second cycle adds digits only and takes any carry forward
3. third cycle adds digits and zones. Any digit carry is added to zone portion and any zone carry is added to units zone
4. fifth cycle (if zone carry) adds carry to units position. Any carry is lost

C. No wordmarks are required

@ MULTIPLY (Optional)

A. Function

1. the multiplicand (A field) is repetitively added to the B field under control of the multiplier (high order of B field)
 - a. the multiplier is reduced each time an addition takes place until it is reduced to zero

B. Rules

1. the length of the B field is equal to the number of digits in the multiplicand and multiplier, plus one
2. both fields must be defined with wordmarks

? ZERO AND ADD

A. The A field is transferred to the B field including wm

B. A standard sign is generated (algebraic sign control)

C. The high order positions are filled with zeros

D. B field data and wordmarks are cleared

E. I/E change with A field wordmark

I ZERO AND SUBTRACT

A. Same as zero and add

INDEXING (Optional)

A. No Op Code (Auto I Phase function)

B. Index register is added to A or B star

1. zone hits in address lens selects index reg
 - a. A or B star gates to A reg
 - b. index reg (storage) gates to B reg
 - c. adder gated to A or B star
2. 3 or 4 cycles taken after I₃ or I₆
 - a. 4th cycle if hundreds zone carry

TYPE ARRANGEMENT IDENTIFICATION

(STANDARD ARRANGEMENTS ONLY)

A single array is shown - blank blocks indicate character is same as "A" arrangement

STANDARD

	WV	UT	S/	@#	09	87	65	43	21	II	LI	HG	FE	DC	BA	*\$	-R	QP	ON	MI	KJ	%	+Z	YX
A, A2, A3			S &								/													
B, B2, B3			S 0																					
C, C2, C3											-													
D, D2, D3																								
E, E2, E3			S &	>#						<	-					*	/R							
F, F2, F3										.	+													
G, G2, G3										.	+													
H, H2, H3										.	+													
J, J2, J3										.	+													
K, K2, K3			@ =							Y	+													

- * Styles A - K are .093" (2,35 mm) high and have a flat top "3"
- x Styles A2 - K2 are .093" (2,35 mm) high and have a round top "3"
- + Styles A3 - K3 are .079" (2,0 mm) high

NOTE: Character height is measured from outside edge (example I $\frac{1}{1}$)

TYPE ARRANGEMENT	CHAIN PART NO.	STD. CARTRIDGE PART NO.	INTERCHANGEABLE CART. PART NO.	TYPE ARRANGEMENT	CHAIN PART NO.	STD. CARTRIDGE PART NO.	INTERCHANGEABLE CART. PART NO.
A	474245	474183	475356	G2	475236	475246	475372
B	474246	474184	475357	H2	475237	475247	475373
C	474247	474185	475358	J2	475238	475248	475374
D	474248	474186	475359	K2	475239	475249	475375
E	474249	474187	475360	A3	475591	475601	475611
F	474250	474188	475361	B3	475592	475602	475612
G	474251	474189	475362	C3	475593	475603	475613
H	474252	474190	475363	D3	475594	475604	475614
J	474253	474225	475364	E3	475595	475605	475615
K	474244	474135	475365	F3	475596	475606	475616
Above arrangements will be available by RSDP only							
A2	475230	475240	475366	G3	475597	475607	475617
B2	475231	475241	475367	H3	475598	475608	475618
C2	475232	475242	475368	J3	475599	475609	475619
D2	475233	475243	475369	K3	475600	475610	475620
E2	475234	475244	475370	Numeric .093"	475310	None	475332
F2	475235	475245	475371	Numeric .079"	475889	None	475890

GERMANY

STANDARD A	A2	A1	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	-R	QP	ON	ML	KJ	%,	†	Z	YX
GERMANY A	A2	A7					5																											

CHAIN U. CARTRIDGE
PART NUMBERS

TYPE ARRANGEMENT	CHAIN PART NO.	STD. CARTRIDGE PART NO.	INTERCHANGEABLE CART. PART NO.	TYPE ARRANGEMENT	CHAIN PART NO.	STD. CARTRIDGE PART NO.	INTERCHANGEABLE CART. PART NO.
A	750808	750809	756472	numeric .093"	4053792	none	4063793
A2	758331	758332	4063762				

NOTES

SMS Field Replacement Cards "most used" for 1401 System.

A group of pluggable CAP-CARD Assemblies has been provided for field replacement of SMS Cards with the fixed factory programmed cap. For the 1401 System the following "most used" Field Replacement Cards are important for your service.

With Field Replacement Card the following SMS Cards may be replaced

P/N	P/N	Description
370975	371251	COMW
	371261	CGFW
	371262	COVY
	371263	CG--
370976	371252	CHW
	371264	CHVW
	371265	CHVV
	371266	CH--
370977	371071	CHXC
	371253	CHVW
	371267	CHVU
	371268	CHWF
370978	371072	CHXC
	371254	CHVW
	371269	CHVU
	371270	CHWF
370979	371073	CHVW
	371074	CHVS
	371075	CHVU
	371255	CHVQ
370980	371274	CHVW
	371275	CHVZ
	371276	CH--
	371277	CHVQ
370981	371271	COZY
	371272	COZT
	371273	CO--
	371278	COYG
370983	371580	JCMW
	371581	JGVW
	371582	JGVV
	371583	JG--

For further information see 1401 CEM 29 (77) and the instructions given in the Cap Instructions, which must be available at every installation. (The cap kit B/M 431 271 must be ordered by your local BO from your Parts Distribution Center, e. g. within Germany from Zentrallager Frankfurt).

NOTES

Lined area for notes with horizontal lines and binder holes on the right side.

TECHN. RUNDSCHREIBEN NR. 14/62

Betr.: Abkürzungen in den Schaltbildern - Type 1401

BASIC 1401

Optional Features

Card Feed - 1404	CF	Kartenzufuhr - 1404
Card Fd Comp	CFC	Kartenzuführungsvergleichseinrichtung (1404)
Column Binary	CH	Dualkartenverarbeitung
Bit Test	BT	Bit Test (W-Operation)
Compressed Tape	CW	Verdichtetes Band
Dual Hopper	DH	Doppeltes Magazin (1404)
Dual Speed Carr.	DS	2 Geschwindigkeiten-Vorschub
Expand. Print Edit	EE	Erweiterte Druckaufbereitung
51 Column Feed	FCF	Kartenzuführung für 51-spaltige Karten
Read Punch Release	FP	Abfühler/Stanzerfreigabe
Hi-Lo-Eq-Comp	HL	Vergleich hoch, niedrig, gleich
Indexing	IN	Indexing
Move Record	MR	Übertragen Bereich
Input/Output	IO	Eingabe/Ausgabe
Multiply/Divide	MD	Multiplikation/Division
Numeric Print Ctl.	NU	Numerisches Drucken
No Numeric Print Ctl.	NNU	Normales Drucken
No Print Storage	NPF	Ohne Druckspeicher
Print Storage	PF	Druckspeicher
Punch Feed Read	RP	Stanzen in gleiche Karte
Sense Switches	SS	Umschalter
Sterling Basic	SBA	Sterling Einrichtung
Sterling Exp. Edit	SEE	Sterling erweiterte Druckaufber.
Sterling M/D	SMD	Sterling Multi-Divi
1,4K Storage	1M	1400 Kernspeicherstellen
2 K Storage	2M	2000 Kernspeicherstellen
4 K Storage	4M	4000 Kernspeicherstellen
8 K Storage	8M	8000 Kernspeicherstellen
12 K Storage	12M	12000 Kernspeicherstellen
16 K Storage	16M	16000 Kernspeicherstellen
Advanced Program	APF	Zusätzliche Programmhilfe

100 Print Positions	100	100 Schreibstellen
Add Print Ctl.	132	132 Schreibstellen

Attachments

Attachment Circuitry	CM
Magnetic Tape Adapter	MT
Paper Tape Adapter	PT
Inquiry Station	INQ
Buffered Inquiry Station	BINQ
Low Speed Tape	LST
Disc Storage	RAM
Overlap-Basic	OV
Overlap-R/P	OVR
Overlap-Tape	OVT
Overlap-Punch Feed Read	OVRP
Drums	DR
Input/Output	IOA
Input/Output Common	IOC
1210 Bank Sorter Reader	BSR
1252 Small Document Read	BSR
Data Transmission	BSR
Kimball Tag Reader	BSR
Sage	BSR
Communications (multiplex)	BSR
Multiplexing	MX

Perman

Wimmer

IBM
FRANCE

ORDINATEUR 1401 - TABLEAU DES CODES

Car.	Instruct.	Code Machine				Code Carte	Car.	Instruct.	Code Machine				Code Carte	Car.	Instruct.	Code Machine				Code Carte							
		C	B	A	4 2 1				C	B	A	4 2 1				C	B	A	4 2 1		C	B	A	4 2 1			
+		C	B	A		12	-		B				11	0		C				0	0		C				0
δ	ZA	C	B	A	B	12-0	δ	ZS	C	B	A	B	11-0	/	CS	C	B	A	B	0-1	1	R					1-1
A	A	B	A			12-1	J		C	B			11-1	S	S	C	B	A		0-2	2	W					2-2
B	B	B	A			12-2	K	SS	C	B			11-2	T		C	B	A		0-3	3	WR	C				2-3
C	C	C	B	A		12-3	L	LCA	C	B			11-3	U	CU	C	B	A		0-4	4	P					4-4
D	MN	B	A			12-4	M	MCW	C	B			11-4	V	BWZ	C	B	A		0-5	5	RP	C				4-5
E	MCE	C	B	A		12-5	N	NOP	C	B			11-5	W	BBE	C	B	A		0-6	6	WP	C				4-6
F	CC	C	B	A		12-6	O		C	B			11-6	X	MIZ	C	B	A		0-7	7	WRP					4-7
G		B	A			12-7	P	MCM	C	B			11-7	Y	MZ	C	B	A		0-8	8	SRP					5-8
H	SBR	B	A			12-8	Q	SAR	C	B			11-8	Z	MCS	C	B	A		0-9	9	SPF	C				5-9
I		C	B	A		12-9	R		C	B			11-9	#		C	B	A		0-2-B	#	MA					3-8
* H		B	A			12-3-8	N		C	B			11-3-8	%	SW	C	B	A		0-3-8	01	M	C				4-8
II) CW		C	B	A		12-4-8	*		C	B			11-4-8	%	D	C	B	A		0-4-8							5-8
						12-5-8							11-5-8							0-5-8							6-8
						12-6-8							11-6-8							0-6-8							7-8
*		C	B	A		12-7-8	Δ		C	B			11-7-8							0-7-8	Blanc	C					

SÉQUENCE DES CARACTÈRES

Blanc . H a N * - / , % # © δ A a l 5 J a R + s a z 0 a 9
) + S

IBM 144998

Instruction B (I) d — Transfert si d :		IBM 1401 INSTRUCTIONS		Instructions de MOUVEM et CHARGEMENT	
b) Inconditionnel	2δ	Erreur Lecture	si Inter.	BANDES	
9 Canal 9	1δ	Erreur Perfo.	arrêt clié	L(%U#)(B)R	Charg. Lecture
0 Canal 12	#	Erreur Impr.	E/S est H.F.	L(%U#)(B)W	Charg. Ecriture
A Dernière carte	Q	Demande Interrogation		M(%U#)(B)R	Mouv. Lecture
B Invers. manuel B	R	Saut papier occupé	d SAUT IMMÉDIAT AU	M(%U#)(B)W	Mouv. Ecriture
C Invers. manuel C	/	Comparaison B * A	1 Canal 1	M(%C#)(B)R	Lecture
D Invers. manuel D	S	Comparaison B = A	2 Canal 2		Rehde condensée
E Invers. manuel E	T	Comparaison B < A	3 Canal 3	P(A)(B)	Mouv. Enreg.
F Invers. manuel F	U	Comparaison B > A	4 Canal 4		jusqu'à # ou #
G Invers. manuel G	V	Err. Lect. Ecrit. (Disques)	5 Canal 5	X(A)(B)	Mouv. avec
K Fin de bande	W	Err. Long. Enreg. (Disques)	6 Canal 6		inscrip. de zéros
L Erreur bande	X	Comp. adr. inég. (Disques)	7 Canal 7	G Canal 7	
N Accès impossible (Disques)	Y	Err. quelconque (Disques)	8 Canal 8	H Canal 8	* Numéro Unité de bande
P Impriments occupés	Z	Dépas. capacité arithm.	9 Canal 9	I Canal 9	Instruction U (%U#) d
* Effacement d'interrogation	%	Contrôle programme	0 Canal 10	2δ Canal 10	d Caractère de contrôle
			# Canal 11	. Canal 11	B Espacement arrière
			0 Canal 12	II Canal 12	E Saut avant avec effacem.
					M Pose d'une marque bande
1 Marque de mot	3	M. Mot ou non Hors-texte	4 ESPACEMENT IMMÉDIAT	g ESPAC. SUPPL. APRÈS IMPR.	R Rebobinage
2 Pos de hors-texte	C	M. Mot et/ou Hors-texte 12	J 1 Espacement	/ Pas d'espacement	U Rebobinage et décharg.
B Hors-texte 12 (A et B)	L	M. Mot et/ou Hors-texte 11	K 2 Espacements	S 1 Espacement	
K Hors-texte 11 (B seul)	T	M. Mot et/ou Hors-texte 0	L 3 Espacements	T 2 Espacements	
S Hors-texte 0 (A seul)					

IBM 144998

Instruction B (1) d — Transfert si d		IBM 1401 INSTRUCTIONS				Instructions de MOUVEM et CHARGEMENT						
		Saut de papier F d				BANDES		DISQUES				
b	Inconditionnel	28	Erreur Lecture	si Inter	d	SAUT IMMEDIAT AU	d	SAUT APRES IMPR. AU	M(%FO)(B)	Recherche disque		
9	Canal 9	16	Erreur Parfo	arrêcté	1	Canal 1	A	Canal 1	L(%U#)(B)R	Charg. Lecture		
0	Canal 12	*	Erreur Impr.	E/S est H/E	2	Canal 2	B	Canal 2	L(%U#)(B)W	Charg. Ecriture		
A	Dernière carte	Q	Demande Interrogation		3	Canal 3	C	Canal 3	M(%U#)(B)R	Mouv. Lecture		
B	Invers. manuel B	R	Saut papier accoupe		4	Canal 4	D	Canal 4	M(%U#)(B)W	Mouv. Ecriture		
C	Invers. manuel C	S	Comparaison B > A		5	Canal 5	E	Canal 5	M(%C#)(B)R	Lecture		
D	Invers. manuel D	T	Comparaison B < A		6	Canal 6	F	Canal 6	M(%U#)(B)W	Mouv. Ecriture		
E	Invers. manuel E	U	Comparaison B > A		7	Canal 7	G	Canal 7	M(%F#)(B)	Contrôle Ecriture		
F	Invers. manuel F	V	Err. Lact. Ecrit. (Disques)		8	Canal 8	H	Canal 8	M(%F#)(B)R	Lecture avec MM		
G	Invers. manuel G	W	Err. Long. Enreg. (Disques)		9	Canal 9	I	Canal 9	L(%F#)(B)W	Ecrit. avec M.M.		
K	Fin de bande	X	Comp. adr. Inég. (Disques)		0	Canal 10	J	Canal 10	P(A)(B)	Mouv. Enreg. # peut-être 1 ou 2 jusqu'à # ou #		
N	Accès impossible (Disques)	Y	Err. quelconque (Disques)		1	Canal 11	K	Canal 11	X(A)(B)	Mouv. avec insertion de zéros		
P	Imprimante occupée	Z	Dépass. capacité arithmèr.		2	Canal 12	L	Canal 12	#	Numéro Unité de bande		
K	Effacement d'interrogation	%	Contrôle programme		3	Canal 1	M	Canal 1				
Instruction V (1) (B) d — Transfert si d										Instruction U (%U#) d		
1	Marque de mot.	3	M.Mot. ou non. Hors-texte		d	ESPACEMENT IMMEDIAT	d	ESPAC. SUPPL. APRES IMPR.	R	Rebobinage	d	Caractères de contrôle.
2	Phé de hors-texte	0	M.Mot. et/ou Hors-texte	12	J	1 Espacement	/	Pas d'espacement	R	Rebobinage	B	Espacement arrière
B	Hors-texte 12 (A et B)	1	M.Mot. et/ou Hors-texte	11	K	2 Espacements	S	1 Espacement	U	Rebobinage et décharg.	E	Saut avant avec effacem.
K	Hors-texte 11 (B saut)	1	M.Mot. et/ou Hors-texte	0	L	3 Espacements	T	2 Espacements			M	Posé d'une marque bande
S	Hors-texte 0 (A saut)	1	M.Mot. et/ou Hors-texte	0								

IBM FRANCE

ORDINATEUR 1401 - TABLEAU DES CODES

Car.	Instruct.	Code Machine C B A 8 4 2 1	Code Carte	Car.	Instruct.	Code Machine C B A 8 4 2 1	Code Carte	Car.	Instruct.	Code Machine C B A 8 4 2 1	Code Carte	Car.	Instruct.	Code Machine C B A 8 4 2 1	Code Carte			
B	F	C B A	12	B	11	C B	2	D	0	G	B	2	O	1				
1	ZA	C B A 8	12-0	2	S	B 8	2	H-D	0	S	C A	1	0-1	J	R			
A	A	B A	12-1	J	S	C B	1	11-1	S	S	G A	2	0-2	2	W			
B	B	B A	12-2	K	SS	C B	2	11-2	T		A	2-1	0-3	3	WR			
C	C	C B A	12-3	L	CA	B	2	11-3	U	CU	C A	4	0-4	4	P			
D	MN	B A	12-4	M	MCW	C B	4	11-4	V	BWZ	A	4	1	0-5	5	EP		
E	NCE	C B A	12-5	N	HOP	B	4	11-5	W	BBE	A	4	2	0-6	6	WF		
F	OD	C B A	12-6	O		B	4	2	11-6	X	MZ	C A	4	2	1	0-7	7	WRP
G		B A	12-7	P	MCM	C B	4	2	11-7	Y	MZ	C A	8	0-8	8	SRF		
H	SBR	B A B	12-8	Q	SAR	C B	8	11-8	Z	MCS	A B	1	0-9	9	SPF			
I		C B A B	12-9	R		B	8	11-9			A B	2	0-2-8	A	MA			
J		B A B	12-3-8	N		C B	8	2	11-3-8		S	A B	2	1	0-3-8	3	M	
K	QW	C B A 8 4	12-4-8	X		B	8 4	11-4-8	%	D	A 8 4	1	0-4-8					
			12-5-8					11-5-8					0-5-8					
			12-6-8					11-6-8					0-6-8					
			12-7-8					11-7-8					0-7-8	Blanc	C			

SEQUENCE DES CARACTERES

Blanc H B N * - / , ' * C 5 A 0 1 8 J & R 1 3 2 0 0 9

IBM FRANCE

ENTSCHESSSELN VON IBM 1401- 1440- 1460- MASCHINENADRESSEN

IBM DEUTSCHLAND 651 026 68941 - 0

IBM Form 71857

Erste bzw. mittlere Stelle				Ziffer	Letzte Stelle			
?	I	#	0	0	0	#	I	?
A	J	V	1	1	1	/	J	A
B	K	S	2	2	2	S	K	B
C	L	T	3	3	3	T	L	C
D	M	U	4	4	4	U	M	D
E	N	W	5	5	5	W	N	E
F	O	X	6	6	6	X	O	F
G	P	Y	7	7	7	Y	P	G
H	Q	Z	8	8	8	Z	Q	H
I	R		9	9	9		R	I
			-	-	-			
	X1				1			12
	X2				2			13
	X3				3			14
								15

- Entschlüsseln von Maschinenadressen („echte“ Adressen) in rein numerische Adressen.
1. Erste bzw. mittlere Stelle der echten Adresse im Feld A aufsuchen.
 2. Auf der gleichen Zeile steht im Feld B die Ziffer, die der HUNDERTER- bzw. ZEHNER- Stelle der numerischen Adresse entspricht.
 3. Letzte Stelle im Feld C aufsuchen.
 4. Auf der gleichen Zeile steht im Feld E die Ziffer, die der EINER- Stelle der numerischen Adresse entspricht.
 5. TAUSENDER- Stelle im Feld E ablesen, und zwar im Schnittpunkt der Spalten aus erster und letzter Stelle der echten Adresse (Feld A + C).
 6. INDEXREGISTER: Im Feld A mittlere Stelle der echten Adresse aufsuchen. In entsprechender Spalte des Feldes D kann das Indexregister abgelesen werden.
- Beispiel: Maschinenadresse: IBM
 -----> Zeile; -----> Spalte
-

VORSCHLÜSSELN IN IBM 1401- 1440- 1460- MASCHINENADRESSEN

IBM DEUTSCHLAND 651 026 68941 - 0, R6

IBM Form 71857

Hunderter bzw. Zehner St.				Ziffer	Einerstelle			
?	I	#	0	0	0	#	I	?
A	J	V	1	1	1	/	J	A
B	K	S	2	2	2	S	K	B
C	L	T	3	3	3	T	L	C
D	M	U	4	4	4	U	M	D
E	N	W	5	5	5	W	N	E
F	O	X	6	6	6	X	O	F
G	P	Y	7	7	7	Y	P	G
H	Q	Z	8	8	8	Z	Q	H
I	R		9	9	9		R	I
			-	-	-			
	X1				1			12
	X2				2			13
	X3				3			14
								15

- Verschlüsseln von numerischen in echte (Maschinen-) Adressen
1. TAUSENDER- STELLE (N) der zu verschlüsselnden Adresse im Feld E aufsuchen.
 2. HUNDERTER- STELLE in Zeile des Feldes B aufsuchen.
 3. Auf der gleichen Zeile ergibt sich im Feld A das Zeichen, das der Hunderter- Stelle der echten Adresse entspricht, und zwar im Schnittpunkt der Spalte aus Feld E mit der Zeile des Feldes B.
 4. EINER- STELLE in Zeile des Feldes B aufsuchen.
 5. Auf der gleichen Zeile ergibt sich im Feld C das Zeichen, das der letzten Stelle der echten Adresse entspricht, und zwar im Schnittpunkt der Spalte des Feldes E mit Zeile des Feldes B.
 6. INDEXREGISTER: Zehner- Stelle der numerischen Adresse im Feld B aufsuchen. Auf der gleichen Zeile ergibt sich im Feld A das mittlere Zeichen der echten Adresse, und zwar im Schnittpunkt dieser Zeile mit der Spalte des Feldes D (X1, X2 oder X3).
- Beispiel: Numerische Adresse: 3 4 2 1 + X1
 -----> Zeile; -----> Spalte
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