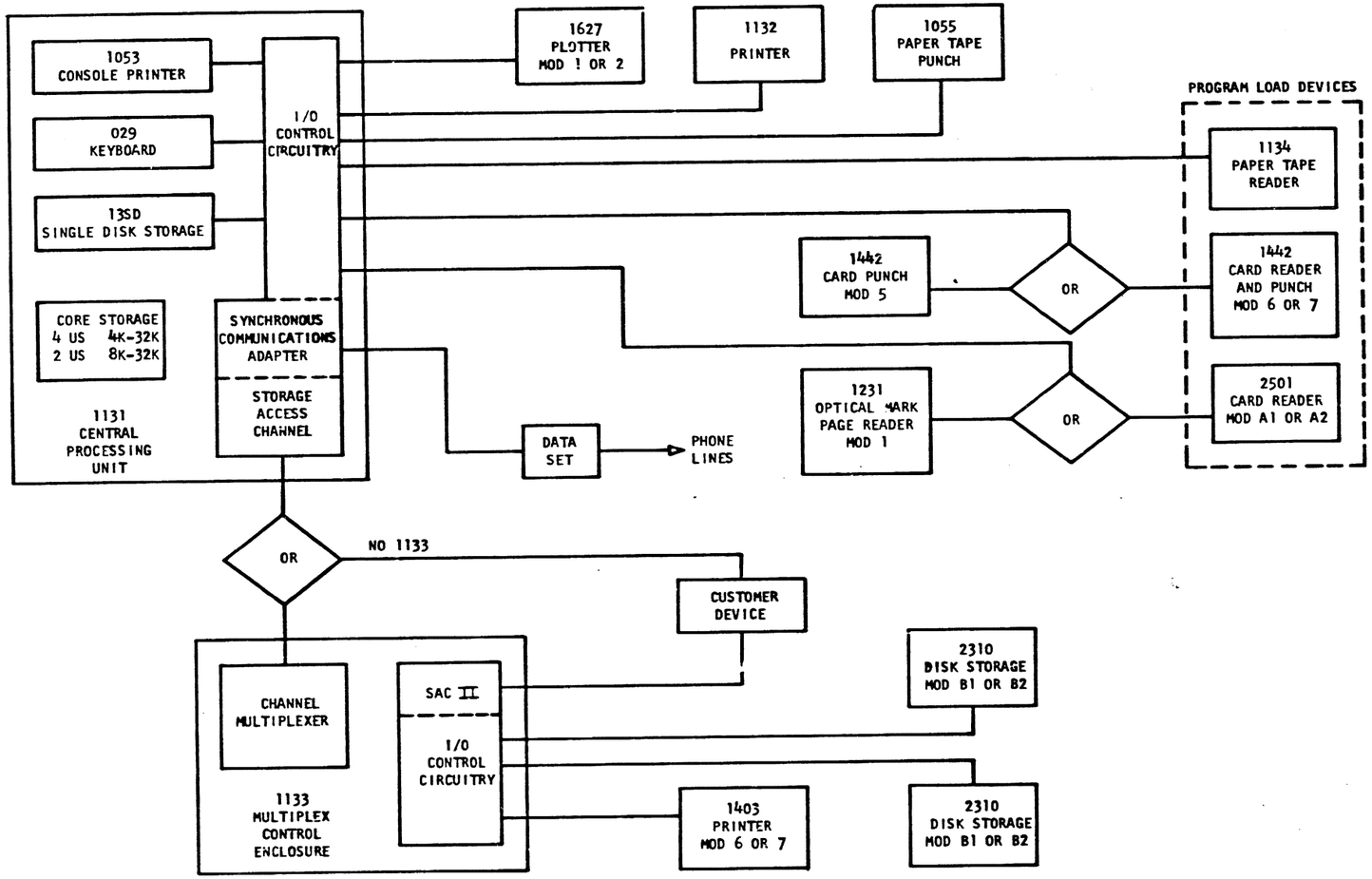


DATE	EC NUMBER	DATE	EC NUMBER
MAY 65	4154800		
OCT 65	415483A		
22APR68	419675		

RED

1130 SYSTEM CONFIGURATOR

DATE	APR 68	P/N	2201354
		TYPE	1130

IBM AA011

DATE	EC NUMBER	DATE	EC NUMBER		
22APR68	419675				
OCT 65	415483A				
9-13-65	415480D				

1130 SYSTEM DATA FLOW				
	DATE	4-19-65	P/N	2201356
			TYPE	1131
IBM				AA101

CONSOLE
SAC
SCA
1231
2501
029/1053 KEYBOARD/ PRINTER
1442 CARD READ/PUNCH
SINGLE DISK STORAGE
1132 PRINTER
1134/1055 PAPER TAPE READ/PUNCH
1627 PLOTTER

I/O OUTPUT BUSS
I/O INPUT BUSS

OP (4, 0)
FLAG (5, 5)
PARITY (P2, P1)

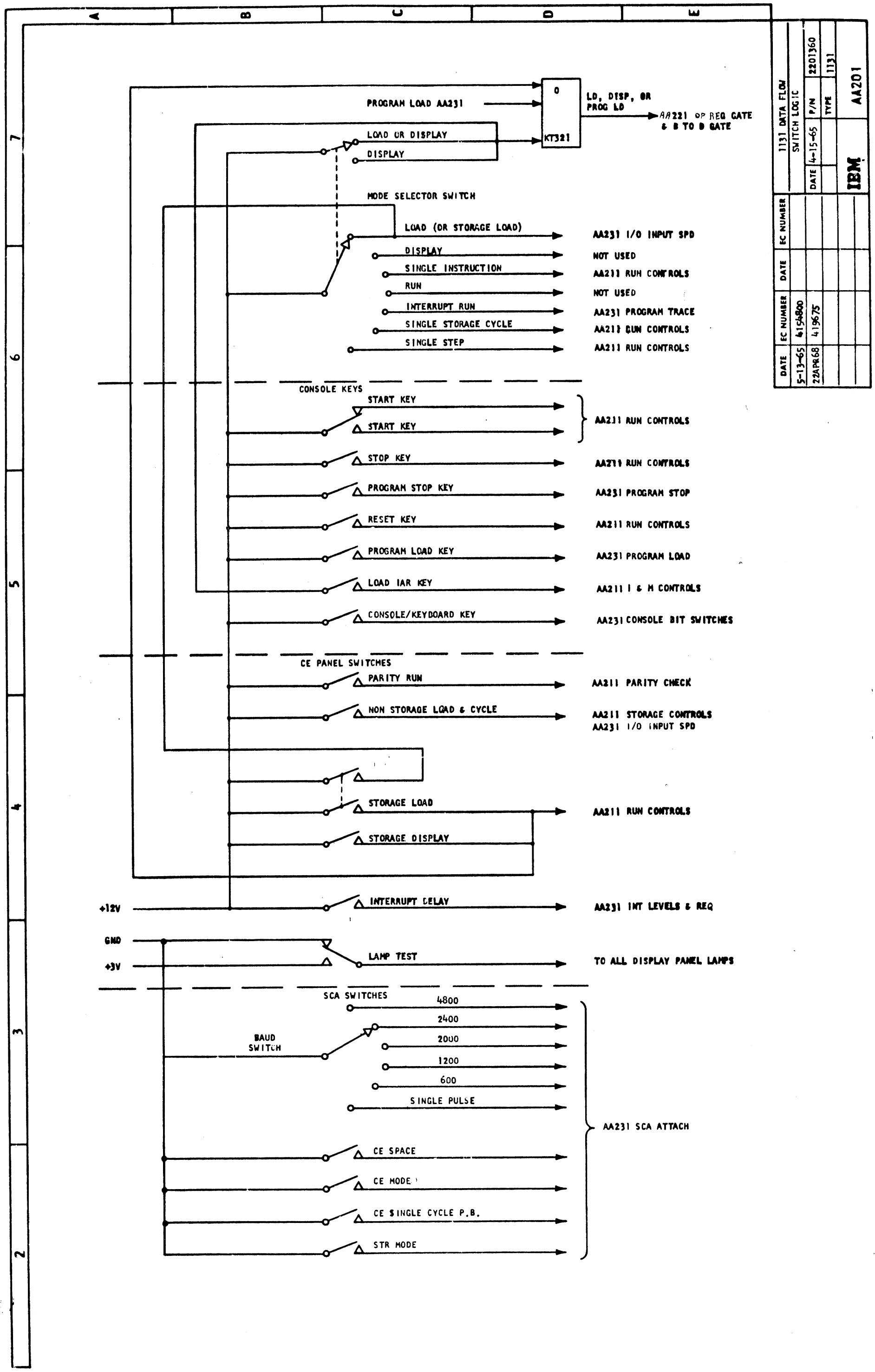
TEMPORARY ACCUMULATOR (U REG) U15, U0
ACCUMULATOR (A REG) A15, A0
ARITHMETIC FACTOR (D REG) D15, D0
STORAGE BUFFER (B REG) B15, B0

CARRY/ OVERFLO
ACCUMULATOR EXTENSION (Q REG) Q15, Q0
CYCLE CONTROL COUNTER (15, 10)
MODIFIER (9, 8)
TAG (7, 6)
INSTRUCTION ADDRESS (I REG) I-15, I-0
STORAGE ADDRESS (M REG) M15
M1 (32K) M2 (16K) M3 (8K)

ADDR DECODE

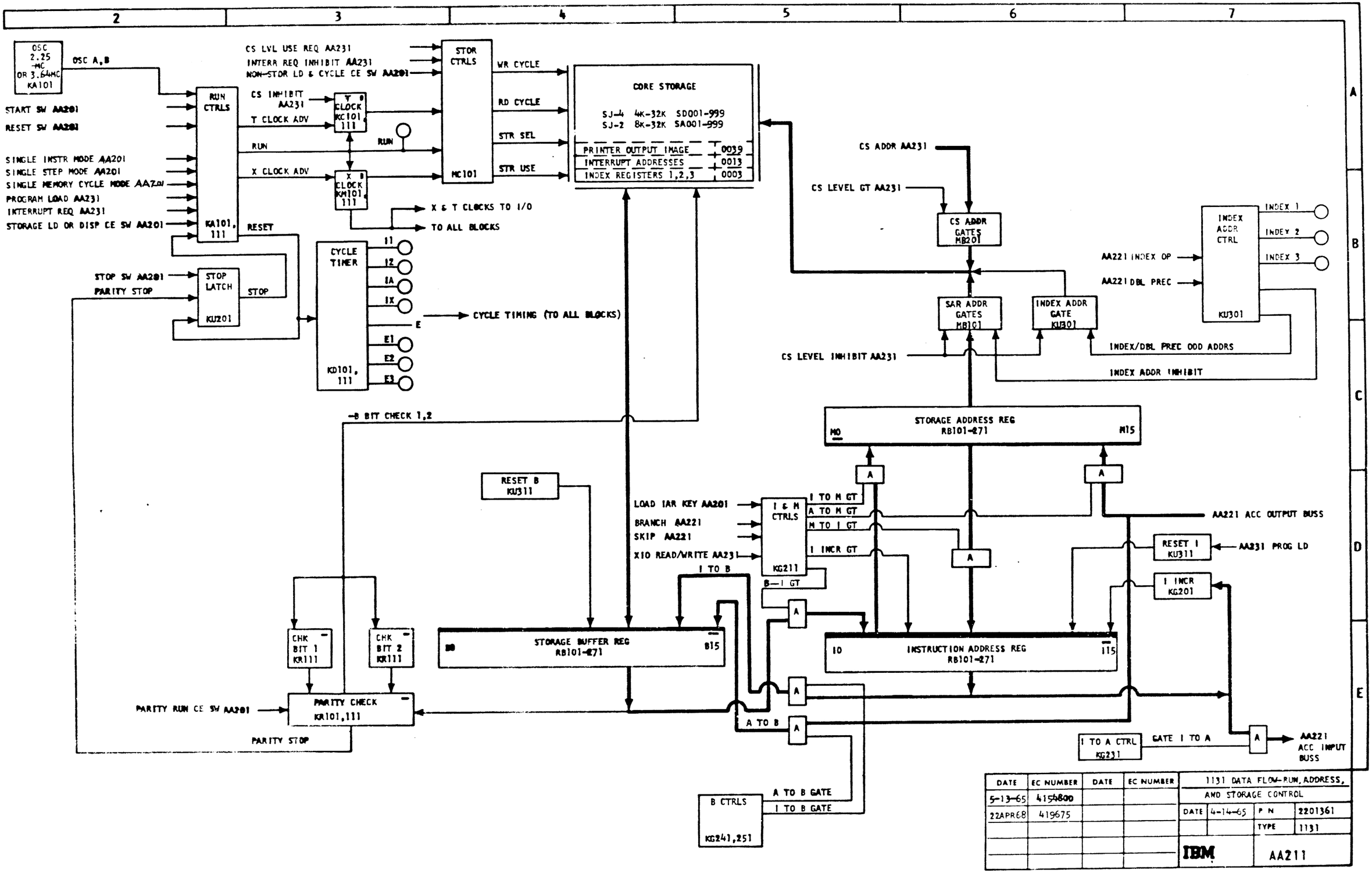
CORE STORAGE
4US: 4K-32K
2US: 8K-32K

RESERVED FOR
PRINT OUTPUT IMAGE 0039
INTERRUPT ADDRESSES 0013
INDEX REGISTER 1,2,3 0003
CORE ADDR



DATE	EC NUMBER	DATE	EC NUMBER
5-13-65	4154800		
22APR68	419675		

1131 DATA FLOW
SWITCH LOGIC
DATE 4-15-65
P/N 2201360
TYPE 1131
IBM
AA201



DATE	EC NUMBER	DATE	EC NUMBER
~~5-13-65~~	~~415800~~		
22APR68	419675		

1131 DATA FLOW-RUN, ADDRESS, AND STORAGE CONTROL

DATE	4-14-65	P N	2201361
		TYPE	1131

IBM AA211

AA221

STORAGE BUFFER REG RB101-271 (B0 – E15)

ACC INPUT BUSS AA211

LOAD/DISP/PROG LD INHIBIT AA201

GATE OP REC KD101 — GATE B0-9 TO OP REG, FLAG, TAG, MOD

BE

GATE B TO D KG231 — GATE B TO D0-7, 8-15; DC SET D0-7

GATE B10-B15 TO CCC

CCC GATE KT301 — SLC OP

GATE CCC TO A

DECR

SET 1,16,18

RESET CCC

CCC CTRL KG221 — SHIFT CTRL

OP REG RN101 (0 – 4)

FLAG RN101 (5)

ARITHMETIC FACTOR REG RD101-171 (D0 – D15)

TAG RN101 (6 – 7)

MODIF RN111 (8 – 9)

CCC32 CYCLE CTRL RS101-121 (CCC 1)

CCC TO A10-A15

RESET OP REG KU311

TG OP DECODES

OP DECODES

WAIT

OP DECODES (TO ALL BLOCKS)

TAG MODIFIER

DN101 — RESET D SP

(ADD, SUB, EOR, OR, AND) D TO A GATES

DN111 — X10 OP DECODES → AA231 TO I/O

X10 OP DN201 — X10 TIME GATES → AA231 TO I/O

ARITHMETIC CONTROL

ARITH CTRL ADD/SUB

ADD GATE

SUB GATE

ARITH SIGN

OVFL GATE

ADD

KT101,111 121,201 — A15,D15 — SHIFT LEFT OR DBL PRECESION CARRY ENTRY

MULT KT101,121 — SHIFT CTRL

DIVIDE — ZERO REM — D15 — QUOTIENT CORRECT SET

QUOTIENT LOAD Q15

KT101,131 — DIVIDE OVFL

ADD GATE

SUB GATE

A0 — D14 — D15

OVFL GATE

DIVIDE OVFL

CARRY OVFL CTRL — KS101,111

TEMP CARRY

DBL PREC CARRY

OVFL

CARRY

STORE STATUS

BRANCH & SKIP CTRLS — KB101,111 KS111

AA211 BRANCH 1

AA211 BRANCH 2

AA211 SKIP

BRANCH OUT RESET X10 INTERRUPT LEVELS → AA231 TO INTERRUPT

TEMPORARY ACCUMULATOR RA101-271 (U0 – U15)

ACCUMULATOR RA101-271 (A0 – A15)

SHIFT

ACCUMULATOR EXTENSION RQ101-171 (Q0 – Q15)

QUOTIENT LOAD Q15

RESET 1 KA111

A TO U SPL

U TO A SPL — J & A CTRL KG231

AA211 ACC OUTPUT BUSS

RESET A KU311

A0 SHIFT RT/MULT SIGN ENTRY

EXCHANGE A & Q

SHIFT CTRLS — KT301,311

SHIFT RT A, SHIFT LEFT A

SHIFT RT Q, SHIFT LEFT Q

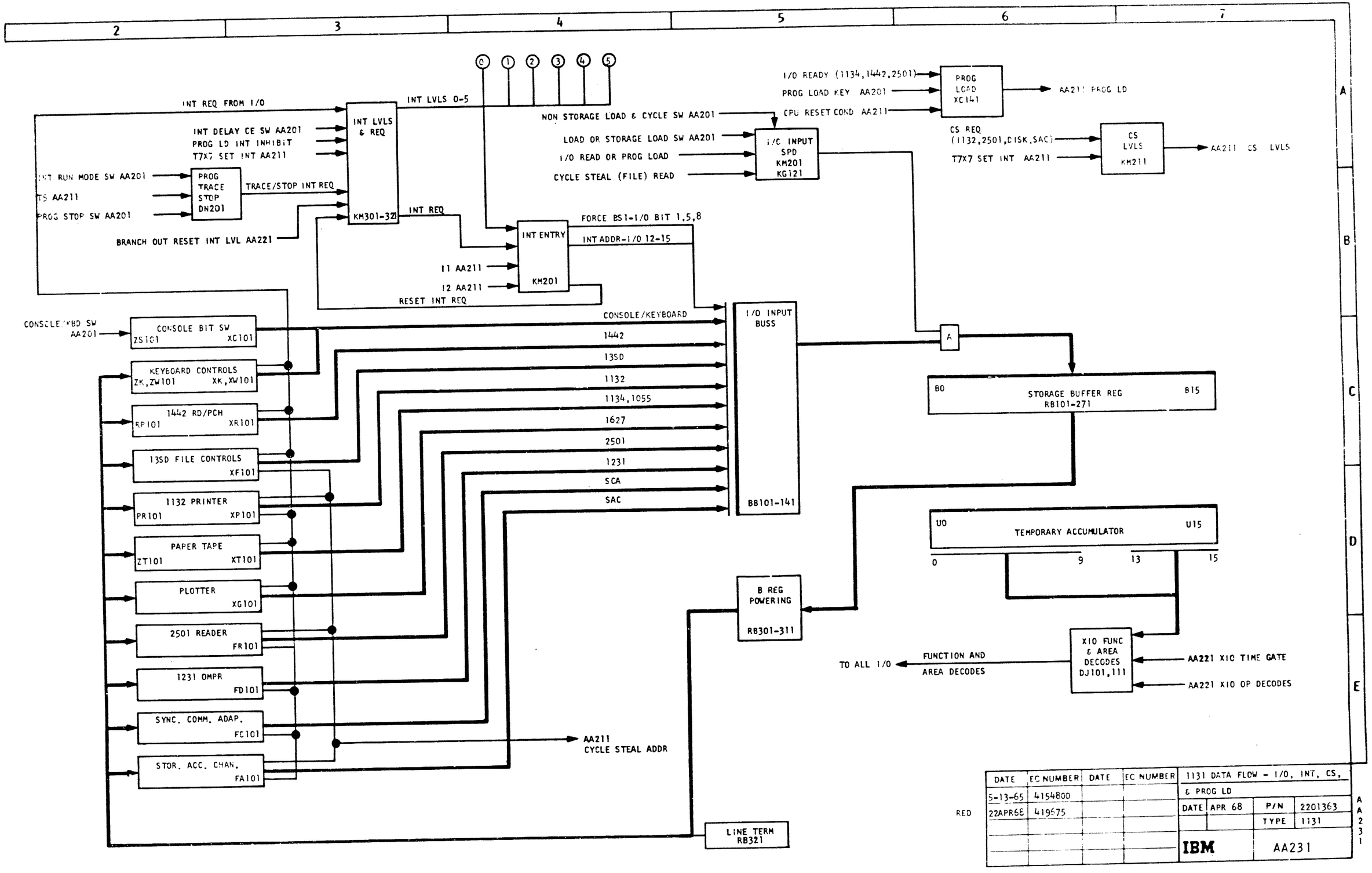
DATE	EC NUMBER	DATE	EC NUMBER
5-13-65	4154800		

1131 DATA FLOW-ARITHMETIC, SHIFT, & BRANCH CONTROLS

DATE 4-14-65 | P/N 2201362 | TYPE 1131

IBM AA221

AA221



DATE	EC NUMBER	DATE	EC NUMBER
5-13-65	4154800		
22APR68	419675		

RED

1131 DATA FLOW - I/O, INT, CS, & PROG LD

DATE	APR 68	P/N	2201363
		TYPE	1131

IBM AA231

AA231

1131 INSTRUCTION CYCLE PATTERNS

CODE	INSTRUCTIONS	I1	I2	IX	IA	E1	E2	E3
0 0 1 1 0 } 0 0 0 0 0 }	WAIT NOTE (1) (4)	YES (2)	NO	NO	NO	NO	NO	NO
0 0 0 0 1	EXEC I/O	YES	F=1	T ≠ 0	F=1 IA=1	YES	YES	R/W
0 0 0 1 0	SHIFT LEFT (1)	YES (2)	NO	T ≠ 0	NO	SLC AO=1	NO	NO
0 0 0 1 1	SHIFT RIGHT (1)	YES (2)	NO	T ≠ 0	NO	NO	NO	NO
0 0 1 0 0	LOAD STATUS (1)	YES (2)	NO	NO	NO	NO	NO	NO
0 0 1 0 1	STORE STATUS	YES	F=1	T ≠ 0	F=1 IA=1	YES	NO	NO
0 1 0 0 0	BRANCH & STORE IAR	YES (2)	F=1 BR	T ≠ 00 BR	F=1 IA=1 BR	BR	NO	NO
0 1 0 0 1	BRANCH/SKIP CONDITIONAL	YES (2) (3)	F=1 BR	T ≠ 00 BR	F=1 IA=1 BR	NO	NO	NO
0 1 1 0 0	LOAD INDEX	YES (3)	F=1	NO	F=1 IA=1	T ≠ 00	NO	NO
0 1 1 0 1	STORE INDEX	YES	F=1	NO	F=1 IA=1	YES	T ≠ 00	NO
0 1 1 1 0	MODIFY INDEX T=00/T≠00	YES (3)	F=1	NO	F=1/F=1 IA=1	F=1/YES	F=1/YES	NO
1 0 0 0 0	ADD	YES	F=1	T ≠ 0	F=1 IA=1	YES	NO	NO
1 0 0 0 1	ADD DOUBLE	YES	F=1	T ≠ 0	F=1 IA=1	YES	YES	NO
1 0 0 1 0	SUB	YES	F=1	T ≠ 0	F=1 IA=1	YES	NO	NO
1 0 0 1 1	SUB DOUBLE	YES	F=1	T ≠ 0	F=1 IA=1	YES	YES	NO
1 0 1 0 0	MULTIPLY	YES	F=1	T ≠ 0	F=1 IA=1	YES	YES	NO
1 0 1 0 1	DIVIDE	YES	F=1	T ≠ 0	F=1 IA=1	YES	YES	NO
1 1 0 0 0	LOAD ACCU	YES	F=1	T ≠ 0	F=1 IA=1	YES	NO	NO
1 1 0 0 1	LOAD ACCU DOUBLE	YES	F=1	T ≠ 0	F=1 IA=1	YES	YES	NO
1 1 0 1 0	STORE ACCU	YES	F=1	T ≠ 0	F=1 IA=1	YES	NO	NO
1 1 0 1 1	STORE ACCU DOUBLE	YES	F=1	T ≠ 0	F=1 IA=1	YES	YES	NO
1 1 1 0 0	AND	YES	F=1	T ≠ 0	F=1 IA=1	YES	NO	NO
1 1 1 0 1	OR	YES	F=1	T ≠ 0	F=1 IA=1	YES	NO	NO
1 1 1 1 0	EXCL OR	YES	F=1	T ≠ 0	F=1 IA=1	YES	NO	NO

NOTE 1. VALID SHORT FORMAT ONLY.

NOTE 2. NOT STANDARD I1 CYCLE, E CYCLES NOT ALWAYS ENTERED

NOTE 3. BRANCH EXTENDED LAST I CYCLE, E CYCLES NOT ALWAYS ENTERED

NOTE 4. FOR 1130 SYSTEM ALL UNASSIGNED OP CODES ARE DECODED AS WAIT OPS.

SHEET 1

DATE	EC NUMBER	DATE	EC NUMBER
	4154800		
OCT 65	415483A		
MAY 67	419633		
22APR68	419675		

1131 INSTRUCTION CYCLE PATTERNS

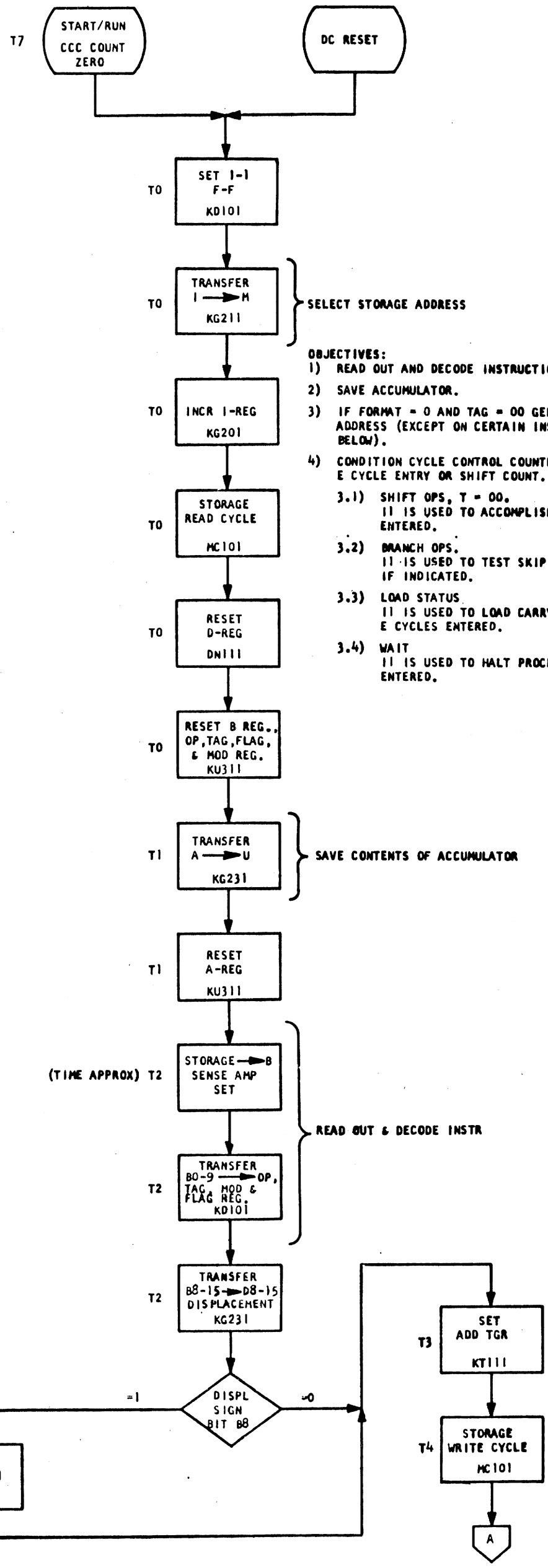
DATE 5-24-65 P/N 2201425

TYPE 1131

IBM AA601

I-1 CYCLE

SHEET 2



OBJECTIVES:

1) READ OUT AND DECODE INSTRUCTION FOUND AT IAR ADDRESS.
2) SAVE ACCUMULATOR.
3) IF FORMAT = 0 AND TAG = 00 GENERATE EFFECTIVE ADDRESS (EXCEPT ON CERTAIN INSTRUCTIONS AS NOTED BELOW).
4) CONDITION CYCLE CONTROL COUNTER TO DETERMINE E CYCLE ENTRY OR SHIFT COUNT.
   - 3.1) SHIFT OPS, T = 00.
     I1 IS USED TO ACCOMPLISH SHIFTS, NO E CYCLES ENTERED.
   - 3.2) BRANCH OPS.
     I1 IS USED TO TEST SKIP CONDITIONS AND SKIP IF INDICATED.
   - 3.3) LOAD STATUS
     I1 IS USED TO LOAD CARRY AND OVERFLO, NO E CYCLES ENTERED.
   - 3.4) WAIT
     I1 IS USED TO HALT PROCESSOR, NO E CYCLES ENTERED.

DATE	EC NUMBER	DATE	EC NUMBER
	4154800		
OCT 65	4154834		
MAY 67	419633		
28APR68	419675		

I-1 CYCLE

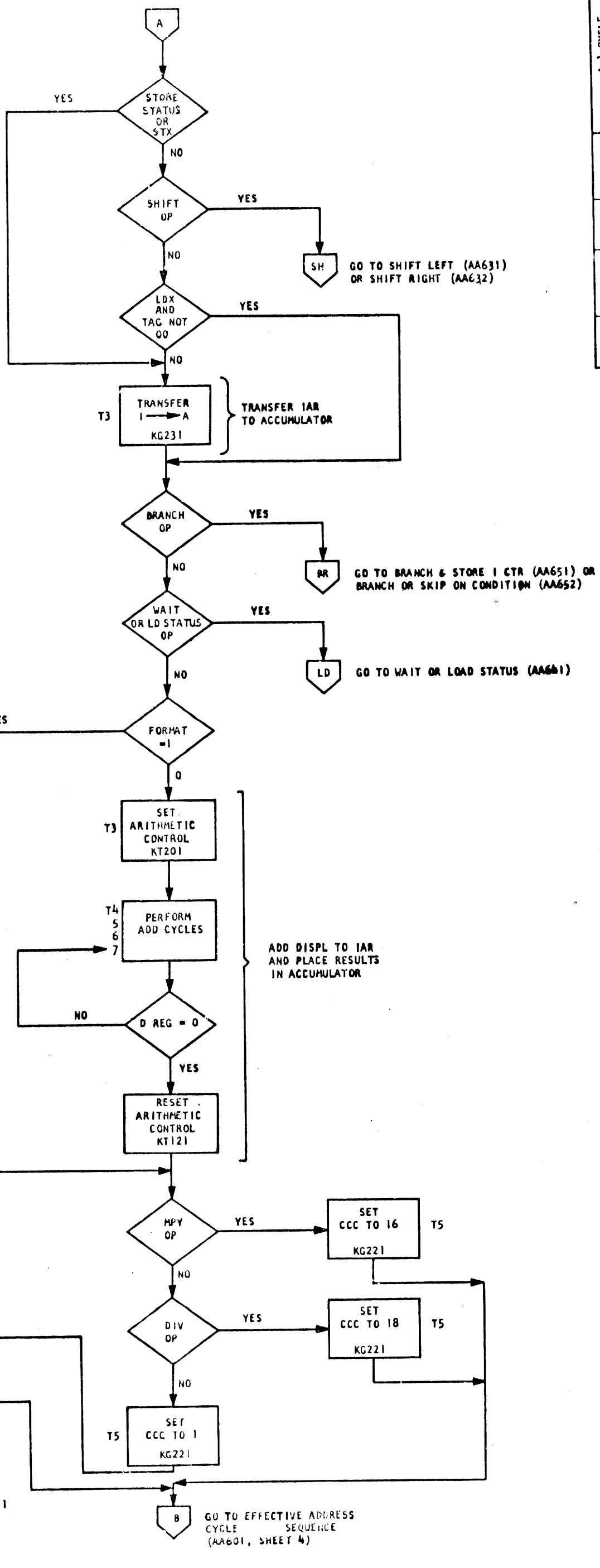
DATE 5-5-65 P/N 2201425

TYPE 1131

IBM AA601

I-1 CYCLE

SHEET 3



DATE	EC NUMBER	DATE	EC NUMBER
	4154B0D		
OCT 65	4154B3A		
MAY 67	419533		
APR68	419675		

I-1 CYCLE

DATE 5-5-65 | P N 2201425

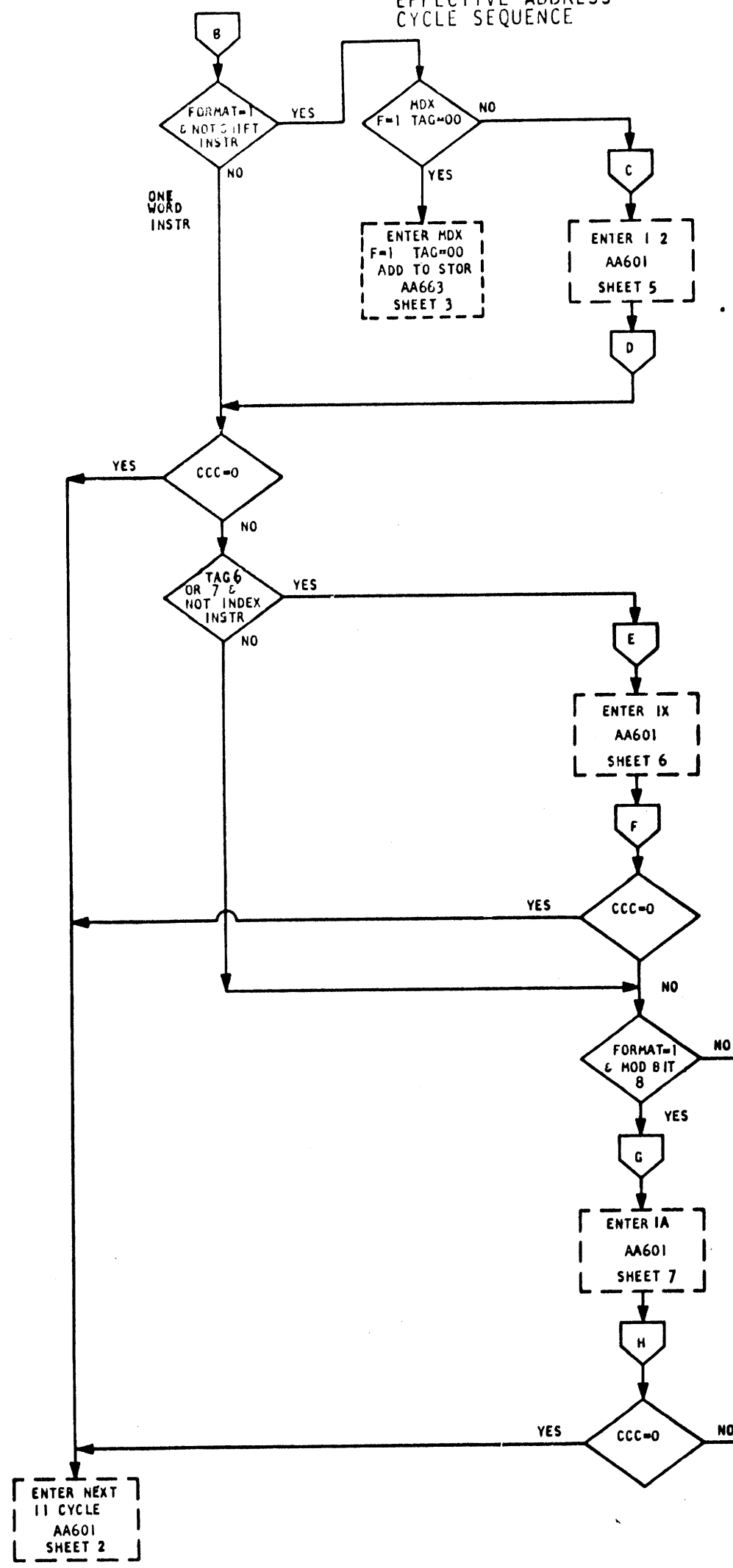
TYPE 1131

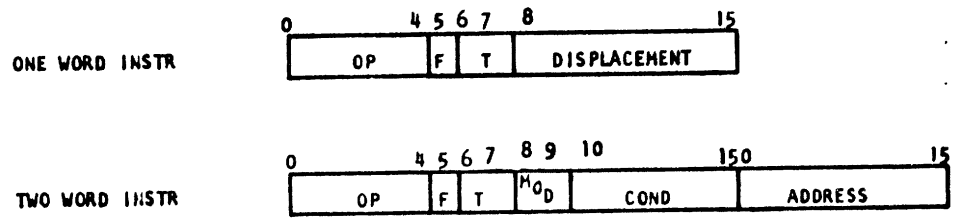
IBM

AA601

EFFECTIVE ADDRESS CYCLE SEQUENCE

SHEET 4





EFFECTIVE ADDRESSING SEQUENCE

FORMAT	TAG	MOD 8	I1	I2*	IX**	IA	EFFECTIVE ADDRESS
0	00	-	✓				DISPLACEMENT + IAR + 1
0	NOT 00	-	✓		✓		DISPLACEMENT & INDEX REG CONTENTS
1	00	0	✓	✓			ADDRESS
1	00	1	✓	✓		✓	(ADDRESS) CONTENTS
1	NOT 00	0	✓	✓	✓		ADDRESS & INDEX REG CONTENTS
1	NOT 00	1	✓	✓	✓	✓	(ADDRESS & INDEX REG CONT) CONTENTS

* NOT SHIFT INSTR. ** NOT INDEX INSTR.

DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154600		
MAY 67	4154834		
22APR68	4196331		
	4196751		

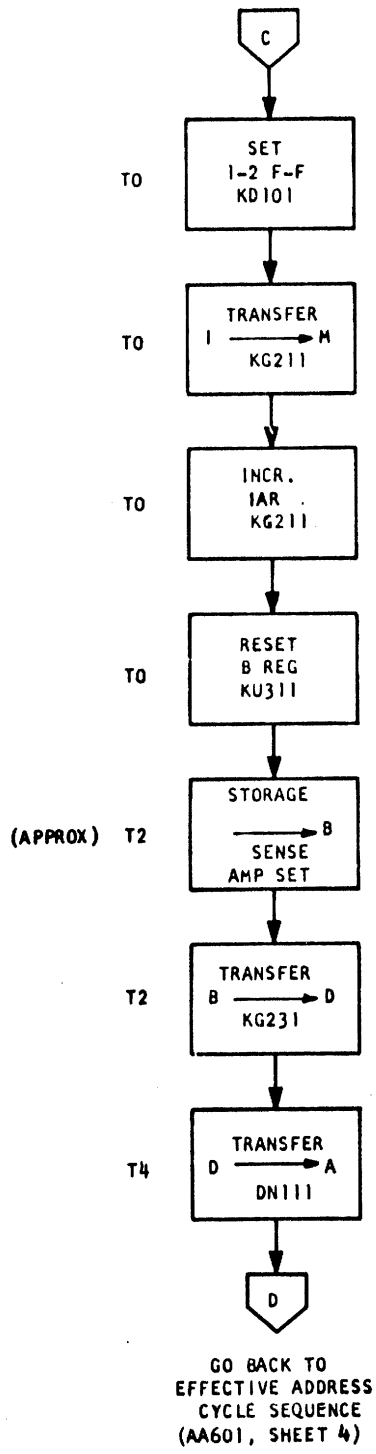
EFFECTIVE ADDRESS CYCLE SEQUENCE

DATE 5-5-65 P/N 2201425

TYPE 1131

IBM

AA601



OBJECTIVES:

1. PLACE ADDRESS WORD OF A TWO WORD INSTRUCTION IN ACCUMULATOR.
2. SEE MDX INSTR. FOR 12 CYCLE ON MDX ADD TO STORAGE OP.

DATE	EC NUMBER	DATE	EC NUMBER
	415480D		
OCT 65	415483A		
MAY 67	419633		
22APR68	419675		

1-2 CYCLE

DATE 5-24-65 P/N 2201425

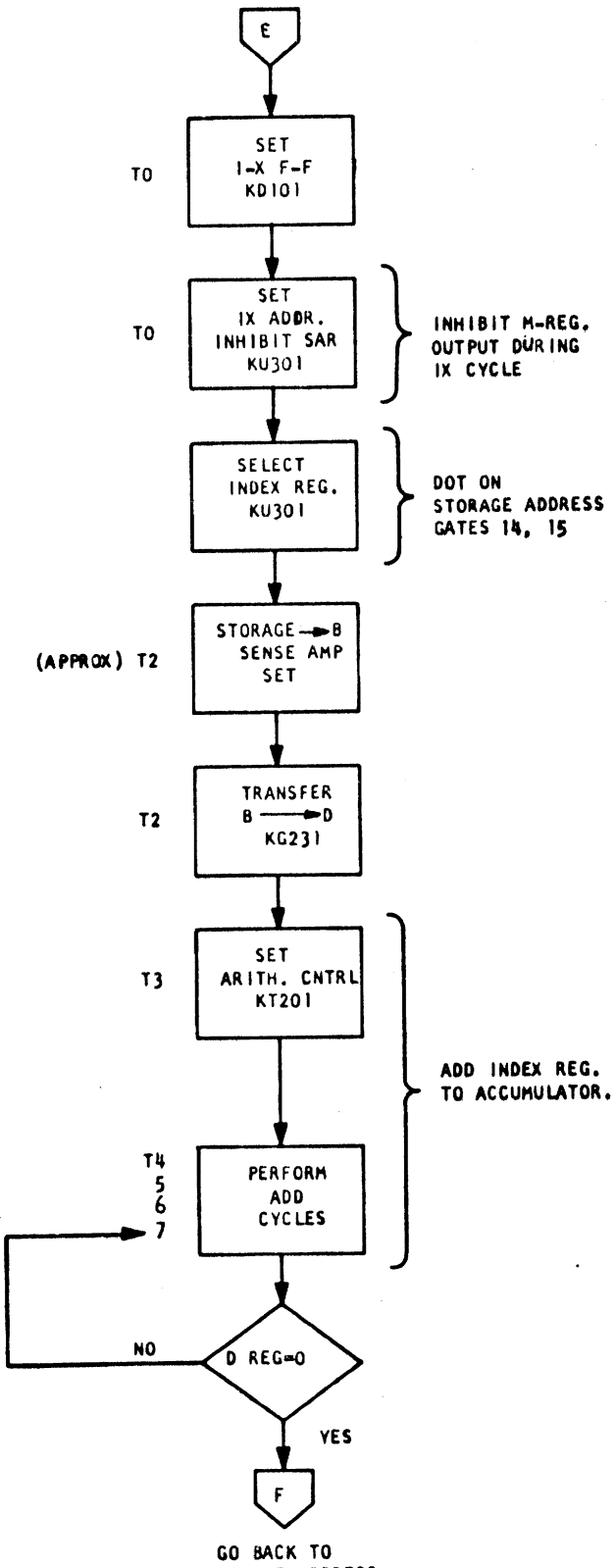
TYPE 1131

IBM

AA601

IX CYCLE

SHEET 6



OBJECTIVES:

1. ADD THE DISPLACEMENT OR THE ADDRESS PORTION OF THE INSTRUCTION TO THE SPECIFIED INDEX REGISTER.
2. SEE OP. CODE FLOW CHARTS FOR FUNCTION OF IX CYCLE ON SHIFT AND MDX.

DATE	EC NUMBER
	4154600
OCT 65	4154534
MAY 67	4i9633
22APR68	419675

EC NUMBER	DATE

IX CYCLE

DATE 5-5-65 | P N 2201425 | TYPE 1131

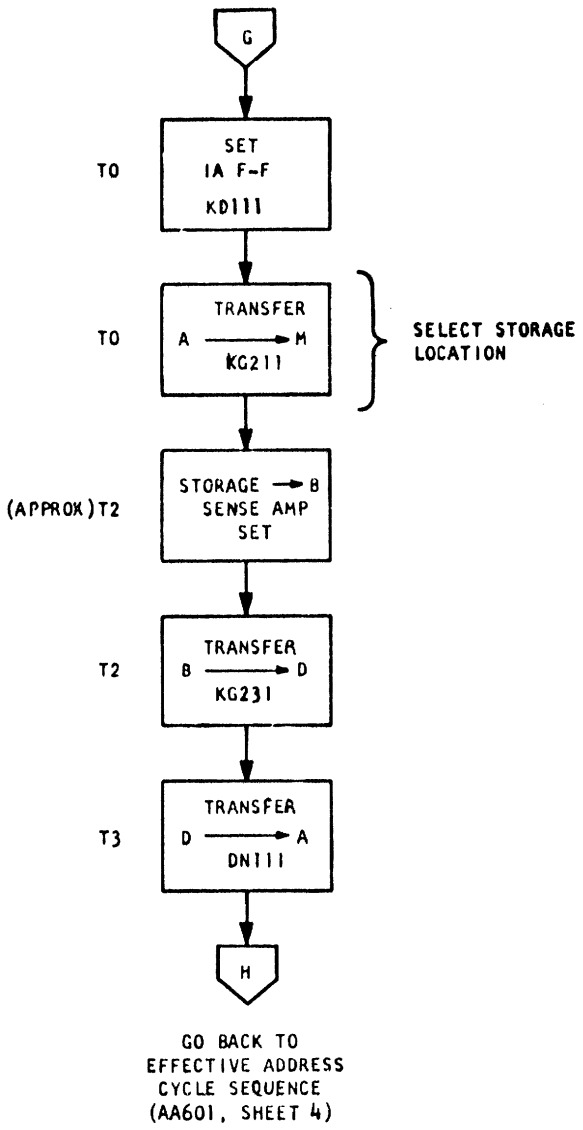
IBM

AA601

I A CYCLE

OBJECTIVE:

1) TRANSFER THE CONTENTS OF THE WORD SPECIFIED BY THE ADDRESS OF A TWO WORD INSTRUCTION TO THE ACCUMULATOR.



GO BACK TO EFFECTIVE ADDRESS CYCLE SEQUENCE (AA601, SHEET 4)

DATE	EC NUMBER	DATE	EC NUMBER
	4154800		
OCT 65	415483A		
MAY 67	419633		
22APR68	419675		

IA CYCLE

DATE 5-24-65 P/N 2201425

TYPE 1131

IBM

AA601

INTERRUPT
FORCED BRANCH AND STORE I CTR INDIRECT

SHEET 1

OBJECTIVE:

TO SERVICE AN INTERRUPT REQUEST BY FORCING A BSI INSTRUCTION WHICH WILL: a. BRANCH TO THE INTERRUPT SUBROUTINE FOR THE APFROPRIATE LEVEL, b. STORE THE I CTR TO PERMIT A RETURN TO THE MAIN LINE PROGRAM.

INTERRUPT REQ FROM I/C

INTR DELAY SW — ON

OFF

CCC COUNT=ø (END OP) — NO

YES

THAT LEVEL TGGR ALREADY ON — YES

NO

T7X7B — SET LEVEL AND REQ TGR FOR THAT LEVEL KM 301,11,21

NOTE THAT INTERRUPT OCCURS ONLY AT THE END OF A COMPLETE INSTRUCTION CYCLE.

HI PRIORITY LV TGR ON — YES

NO

CONTINUE INSTRUCTION SEQUENCE

THAT LEVEL REQ TGR ON — NO

YES

INTERRUPT REQUEST DN201

WAIT OP — YES

NO

T7X7B — SET RUN TRIGGER KU211

ANY CYCLE STEAL LEVEL ON — YES

NO

CS

ENTER CYCLE STEAL (AA611, SHEET 2)

BLOCK STORAGE USE DN201

BSI I1 CYCLE KD101

T0 — BLOCK I-COUNTER INCREMENT KG211

FORCE BSI INDIRECT OP

T0 — GATE BSI OP MOD 8 FORMAT BITS ON I/O BUS KM201

T1 — TRANSFER I/O → B KM201

REQ LEVEL	B BITS 11	12	13	14	15
0		1			
1		1			1
2		1		1	
3		1		1	1
4		1	1		
5		1	1		1
6		1	1	1	
7		1	1	1	1

RPQ

CONTINUE NORMAL BSI I1 CYCLE

ENTER BSI I2 CYCLE KD101

T0 — BLOCK I-CTR INCR KG211

T0 — GATE INT ADDRESS ON I/O BUSS KM201

T1 — TRANSFER I/O → B KM201

CONTINUE NORMAL BSI I2 CYCLE

T7 — RESET HIGHEST PRI REQUEST TRG KM201

T7 — STORAGE USE UNBLOCKED

G

ENTER BSI IA CYCLE (AA601, SHEET 7) (FINISH OP AS A NORMAL CSI INSTR.)

FORCE BSI INDIRECT ADDRESS TO INTERRUPT SUBROUTINE

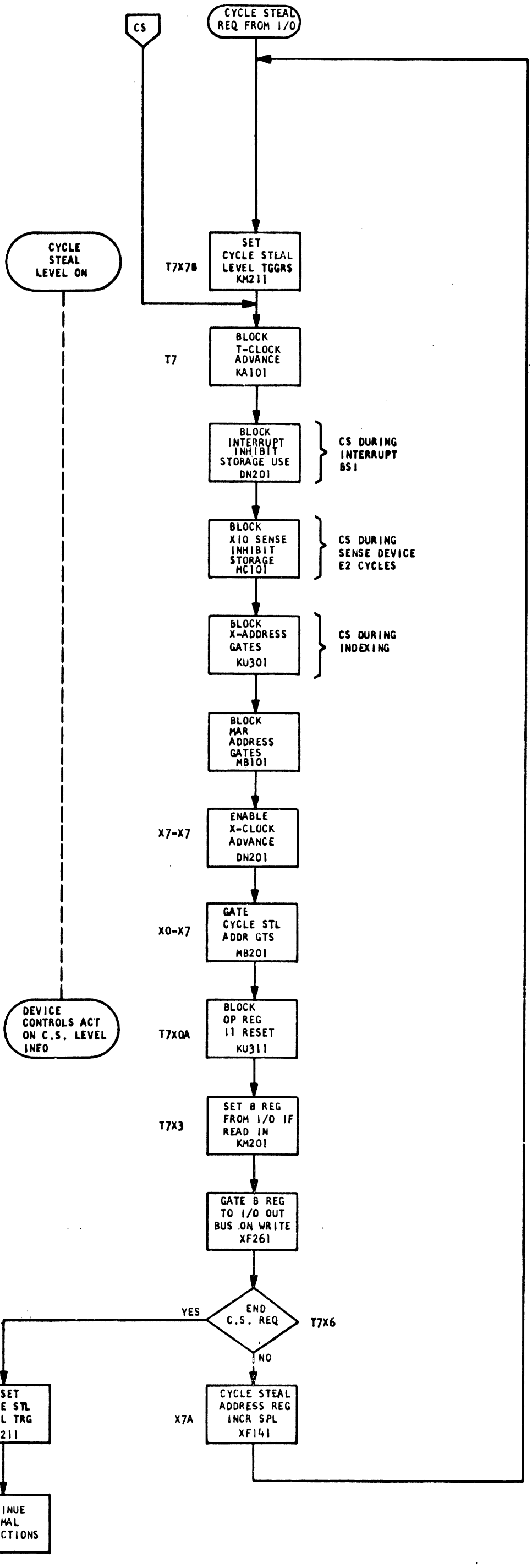
DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154803A		
	4154800		

INTERRUPT FORCED BRANCH AND STORE I CTR INDIRECT

DATE 3-24-5 | P/N 2201432 | TYPE 1131

IBM

AA611



OBJECTIVE:
TO OBTAIN A MACHINE CYCLE FOR EACH C.S. REQUEST. THE DEVICE REQUESTING SERVICE CONTROLS DATA WRITTEN INTO STORAGE FROM THE B REGISTER.
NOTE THAT CYCLES MAY BE STOLEN AT THE END OF ANY MACHINE CYCLE.

DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154800		
	4154834		

IBM

CYCLE STEAL

DATE 3-25-65 P/N 2201432 TYPE 1131

4A611

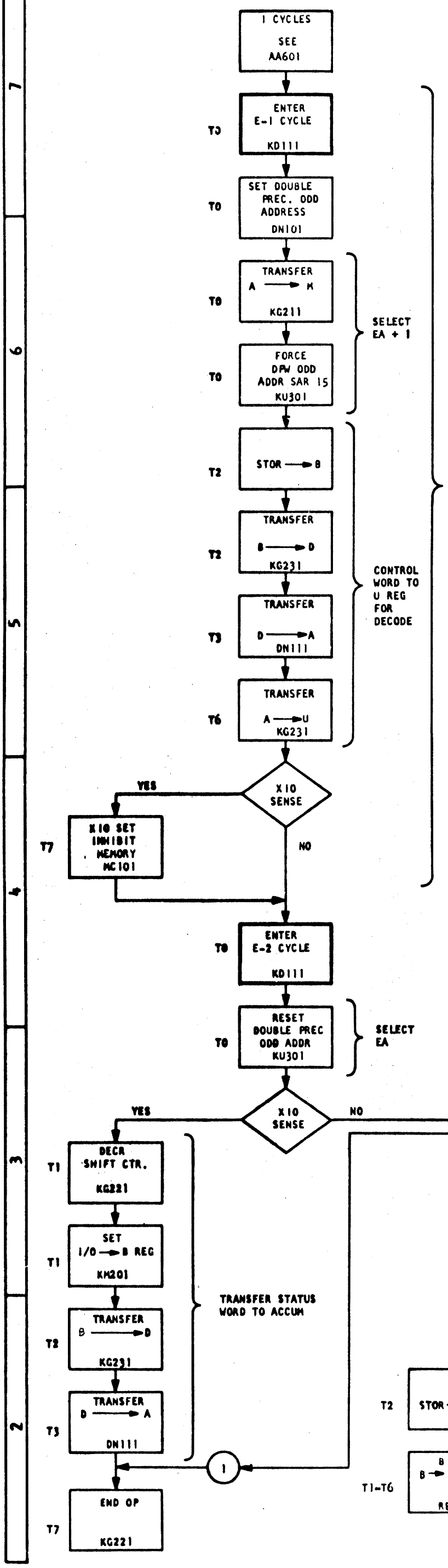
OP CODE 00001
EXECUTE I/O

OBJECTIVES:

1. PLACE THE CONTROL WORD INTO U REG FOR DECODE
2. IF THE FUNCTION IS INITIALIZE READ OR WRITE, THE DATA ADDRESS IS TRANSFERED TO THE CYCLE STEAL ADDRESS REGISTER (E-2 CYCLE)
3. IF THE FUNCTION IS READ OR WRITE, SELECT THE ADDRESS OF THE DATA (E-2 CYCLE) AND TRANSFER THE FIRST CHARACTER. (E-3 CYCLE)
4. IF THE FUNCTION IS SENSE, THE "B IN BUS" IS SAMPLED AND TRANSFERED TO THE ACCUMULATOR. (E-2 CYCLE)

DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154800	5-24-65	2201435
	415483A		1131

OP CODE 00001 EXECUTE I/O — DATE 5-24-65 — P/N 2201435 — TYPE 1131 — IBM — AA621

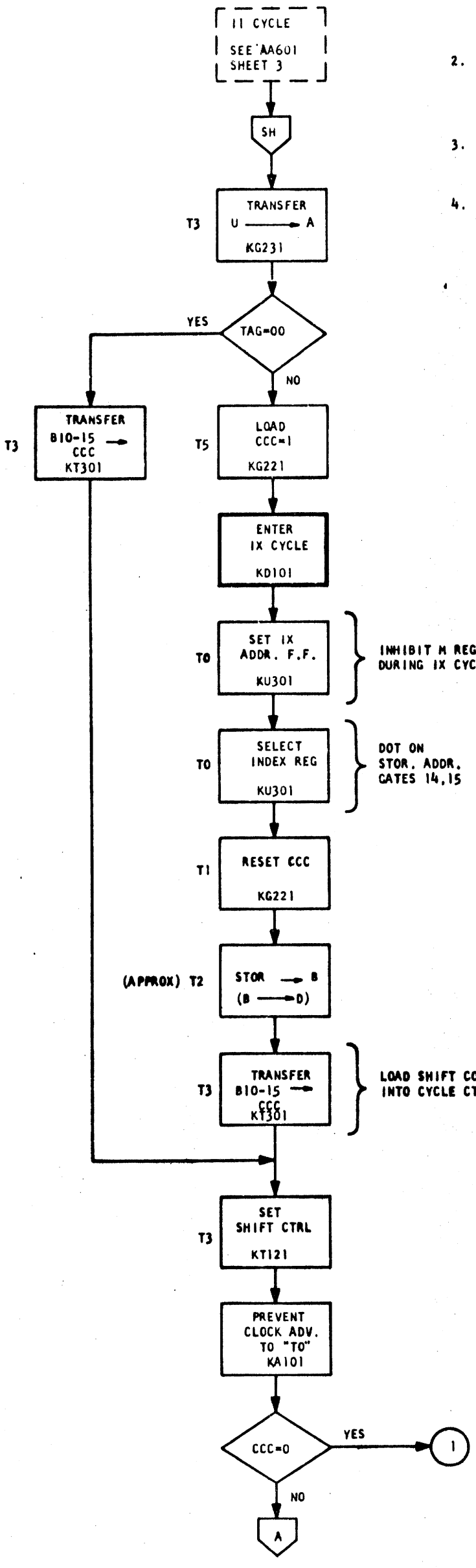


OP CODE 00010 SHIFT LEFT

SHEET 1

OBJECTIVES:

1. BIT 8=0 (SLA OP)
   SHIFT THE ACCUM LEFT THE NO. OF POSITIONS INDICATED BY THE SHIFT CTR (CCC). BIT LEAVING A0 SHIFTS INTO THE CARRY TRG.
2. BIT 9=1, TAG ≠00 (SLC OP)
   SHIFT THE ACCUM LEFT THE NO. OF POSITIONS INDICATED BY THE CCC. TERMINATE SHIFT IF ONE IS FOUND IN A0, SET CARRY TRG ON, AND PLACE REMAINDER OF CCC COUNT IN SELECTED INDEX REG.
3. BIT 8=1
   SHIFT THE ACCUM AND THE Q REG AS A 32 BIT DOUBLE PRECISION WORD.
4. ALL SHIFT OPS ARE SHORT FORMAT (F=0) ONLY.



TAG	CCC SHIFT CNT
00	DISPLACEMENT
01	INDEX 1
10	INDEX 2
11	INDEX 3

OP CODE 00010 SHIFT LEFT			DATE	5-14-55
			P/N	2201437
			TYPE	1131
			IBM	AA631
DATE	EC NUMBER	DATE	EC NUMBER	
	4154800	OCT 65	4154834	

OP CODE 00010 SHIFT LEFT

SHEET 2

DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	415483A		
	4154800		

OP CODE 00010
SHIFT LEFT

DATE	5-24-65	P/N	2201437
		TYPE	1131

IBM

AA631

OP CODE 00011 SHIFT RIGHT

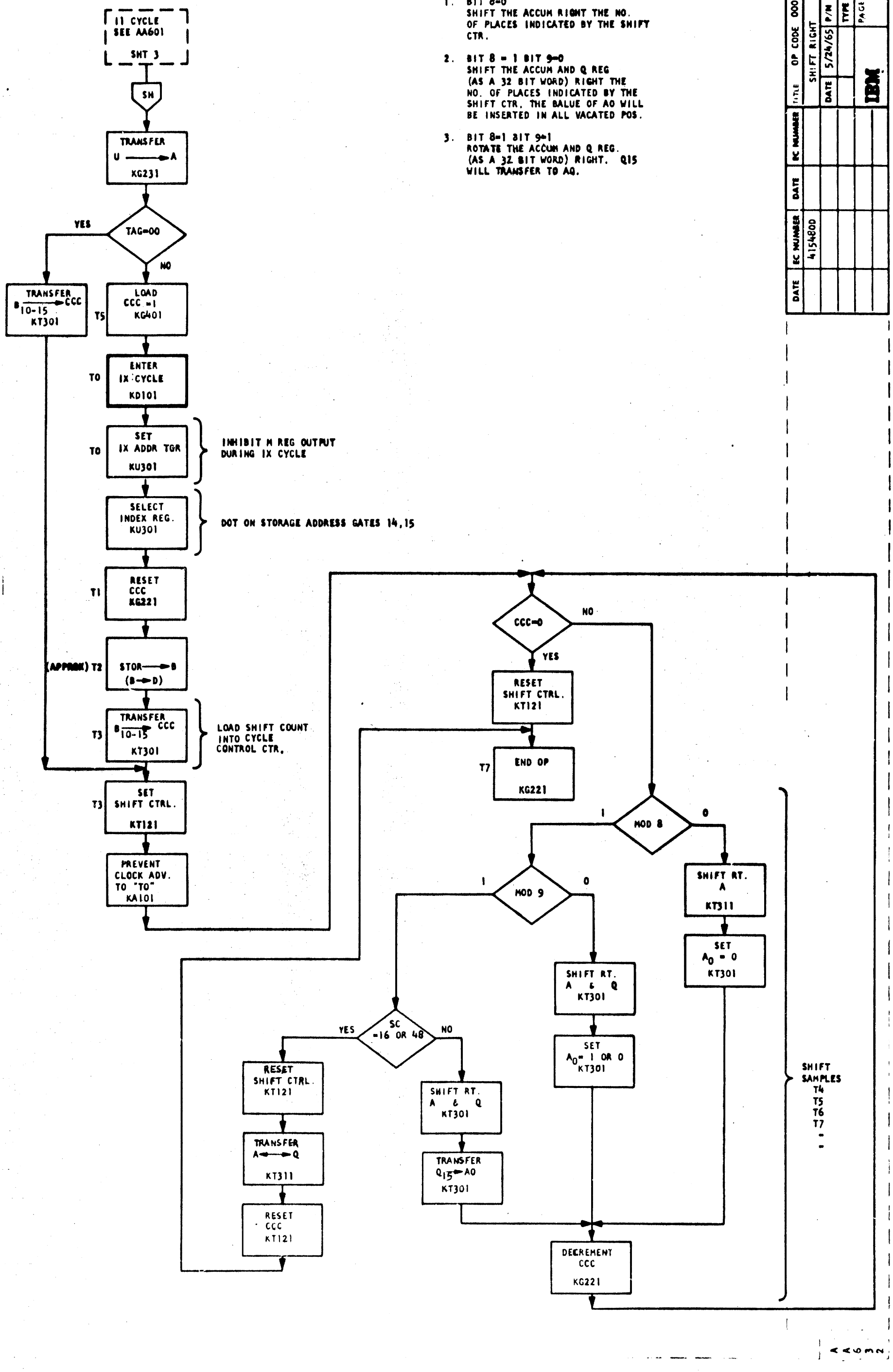
AA632

OBJECTIVES:

1. BIT 8=0
   SHIFT THE ACCUM RIGHT THE NO. OF PLACES INDICATED BY THE SHIFT CTR.

2. BIT 8 = 1 BIT 9=0
   SHIFT THE ACCUM AND Q REG (AS A 32 BIT WORD) RIGHT THE NO. OF PLACES INDICATED BY THE SHIFT CTR. THE BALUE OF A0 WILL BE INSERTED IN ALL VACATED POS.

3. BIT 8=1 BIT 9=1
   ROTATE THE ACCUM AND Q REG. (AS A 32 BIT WORD) RIGHT. Q15 WILL TRANSFER TO AQ.



TITLE	OP CODE 00011 SHIFT RIGHT			
DATE	5/24/65	P/N	2201438	A
		TYPE	1131	A
		PAGE NO	AA632	6 3 2

IBM

DATE	EC NUMBER	DATE	EC NUMBER
	415480D		

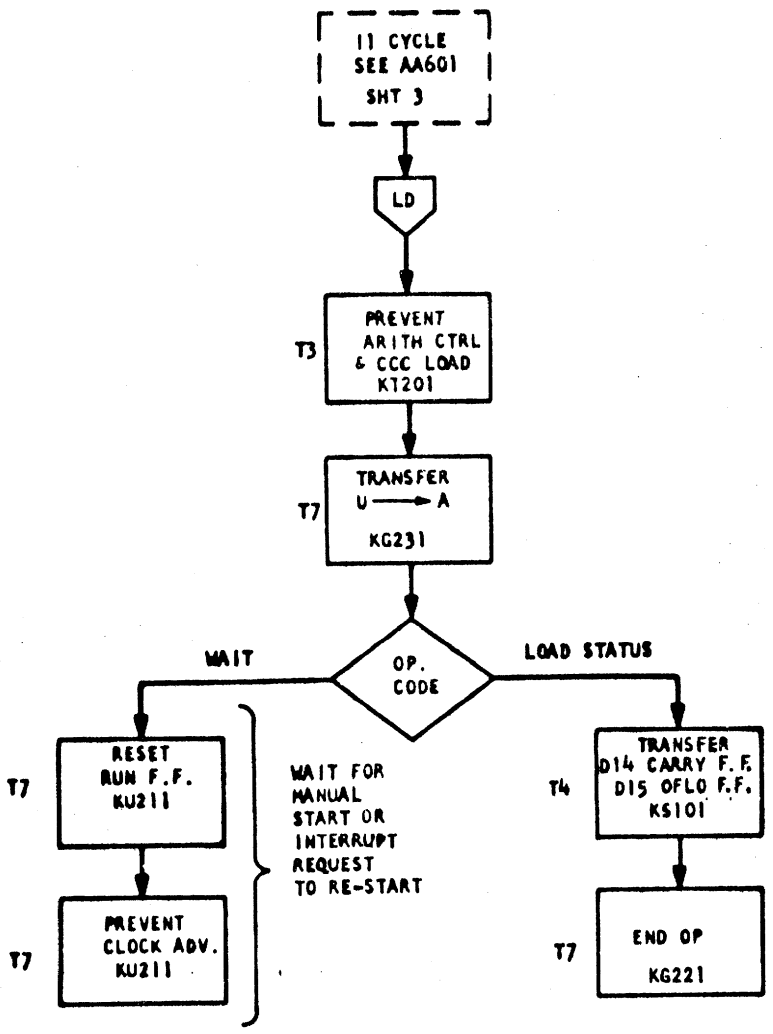
OP CODE 00100 LOAD STATUS

AA641

OP CODE { 00000, 00110, 00111, 01010, 01011, 01111, 10110, 10111, 11111 } WAIT

LOAD STATUS
OBJECTIVES:

1. LOAD THE CARRY INDICATOR WITH THE STATUS OF BIT 14 IN THE INSTRUCTION WORD.
2. LOAD THE OVERFLOW INDICATOR WITH THE STATUS OF BIT 15 IN THE INSTRUCTION WORD.
3. A "1" IN THESE BIT POSITIONS WILL TURN ON THE INDICATOR.
4. A "0" IN THESE BIT POSITIONS WILL TURN OFF THE INDICATOR.



WAIT
OBJECTIVES:

1. STOP THE PROCESSOR IN A WAIT CONDITION
2. LOAD STATUS AND WAIT ARE VALID IN SHORT FORMAT (F=0) ONLY.

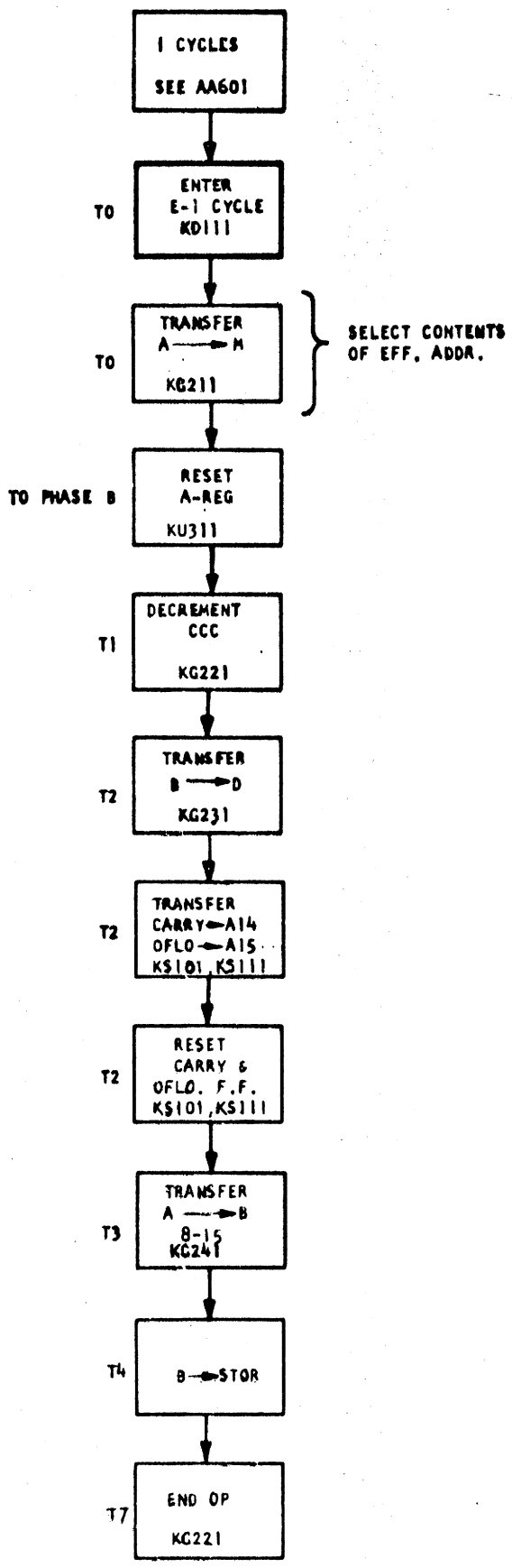
DATE	EC NUMBER	DATE	EC NUMBER
	4154800		

OP CODE 00100 LOAD STATUS
OP CODE----WAIT
DATE 5-24-65 P/N 2201440 TYPE 1131
IBM
AA641

OP CODE 00101 STORE STATUS

OBJECTIVE:

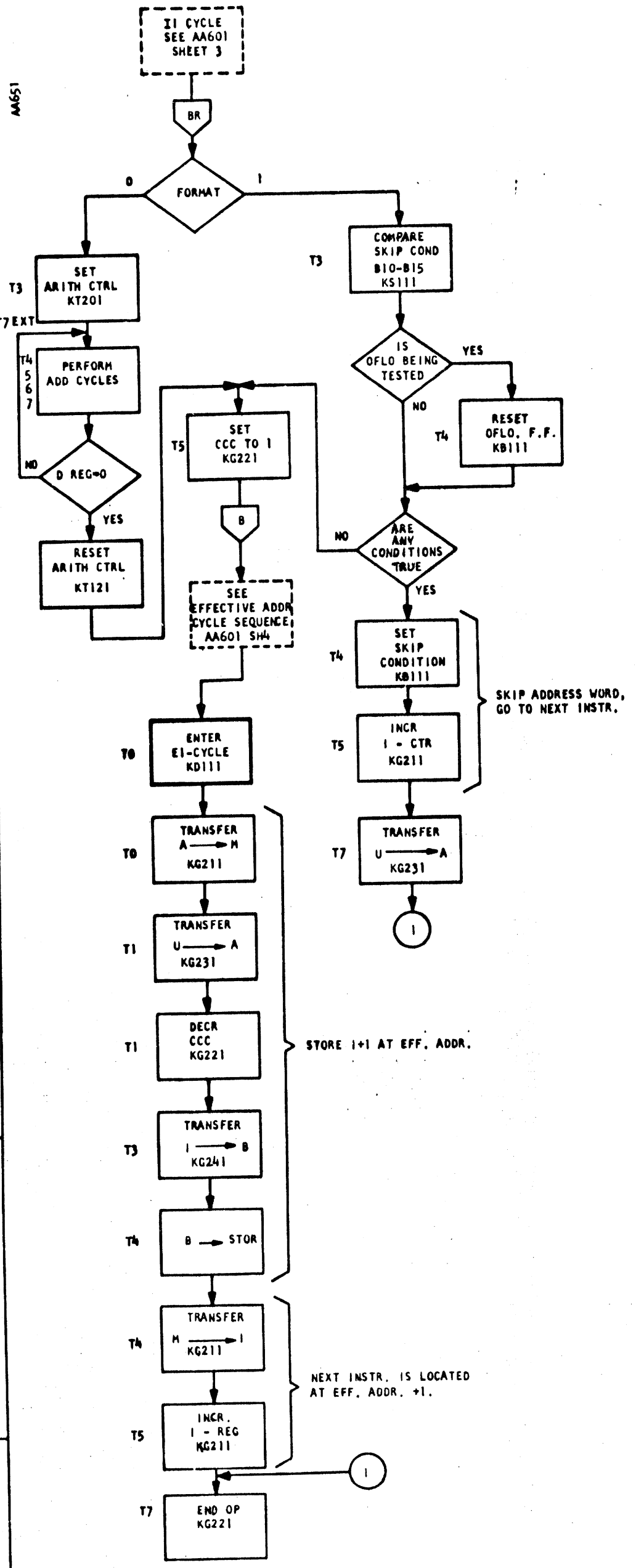
1. STORE THE STATUS OF THE CARRY INDICATOR INTO BIT 14 OF THE CONTENTS OF THE EFF. ADDR.
2. STORE THE STATUS OF THE OVERFLOW INDICATOR INTO BIT 15 OF THE CONTENTS OF THE EFF. ADDR.
3. IF THE INDICATOR IS ON A "ONE" WILL BE STORED.
4. IF THE INDICATOR IS OFF A "ZERO" WILL BE STORED.
5. RESET CARRY AND OVERFLOW.



DATE	EC NUMBER	DATE	EC NUMBER
	4154800		

OP CODE 00101
STORE STATUS
DATE 5-24-65 P/N 2201441 A
TYPE 1131 A
IBM AA642

OP CODE 01000 BRANCH AND STORE INSTRUCTION CTR



BRANCH CONDITIONS

BIT POSITION OF BSI INSTRUCTION	10	11	12	13	14	15
ACCUM = 0	1	0	0	0	0	0
ACCUM < 0	0	1	0	0	0	0
ACCUM > 0	0	0	1	0	0	0
ACCUM IS EVEN	0	0	0	1	0	0
CARRY IS OFF	0	0	0	0	1	0
OFLO IS OFF	0	0	0	0	0	1

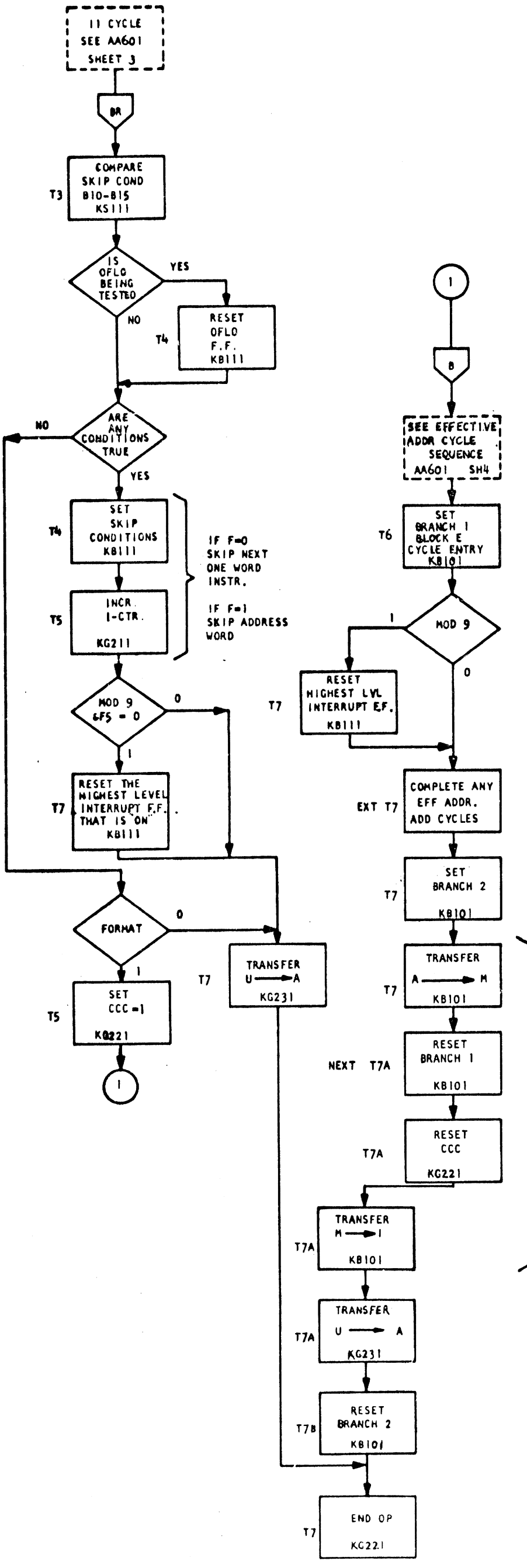
OBJECTIVES:

1. F=0 STORE THE I-CTR. IN THE EFF. ADDR. THE NEXT INSTRUCTION PERFORMED WILL BE AT E.A.+1
2. F=1 IF NONE OF THE BRANCH CONDITIONS BEING TESTED IS TRUE, THE I. CTR. IS STORED AT THE EFF. ADDR. THE NEXT INSTR. PERFORMED WILL BE IN EA+1.
3. F=1 IF ANY OF THE BRANCH CONDITIONS BEING TESTED ARE TRUE, THE NEXT INSTRUCTION IN SEQUENCE IS PERFORMED.
4. RESET OVERFLO IF TESTED

DATE	EC NUMBER	DATE	EC NUMBER	OP CODE 01000 BRANCH AND STORE INSTRUCTION CTR	DATE 5-24-65	P/N 2201443	A A 6 5 1
	4154800					TYPE 1131	IBM AA651

OP CODE 01001 BR OR SKIP ON CONDITION

AA652



BRANCH CONDITIONS

BIT POSITION OF BSC INSTRUCTION	10	11	12	13	14	15
ACCUM=0	1	0	0	0	0	0
ACCUM < 0	0	1	0	0	0	0
ACCUM > 0	0	0	1	0	0	0
ACCUM IS EVEN	0	0	0	1	0	0
CARRY IS OFF	0	0	0	0	1	0
OFLO IS OFF	0	0	0	0	0	1

OBJECTIVES:

1. F=0 IF ANY OF THE CONDITIONS BEING TESTED ARE TRUE, THE I-CTR WILL SKIP THE NEXT ONE WORD INSTR.
2. F=1 IF NONE OF THE CONDITIONS BEING TESTED IS TRUE THE PROGRAM WILL BRANCH TO THE EFF. ADDR.
3. MOD 9=1 IF INST. SKIPS WITH F_5=0 OR DOES NOT SKIP WITH F_5=1 (BRANCH) RESET HIGHEST PRIORITY INTERRUPT LEVEL IN OPERATION.
4. RESET OVERFLO IF TESTED.

DATE	EC NUMBER	DATE	EC NUMBER	OP CODE 01001 BR OR SKIP ON CONDITION	A A 6 5 2
	4154800			DATE 5-24-65 P/N 2201444 TYPE 1131	AA652

IBM

A A 6 5 2

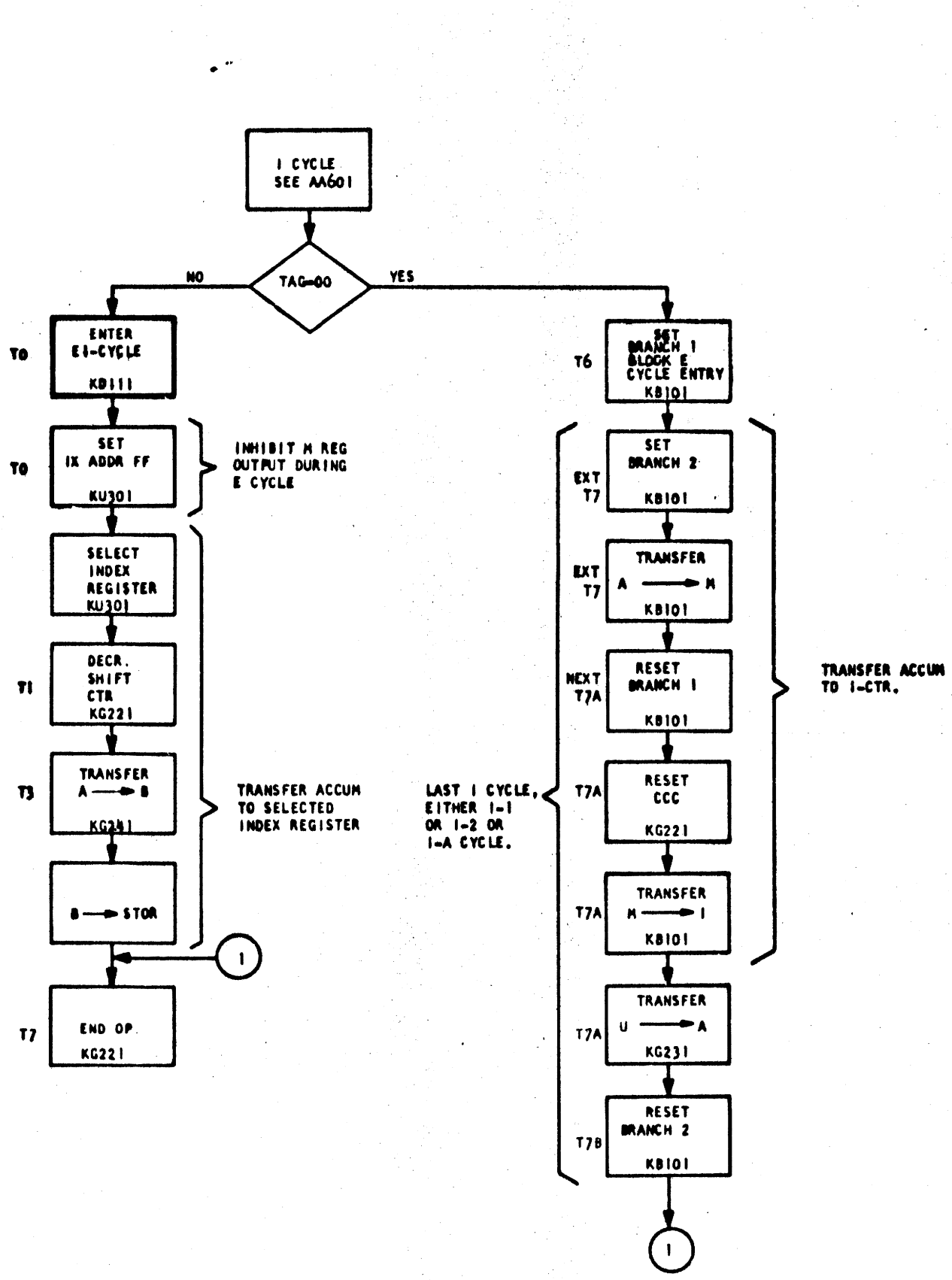
OP CODE 01100 LOAD INDEX

AA661

OBJECTIVES:

1. F=0 LOAD THE I CTR. OR AN INDEX REGISTER WITH THE DISPL.
2. F=1 LOAD THE I CTR. OR AN INDEX REGISTER WITH THE ADDR. PORTION OF THE INSTRUCTION.
3. F=1 MOD 8 LOAD THE I CTR OR AN INDEX REGISTER WITH THE CONTENTS OF THE STORAGE LOCATION SPECIFIED BY THE ADDRESS.

TAG	LOAD
00	I CTR
01	INDEX 1
10	INDEX 2
11	INDEX 3



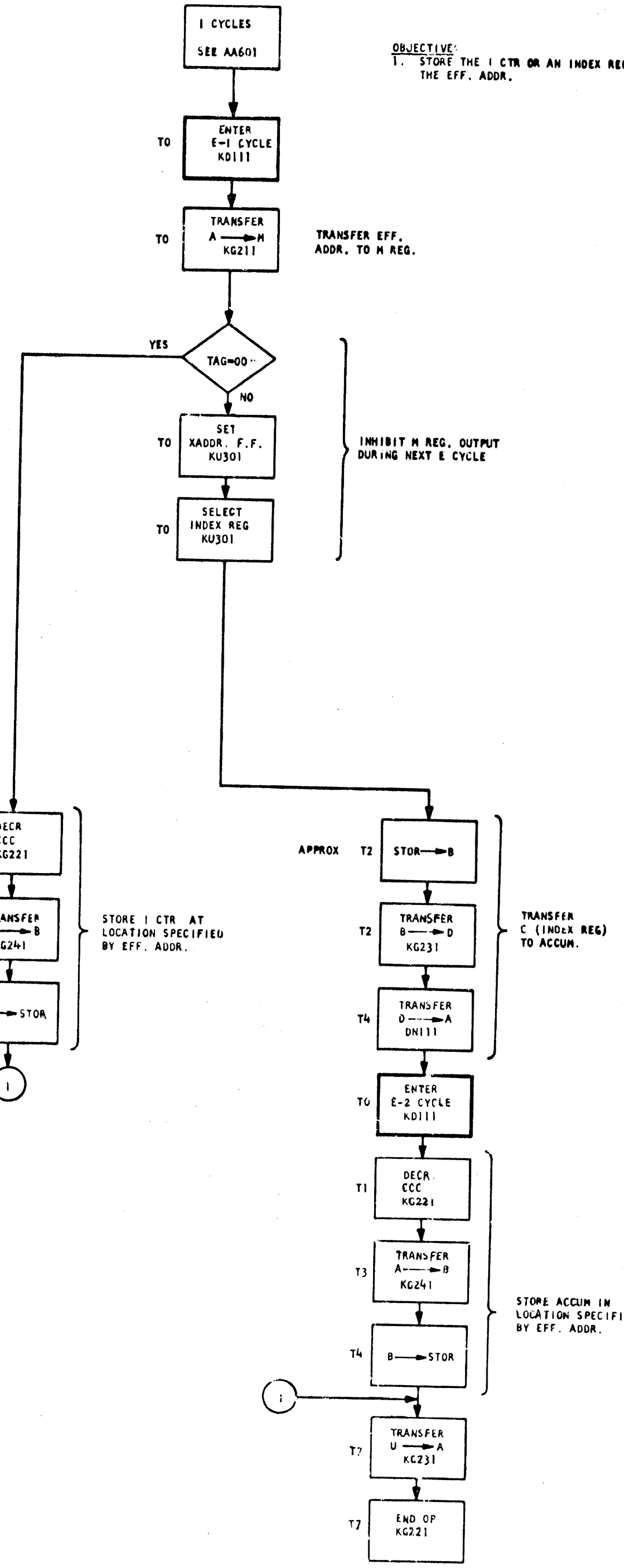
TITLE	OP CODE 01100 LOAD INDEX
DATE	5-24-65
P/N	2201446
TYPE	1131
PAGE NO	AA661
EC NUMBER	4154800
DATE	
EC NUMBER	
DATE	

IBM

AA661

OP CODE 01101 STORE INDEX

AA662



DATE	EC NUMBER	DATE	EC NUMBER
	4154800		

OP CODE 01101
STORE INDEX

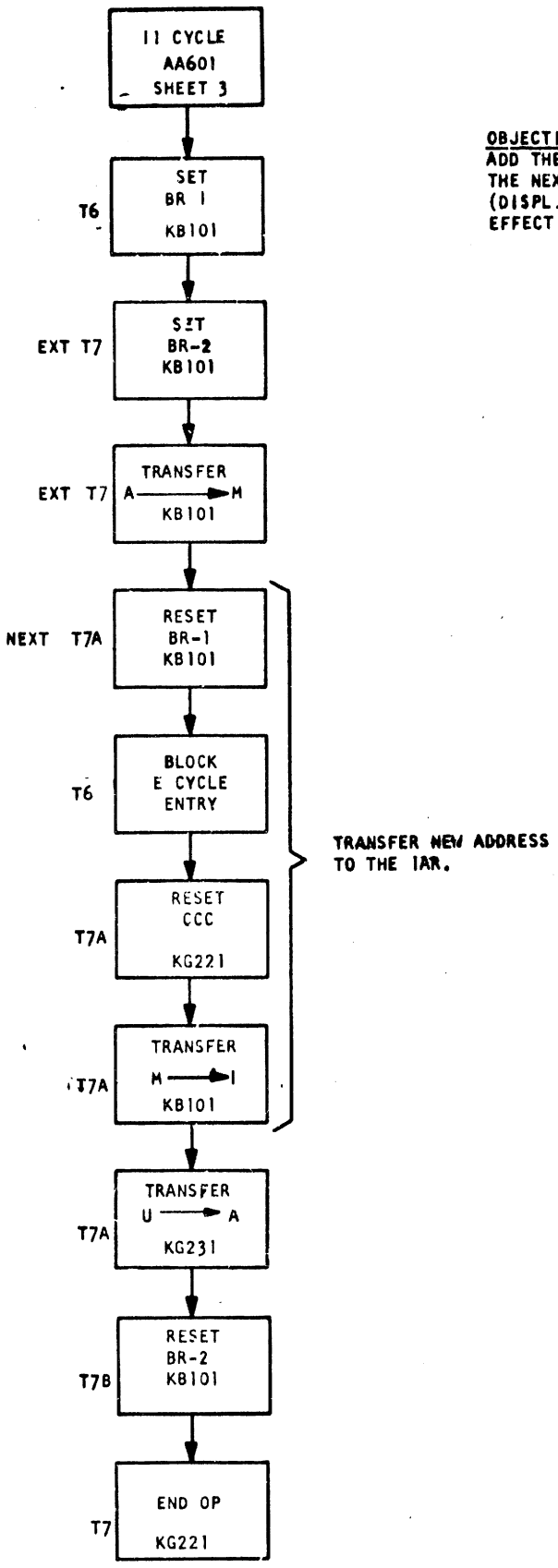
DATE 5-24-65 | P N 2201447
TYPE 1131

IBM

AA662

SHEET 1

OP CODE 01110 MODIFY INDEX AND SKIP FORMAT = 0 TAG = 00



TRANSFER NEW ADDRESS TO THE IAR.

OBJECTIVE:
ADD THE DISPLACEMENT TO THE I-COUNTER. THE NEXT INSTRUCTION WILL BE LOCATED AT (DISPL.) + (I-CTR.+1). THIS PROVIDES AN EFFECTIVE BRANCH TO THE NEW IAR VALUE.

DATE	EC NUMBER	DATE	EC NUMBER
	4154800		
OCT 65	4154834		
JAN 66	415726		
22APR68	419675		

OP CODE 01110 MODIFY INDEX AND SKIP FORMAT=0 TAG=00

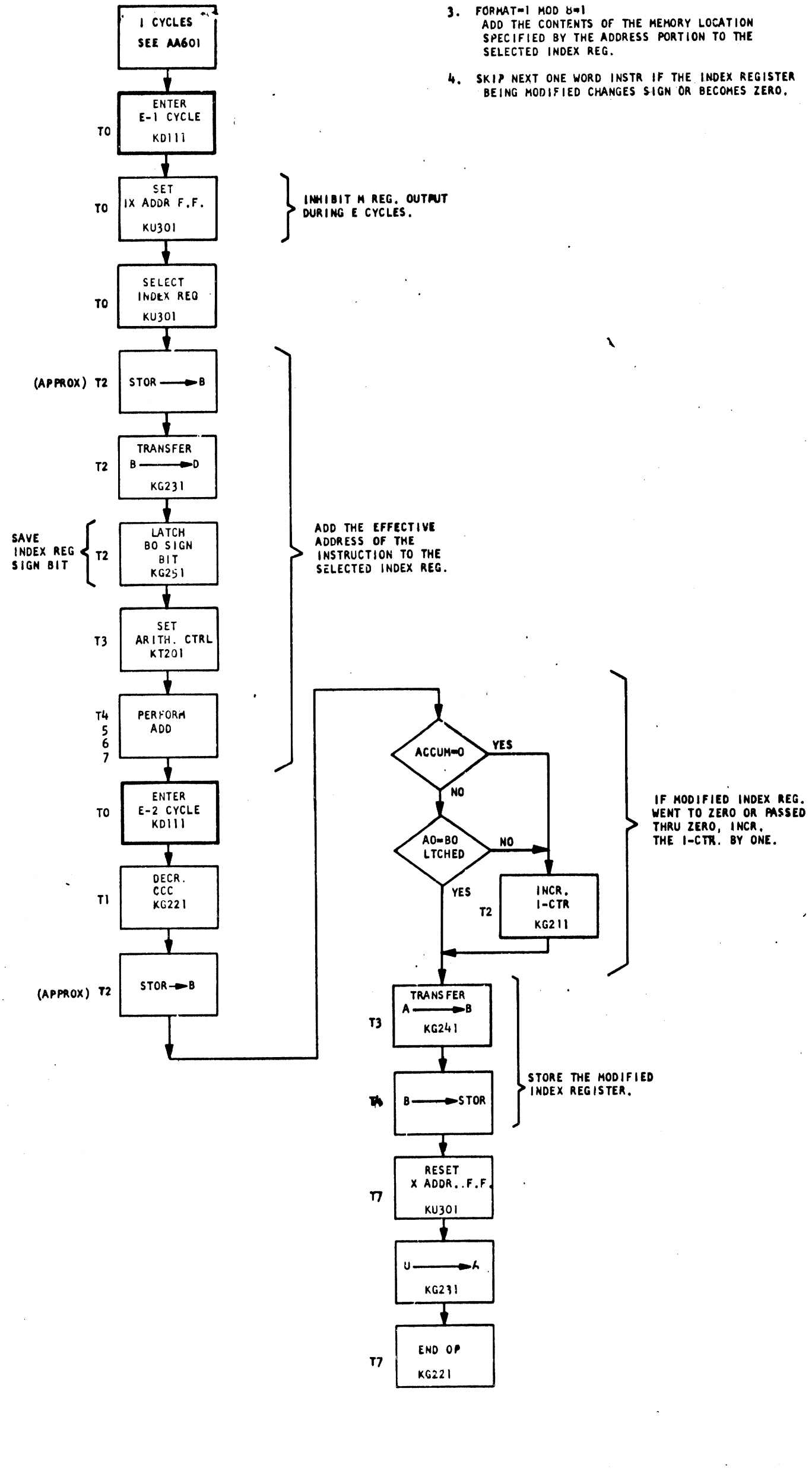
DATE 5-24-65 | P/N 2201448 | TYPE 1131

IBM AA663

OP CODE 01110 MODIFY
INDEX AND SKIP TAG ≠ 00

OBJECTIVES:

1. FORMAT=0
   ADD DISPLACEMENT TO SELECTED INDEX REGISTER.
2. FORMAT=1 MOD 8=0
   ADD THE ADDRESS PORTION OF THE INSTRUCTION TO THE SELECTED INDEX REGISTER.
3. FORMAT=1 MOD 8=1
   ADD THE CONTENTS OF THE MEMORY LOCATION SPECIFIED BY THE ADDRESS PORTION TO THE SELECTED INDEX REG.
4. SKIP NEXT ONE WORD INSTR IF THE INDEX REGISTER BEING MODIFIED CHANGES SIGN OR BECOMES ZERO.



DATE	EC NUMBER	DATE	EC NUMBER
	4154CD		
OCT 65	415483A		
JAN 66	415726		
APR 68	419675		

OP CODE 01110 MODIFY
INDEX & SKIP TAG≠00

DATE 5-24-65 P/N 2201448
TYPE 1131

IBM

AA663

OP CODE 01110 MODIFY INDEX & SKIP - FORMAT = 1 TAG = 00 (ADD TO STORAGE)

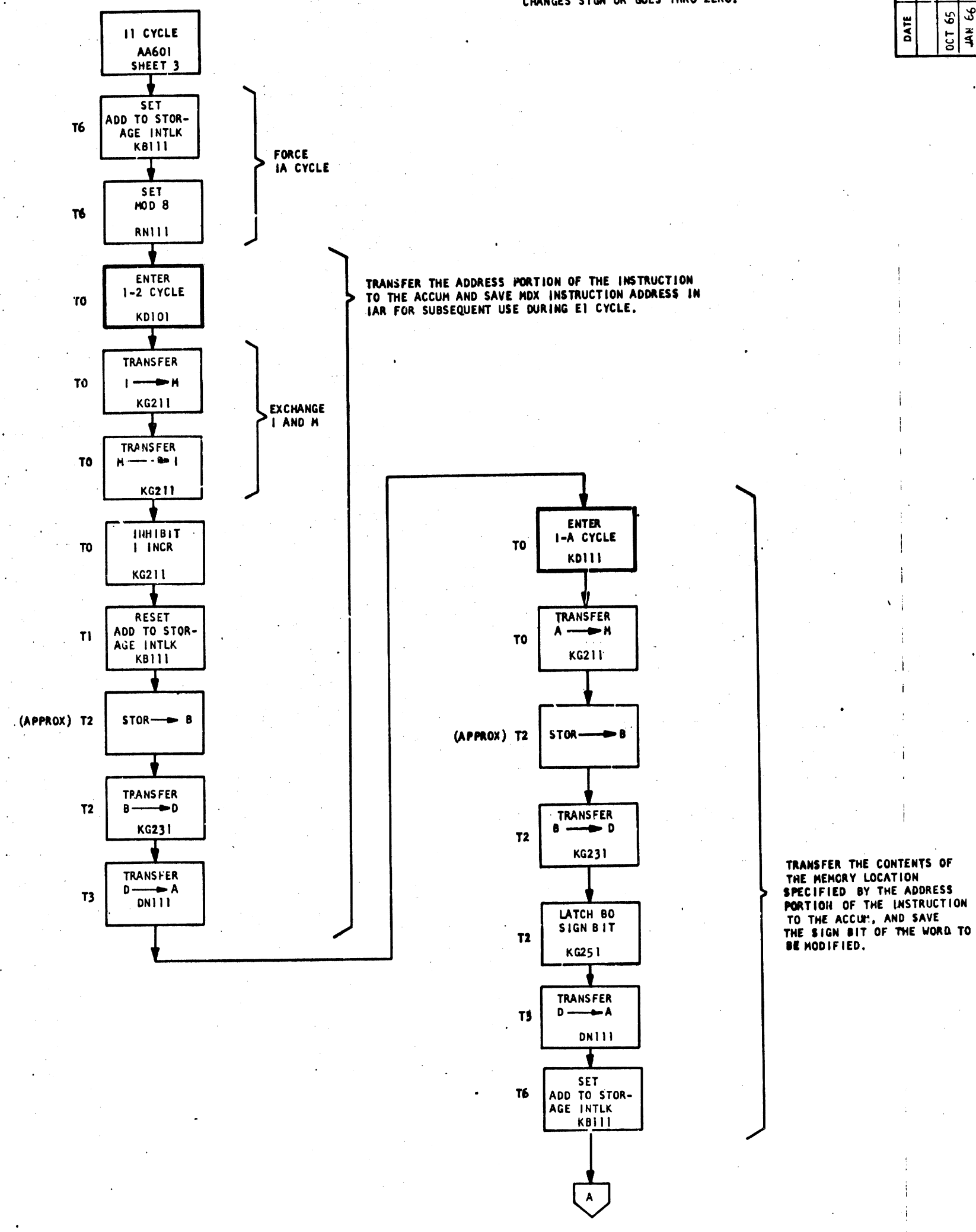
SHEET 3

DATE	EC NUMBER	DATE	EC NUMBER	OP CODE 01110 MODIFY INDEX & SKIP-FORMAT=1 TAG=00		
	4154800			DATE 5-24-65	P/N 2201448	AA663
OCT 65	415483A				TYPE 1131	
JAN 66	415726					IBM
APR 68	419675					

OBJECTIVE:

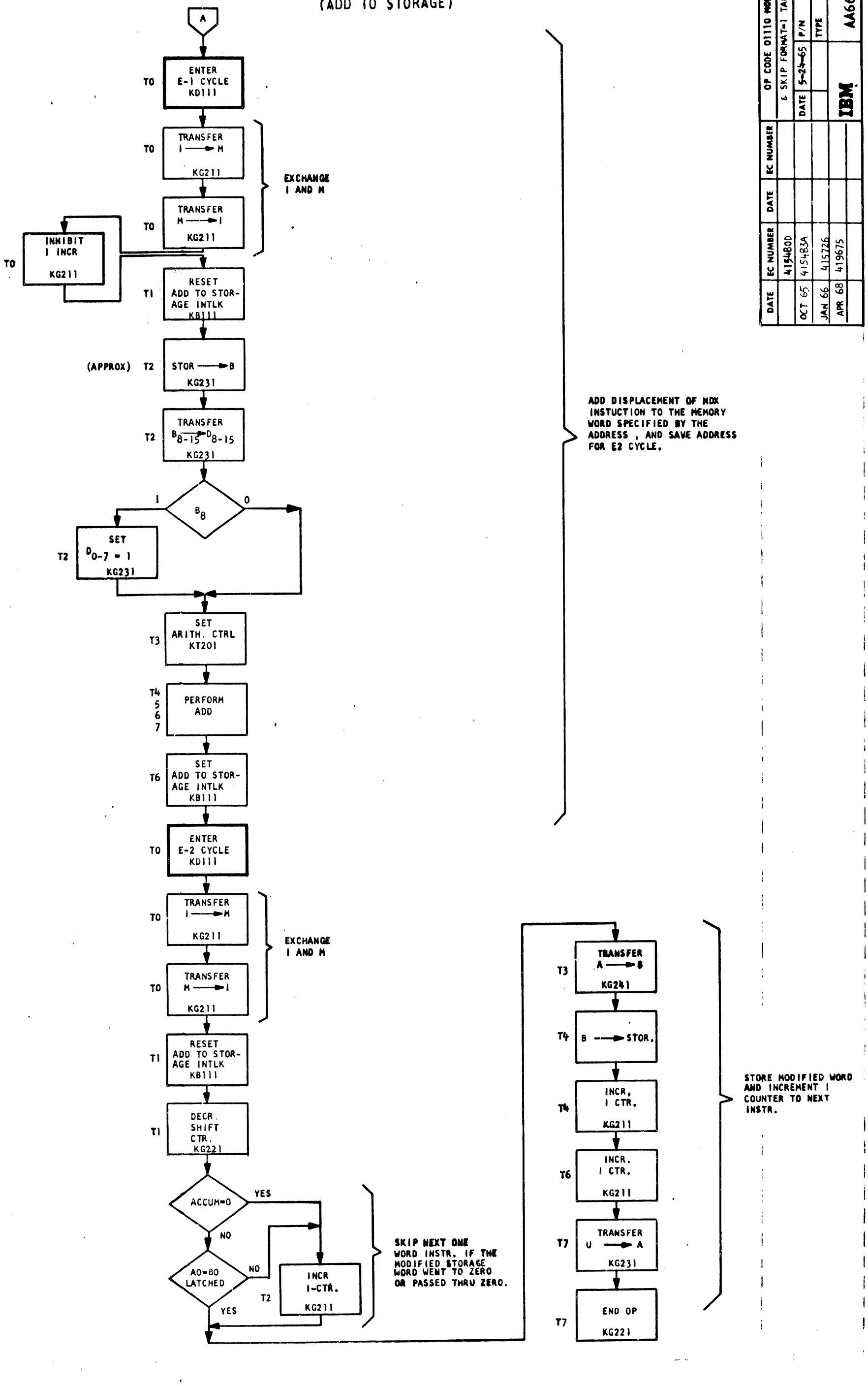
1. ADD THE DISPLACEMENT TO THE CONTENTS OF THE MEMORY LOCATION SPECIFIED BY THE ADDRESS PORTION OF THE INSTRUCTION.

2. SKIP NEXT ONE WORD INSTR. IF MODIFIED WORD CHANGES SIGN OR GOES THRU ZERO.



OP CODE 01110 MODIFY INDEX & SKIP FORMAT = 1 TAG = 00 (ADD TO STORAGE)

SHEET 4



DATE	EC NUMBER	DATE	EC NUMBER
	4154800		
OCT 65	415483A		
JAN 66	415726		
APR 68	419675		

OP CODE 01110 MODIFY INDEX & SKIP FORMAT=1 TAG=00

DATE 5-24-65 P/N 2201448

TYPE 1131

IBM AA663

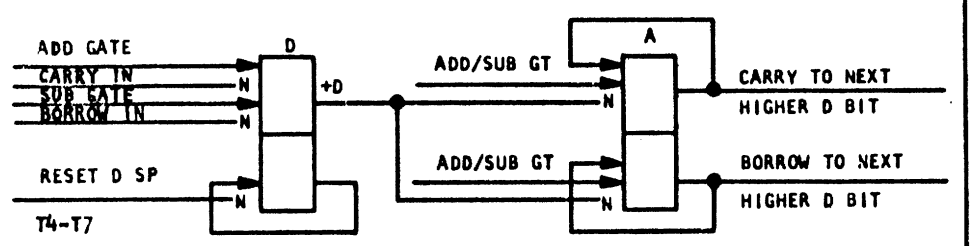
OP CODE 10000 ADD/
OP CODE 10010 SUBT

OBJECTIVES:

1. ADD (OR SUBT.) THE CONTENTS OF THE EFF. ADDR. TO THE ACCUM. THE RESULT WILL BE IN THE ACCUM.
2. TURN ON OVERFLO INDICATOR:
   IF SUM > $2^{15} - 1$
   IF DIFF < -2^{15}
3. SET CARRY IF CARRY OR BORROW IS DETECTED OUT OF AO.

ADD/SUBTRACT LOGIC

ACCUM	D REG	SUM / DIFF	CARRY	BORROW	ACTION ON RESET D REG S.P.
0	0	0	0	0	NO ACTION
0	1	1	0	1	RESET D, SET A, GENERATE BORROW
1	0	1	0	0	NO ACTION
1	1	0	1	0	RESET D, RESET A, GENERATE CARRY



ADD/SUB OVERFLO

ACCUM RESULT NEG(AO=1)	TEMP CARRY OR BORROW	ARITH SIGN (UNLIKE)	OVERFLO
POS	0	LIKE	NO
POS	0	UNLIKE	YES
POS	1	LIKE	YES
POS	1	UNLIKE	NO
NEG	0	LIKE	YES
NEG	0	UNLIKE	NO
NEG	1	LIKE	NO
NEG	1	UNLIKE	YES

OP CODE 10000 ADD			
OP CODE 10010 SUBTRACT			
DATE	5-24-65	P/N	2201450
		TYPE	1131
IBM			AA671

EC NUMBER	DATE	EC NUMBER	DATE
4154800			
419675		22APR68	

OP CODE 10001 DBL PRECISION ADD
OP CODE 10011 DBL PRECISION SUBT

OBJECTIVES:

1. ADD OR SUBTRACT THE CONTENTS OF EA AND EA + 1 TO THE ACCUM AND THE ACCUM EXT (QREQ) AS ONE DOUBLE PRECISION (32 BIT) WORD.
2. EA MUST BE EVEN FOR CORRECT OPERATION.
3. SET CARRY AND OVERFLO AS IN SINGLE ADD OR SUB.

DATE	EC NUMBER	DATE	EC NUMBER
	415480		
OCT 65	415483		
JAN 66	415726		
28APR68	419675		

OP CDE 10001 DBL PRECISION
ABD OP CDE 10011 DBL PRECISION SUBT

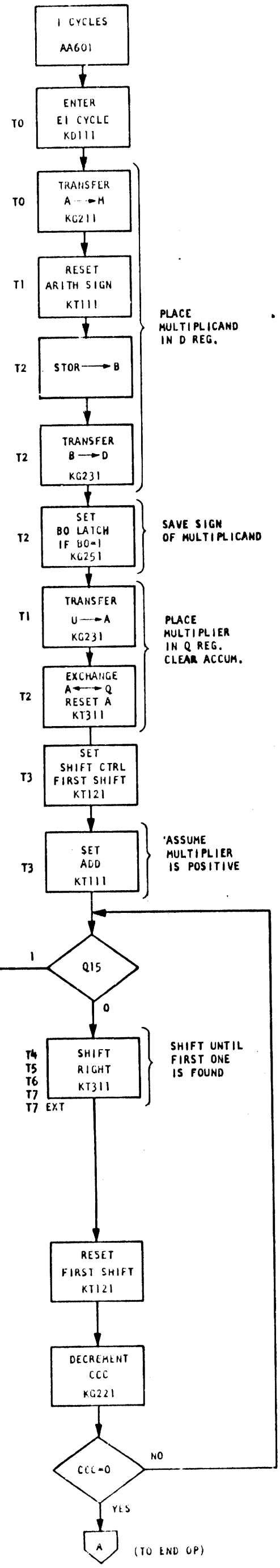
DATE 5-24-65 P/N 2201451
TYPE 1131

IBM

AA672

OP CODE 10100 MULTIPLY

SHEET 1



OBJECTIVE:

1. MULTIPLY CONTENTS OF EFFECTIVE ADDRESS BY THE CONTENTS OF THE ACCUMULATOR.
2. THE RESULT WILL BE A 32 BIT DOUBLE PRECISION PRODUCT LOCATED IN THE ACCUM AND EXT.
3. THERE IS NO CARRY OR OVERFLO IN MULTIPLY.

ALGORITHM:

1. RAPID MULTIPLICATION DEPENDS ON THE FACT THAT ANY BINARY NUMBER MAY BE REPRESENTED BY POWERS OF TWO AS FOLLOWS.

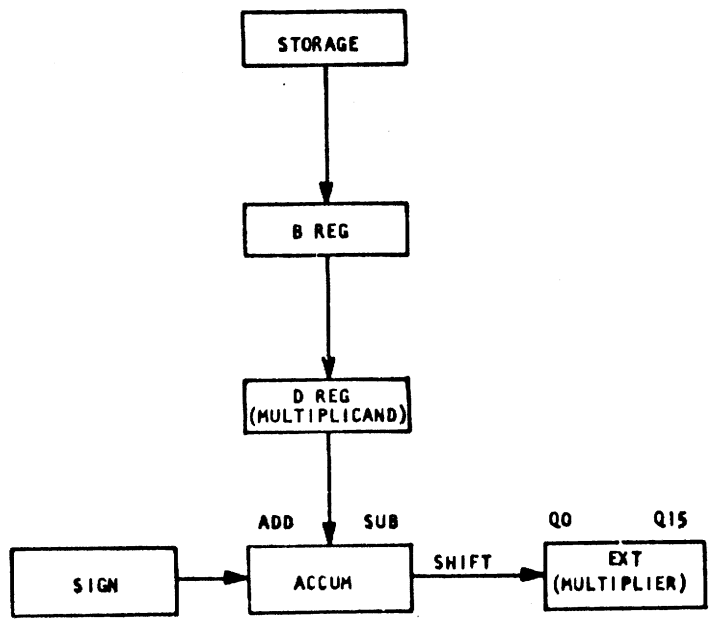
PWR OF 2	8 7 6 5 4 3 2 1 0	RAPID EQUIV	LONG EQUIVALENT
BINARY	0 0 1 1 1 1 0 1 0	$2^7-2^3+2^1$	$2^6+2^5+2^4+2^3+2^1$
BINARY	0 0 1 1 1 0 1 1 1	$2^7-2^3-2^0$	$2^6+2^5+2^4+2^2+2^1+2^0$

2. THUS IT IS NOT NECESSARY TO FORM THE PARTIAL PRODUCT BY ADDING FOR EACH BIT POSITION. WE MAY EXAMINE THE MULTIPLIER (TWO LOWEST ORDER BITS AT A TIME) TO DETERMINE WHEN TO ADD THE MULTIPLICAND, WHEN TO SUBTRACT, OR WHEN TO JUST SHIFT THE MULTIPLIER.

MULTIPLIER Q14	Q15	PREVIOUS ACTION	NEW ACTION	EXPLANATION
0	0	ADD	SHIFT	NO ACTION
0	1	ADD	ADD,SHIFT	SINGLE ONE IN STRING OF ZEROS
1	0	ADD	SHIFT	NO ACTION
1	1	ADD	SUB,SHIFT	START STRING OF ONES
0	0	SUB	ADD,SHIFT	END OF STRING OF ONES
0	1	SUB	SHIFT	NO ACTION
1	0	SUB	SUB,SHIFT	SINGLE ZERO IN STRING OF ONES
1	1	SUB	SHIFT	NO ACTION

3. THIS ALGORITHM PERMITS THE 1130 TO USE FEWER ADD CYCLES THAN WOULD BE POSSIBLE WITH CONVENTIONAL MULTIPLY.

4. DATA FLOW.



OP CODE 10100					
MULTIPLY	DATE	MAY 65	P N	2201452	
			TYPE	1130	
IBM				AA673	

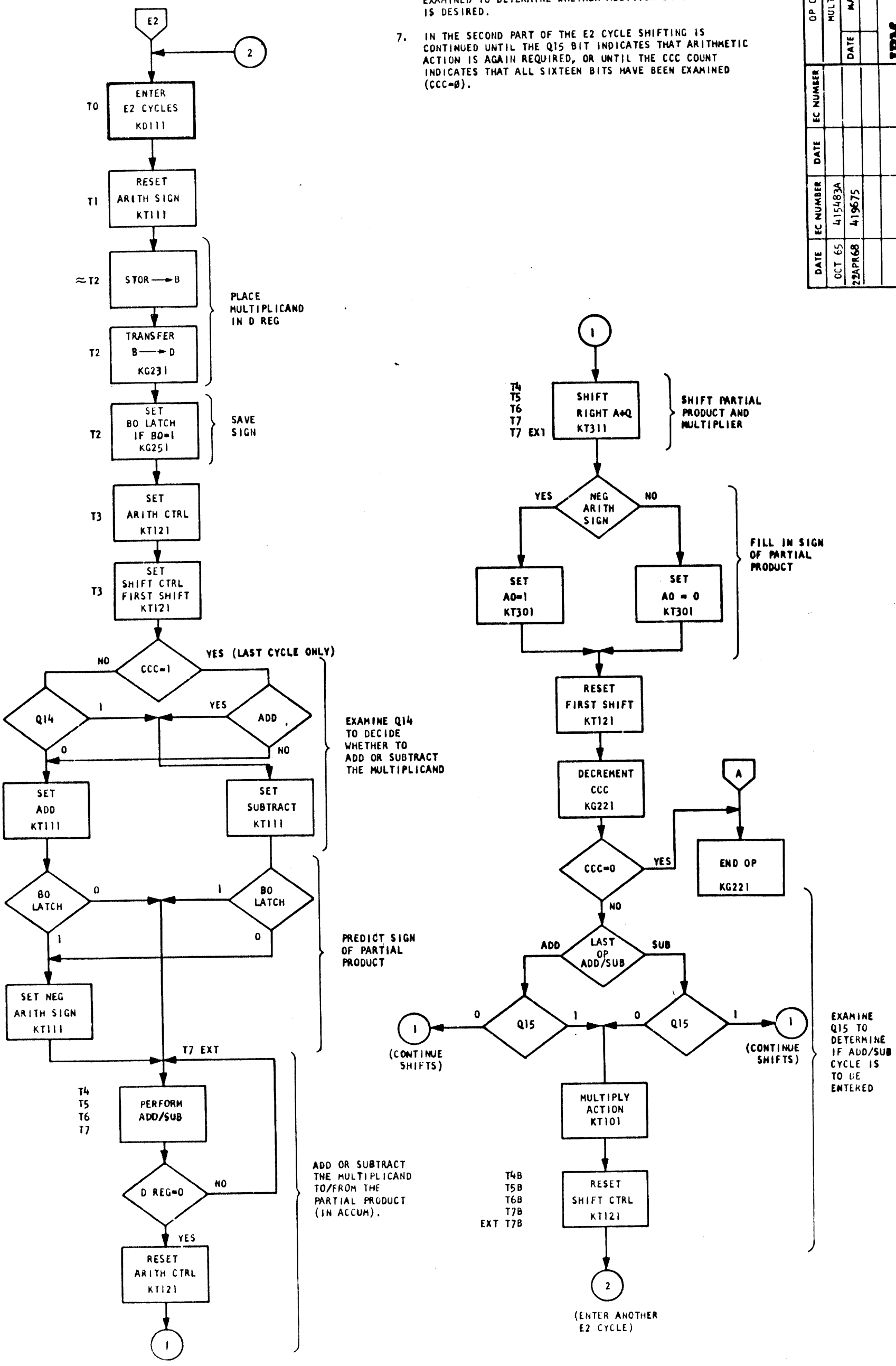
EC NUMBER					
DATE					
EC NUMBER	4154834	4196475			
DATE	OCT 65	22APF68			

OP CODE 10100 MULTIPLY

SHEET 2

ALGORITHM (CONT):

5. MULTIPLY E2 CYCLES ARE ENTERED WHEN AN EXAMINATION OF THE Q15 BIT INDICATES THAT IT IS DESIRED TO ADD OR SUBTRACT THE MULTIPLICAND TO/FROM THE ACCUMULATOR PARTIAL PRODUCT.
6. IN THE FIRST PART OF THE E2 CYCLE THE Q14 BIT IS EXAMINED TO DETERMINE WHETHER ADDITION OR SUBTRACTION IS DESIRED.
7. IN THE SECOND PART OF THE E2 CYCLE SHIFTING IS CONTINUED UNTIL THE Q15 BIT INDICATES THAT ARITHMETIC ACTION IS AGAIN REQUIRED, OR UNTIL THE CCC COUNT INDICATES THAT ALL SIXTEEN BITS HAVE BEEN EXAMINED (CCC=Ø).



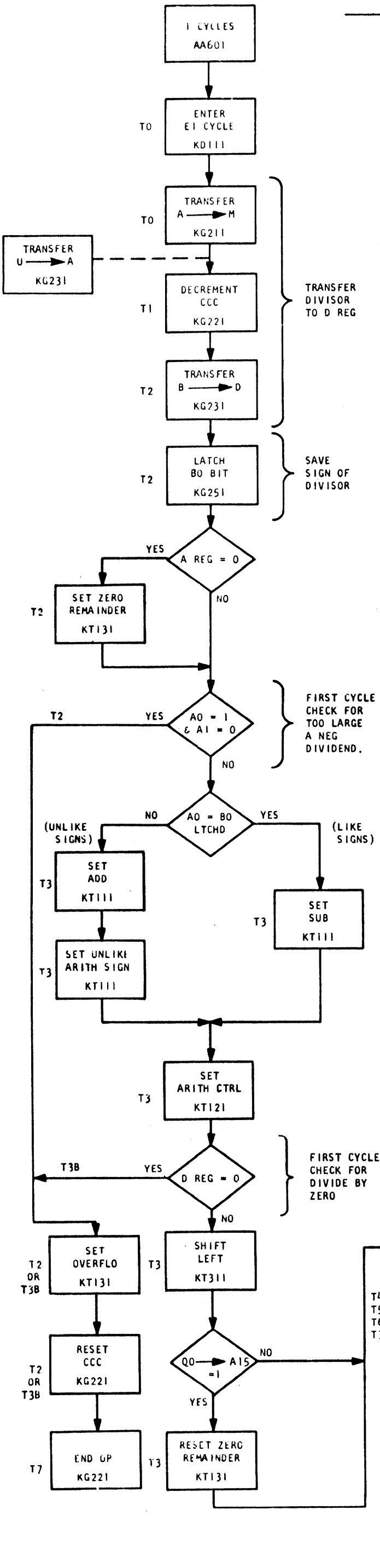
DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	415483A		
22APR68	419675		

OP CODE 10100 MULTIPLY

DATE MAY 65 P/N 2201452 TYPE 1130

IBM AA673

OP CODE 10101 DIVIDE
FIRST CYCLE



OBJECTIVES:

1) THE CONTENTS OF THE ACCUMULATOR AND THE Q REG (TREATED AS A 32 BIT DOUBLE PRECISION WORD) ARE DIVIDED BY THE CONTENTS OF THE EFFECTIVE ADDRESS.

2) AT THE END OF THE OPERATION. THE QUOTIENT WILL BE FOUND IN THE ACCUMULATOR AND THE REMAINDER IN THE Q REGISTER.

ALGORITHM:

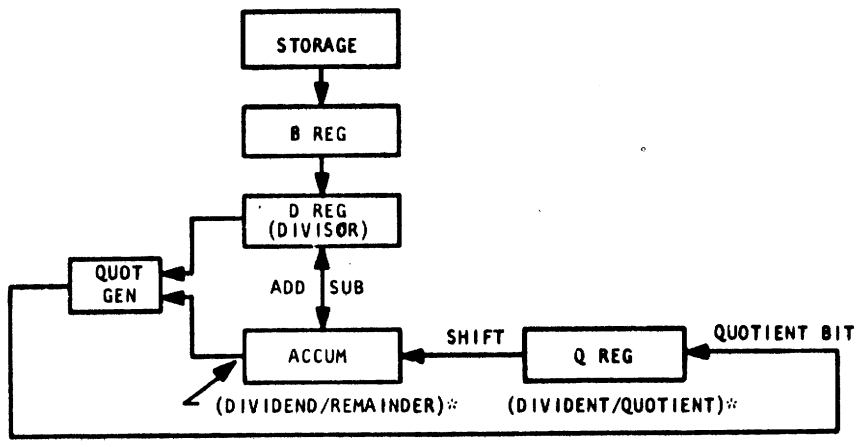
1) THE QUOTIENT OF TWO BINARY NUMBERS MAY BE GENERATED BY SUCCESSIVELY SHIFTING AND SUBTRACTING THE DIVISOR FROM APPROPRIATE ORDERS OF THE DIVIDEND. IF THE SUBTRACTION WAS SUCCESSFUL (REMAINDER SIGN BIT SAME AS DIVISOR SIGN BIT) A QUOTIENT ONE BIT IS GENERATED AND ANOTHER REDUCTION CYCLE IS TRIED. IF THE SUBTRACTION WAS NOT SUCCESSFUL (REMAINDER SIGN BIT NOT THE SAME AS DIVISOR SIGN BIT) A QUOTIENT ZERO BIT IS GENERATED AND AN ADDITION CYCLE IS TAKEN TO RESTORE THE REMAINDER.

2) THIS SHIFT-ADD/SUB PROCEDURE MAY BE ILLUSTRATED AS FOLLOWS: DIVIDE BINARY 00111001 (57) BY 0101 (5)

		QUOTIENT
SHIFT & SUB:	0 0 1 1 1 0 0 1 0 1 0 1	
	+ 0 0 0 1 0 0 0 1	1
SHIFT & SUB:	0 1 0 1	
	- 1 1 1 1 1 1 0 1	0
SHIFT & ADD:	0 1 0 1	
	0 0 0 0 0 1 1 1	1
SHIFT & SUB:	0 1 0 1	
	+ 0 0 0 0 0 0 1 0	1

ANSWER: QUOTIENT 1011 (11) REMAINDER 0010 (2).

3) DATA FLOW



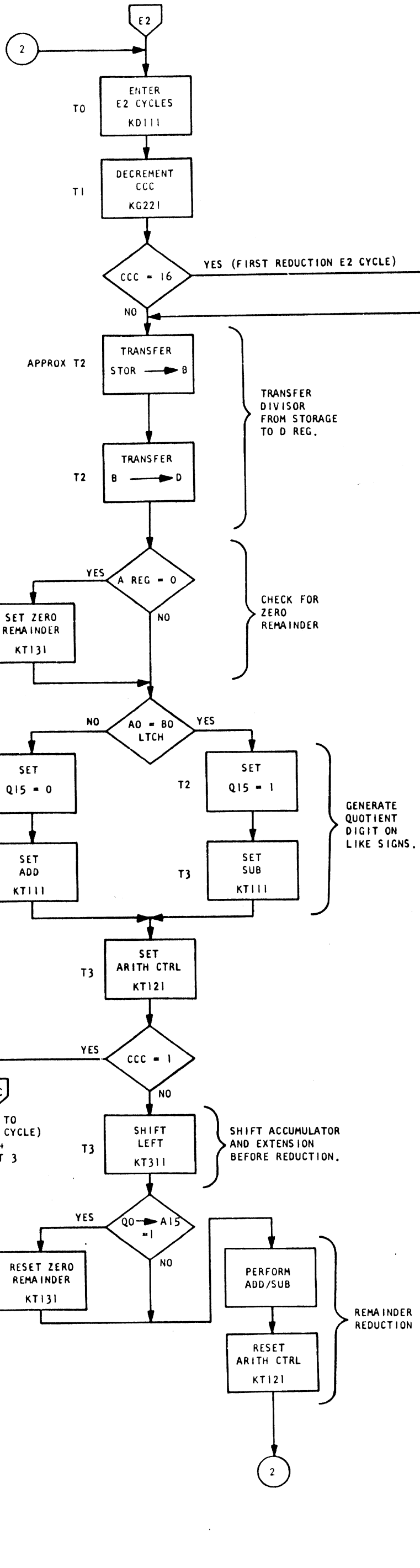
*NOTE THAT A AND Q ARE EXCHANGED AT END OF OP.

DATE	EC NUMBER	DATE	EC NUMBER	OP CODE 10101 DIVIDE	DATE	P/N	
OCT 65	415483A				AUG 65	2201453	AA674
22APR68	419675					TYPE 1130	

IBM

OP CODE 10101 DIVIDE REDUCTION CYCLES

SHEET 2



ALGORITHM (CONT.):

4) THE DIVIDE INSTRUCTION CONSUMES EIGHTEEN E CYCLES (ONE E1 AND SEVENTEEN E2). DURING THE FIRST SIXTEEN THE QUOTIENT IS BUILT UP BY THE SHIFT-ADD/SUB PROCESS. THE SEVENTEENTH AND EIGHTEENTH CYCLE ARE USED FOR CORRECTION AND CHECKING AS EXPLAINED ON SHEET 3.

5) OVERFLOW:

THE PURPOSE OF DIVIDE OVERFLO IS TO DETECT QUOTIENT OVERFLO CONDITIONS RESULTING FROM A DIVIDEND WHICH IS TOO LARGE IN RELATION TO THE DIVISOR. THIS MAY BE BROKEN DOWN AS FOLLOWS:

5.1 FIRST CYCLE CHECKS -

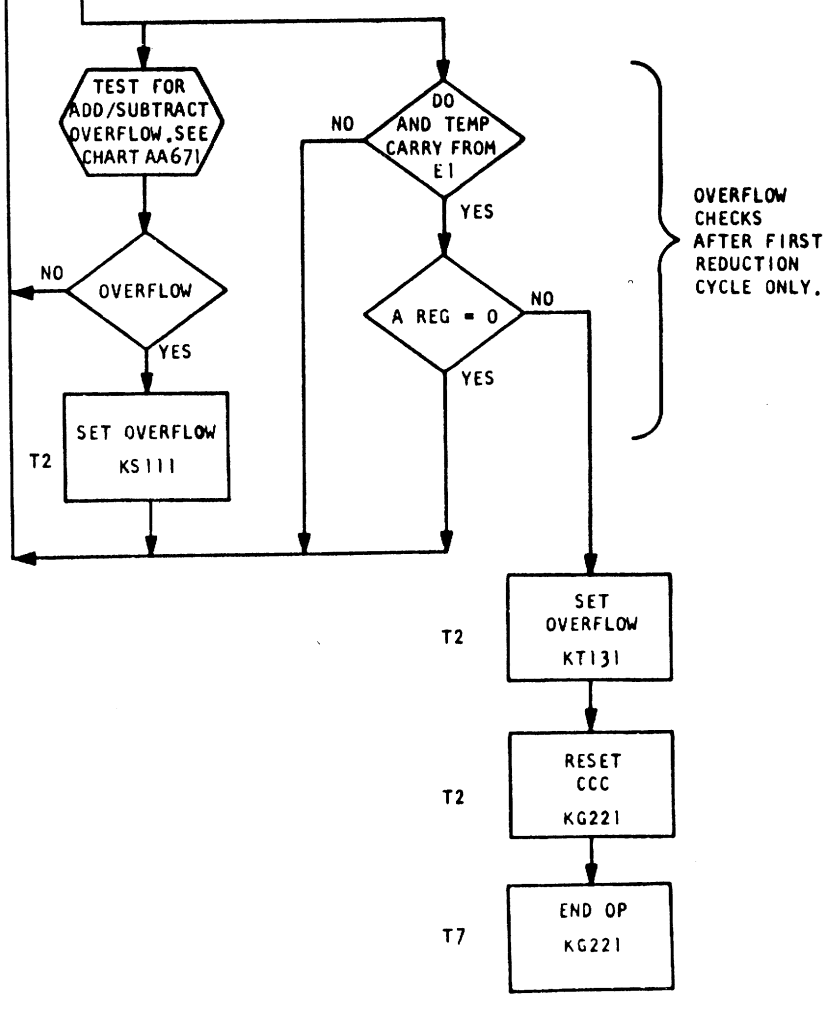
CHECK FOR ZERO DIVISOR
CHECK FOR TOO LARGE A NEGATIVE DIVIDEND

5.2 CHECKS AFTER FIRST REDUCTION CYCLE -

CHECKS FOR A REMAINDER WHICH IS TOO LARGE TO BE REPRESENTED CORRECTLY IN THE ACCUMULATOR (SIMILAR TO ADD/SUB OVERFLOW). CHECKS FOR EXCEPTIONAL CASES (OF UNLIKE DIVIDEND AND DIVISOR SIGNS), WHICH ARE NOT DETECTABLE BY THE LAST CYCLE CHECK.

5.3 LAST CYCLE CHECK -

CHECKS THAT LIKE DIVIDEND AND DIVISOR SIGNS GIVE A POSITIVE QUOTIENT. CHECKS THAT UNLIKE DIVIDEND AND DIVISOR SIGNS GIVE A NEGATIVE QUOTIENT.

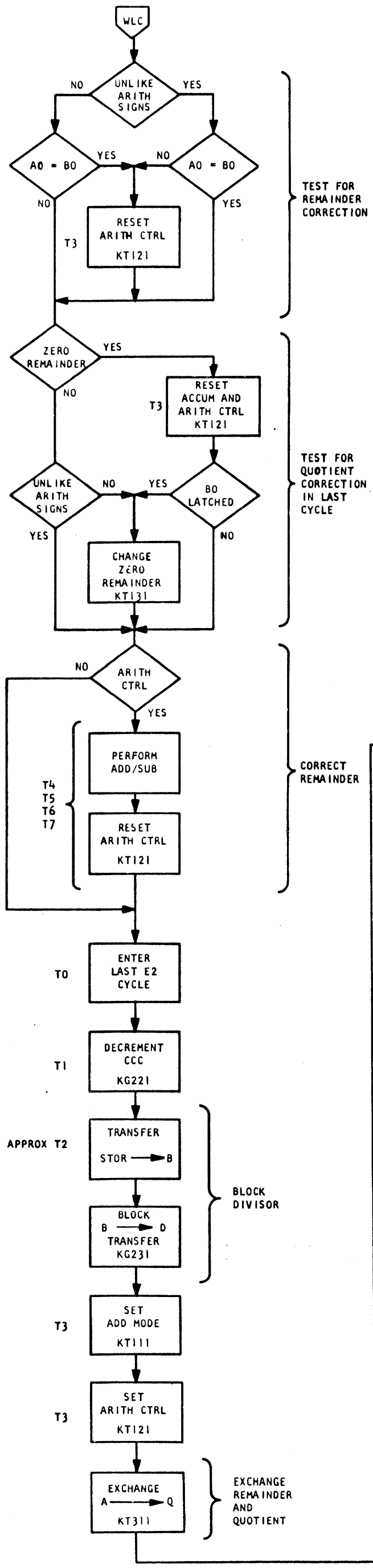


DATE	EC NUMBER	DATE	EC NUMBER	OP CODE 10101 DIVIDE	DATE	AUG 65	P/N	2201453	AA674
OCT 65	415483A						TYPE	1130	
22APR68	419675								

IBM

OP CODE 10101 DIVIDE CORRECTION CYCLES

SHEET 3



ALGORITHM (CONT.):

6) THE SEVENTEENTH (NEXT TO LAST) E CYCLE IS THE REMAINDER CORRECTION CYCLE. IF THE REMAINDER SIGN IS NOT THE SAME AS THE ORIGINAL DIVIDEND SIGN, THE DIVISOR IS ADDED TO (OR SUBTRACTED FROM) THE ACCUMULATOR TO CORRECT THE REMAINDER.

7) THE EIGHTEENTH (LAST) E CYCLE PLACES THE QUOTIENT IN THE ACCUMULATOR AND THE REMAINDER IN THE Q REGISTER, CORRECTS THE QUOTIENT, AND PERFORMS THE OVERFLOW CHECKS AS DESCRIBED UNDER 5.3. THE QUOTIENT GENERATED WILL BE EITHER A POSITIVE NUMBER, OR A NEGATIVE NUMBER IN ONE'S COMPLEMENT FORM. SINCE THE 1130 SYSTEM USES TWO'S COMPLEMENT REPRESENTATION FOR NEGATIVE NUMBERS, A ONE IS ADDED TO THE QUOTIENT WHEN A ONE'S COMPLEMENT RESULT IS DETECTED BY THE FOLLOWING:

7.1) DIVIDEND PLUS AND DIVISOR MINUS

7.2) DIVIDEND MINUS AND DIVISOR PLUS, EXCEPT WHEN REMAINDER IS ZERO

7.3) DIVIDEND MINUS AND DIVISOR MINUS, AND REMAINDER IS ZERO

DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	415483A		
22APR68	419675		

OP CODE 10101 DIVIDE

DATE AUG 65 | P/N 2201453 | TYPE 1130

IBM

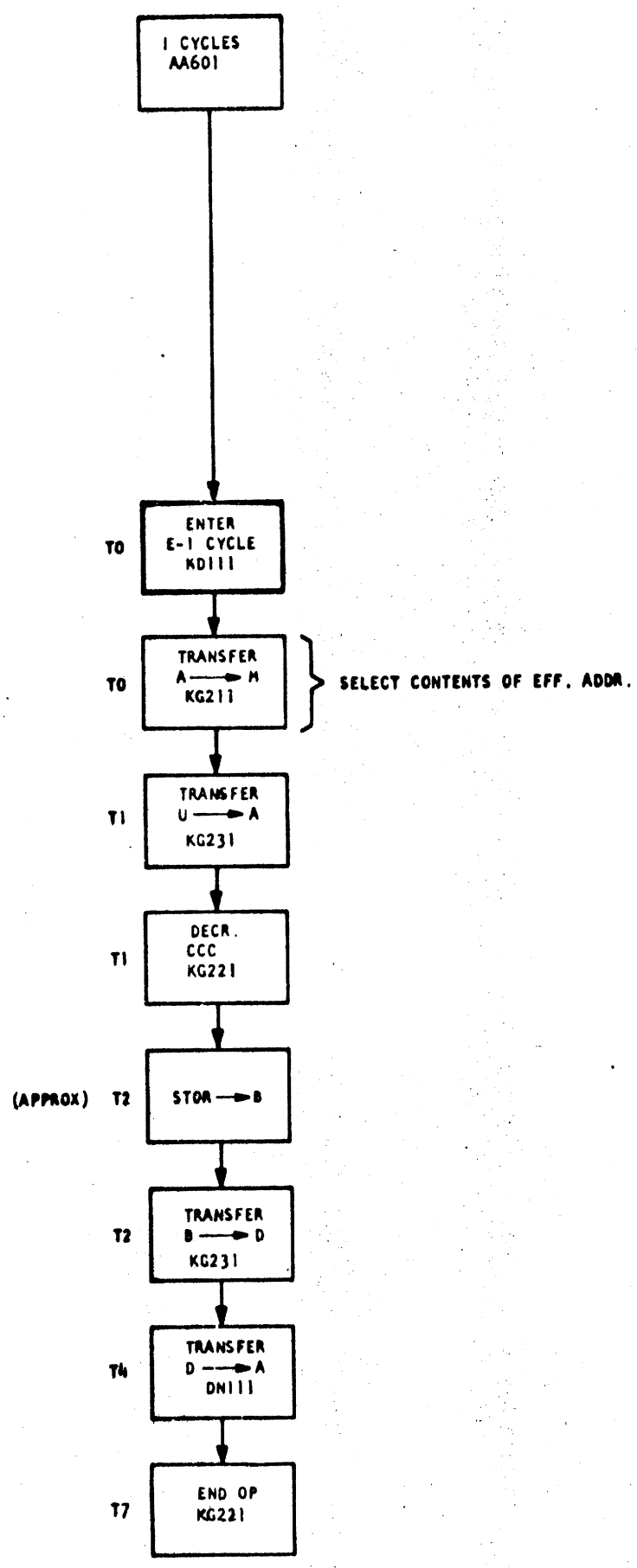
AA674

OP CODE 11000
LOAD ACCUM

AA681

OBJECTIVES:

TRANSFER THE CONTENTS OF THE EFF. ADDR. INTO THE ACCUM.



DATE	EC NUMBER	DATE	EC NUMBER
	4154800		

OP CODE 11000
LOAD ACCUM

DATE	P/N	TYPE
5-24-65	2201455	1131

IBM

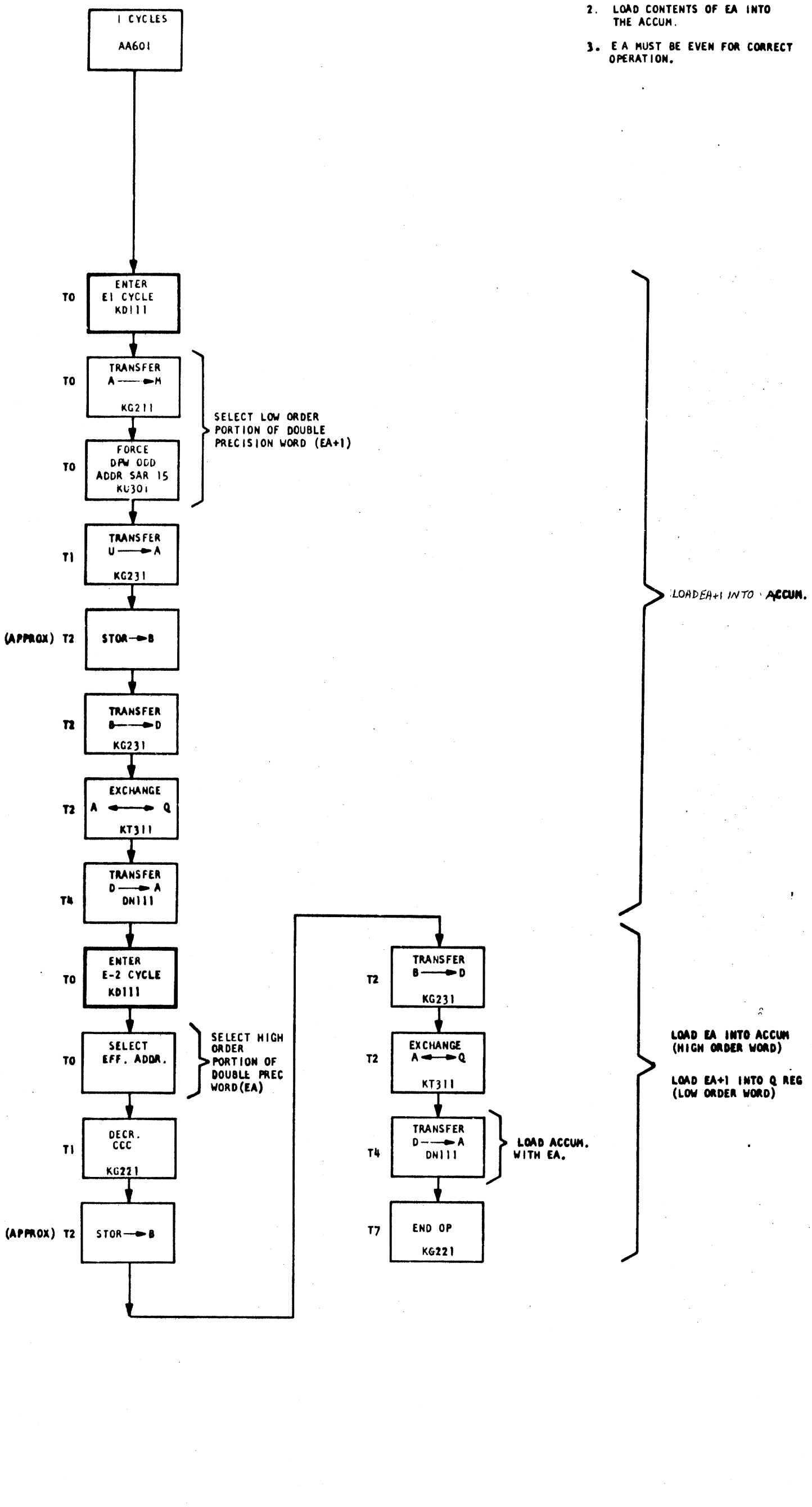
AA681

AA681

OP CODE 11001 DOUBLE PREC LOAD

OBJECTIVES:

1. LOAD CONTENTS OF EA+1 INTO THE Q REG.
2. LOAD CONTENTS OF EA INTO THE ACCUM.
3. E A MUST BE EVEN FOR CORRECT OPERATION.



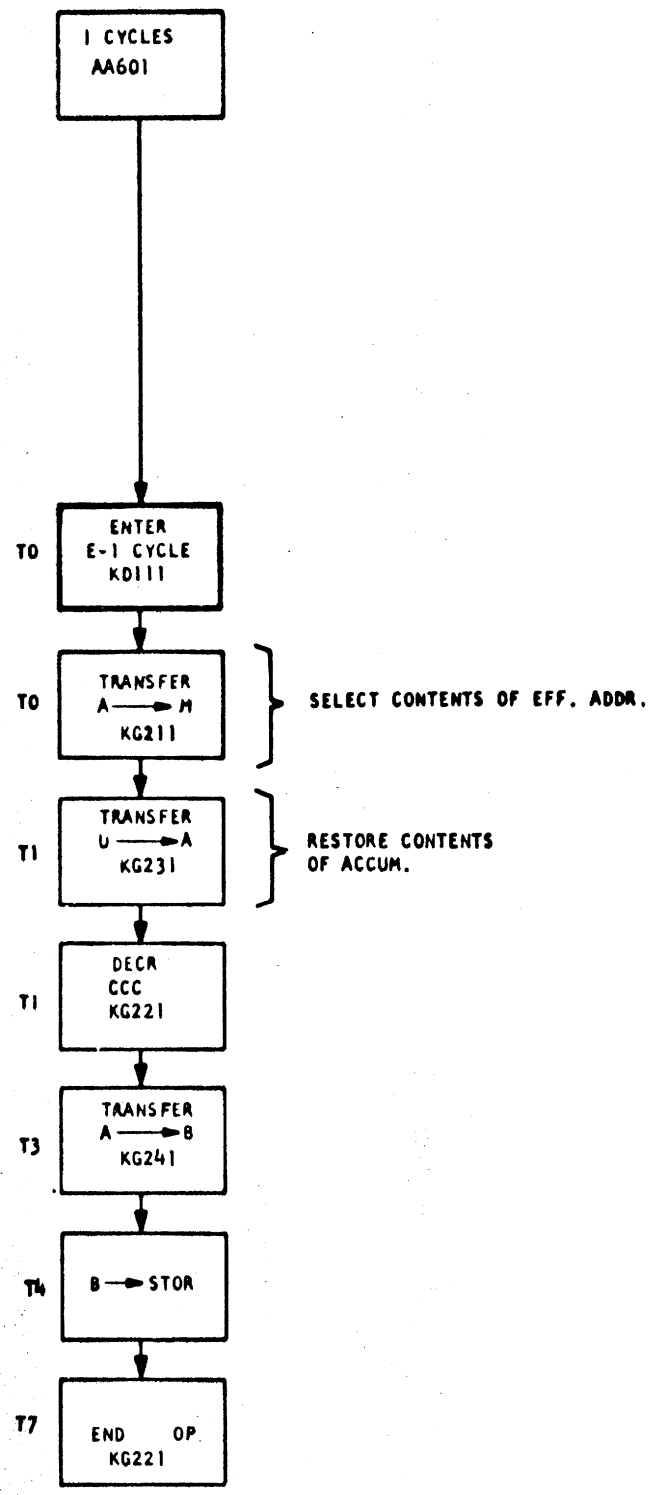
DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154831		4154800

OP CODE 11001
DOUBLE PREC LOAD
DATE 5-24-65 P/N 2201456
TYPE 1131
IBM AA682

OP CODE 11010 STORE ACCUM

AA683

OBJECTIVE:
STORE THE ACCUM INTO THE EFF. ADDR.



OP CODE 11010			
STORE ACCUMULATOR			
DATE	5-24-65	P/N	2201457
		TYPE	1131
EC NUMBER		PAGE NO	AA683
DATE			
EC NUMBER	4154800		
DATE			

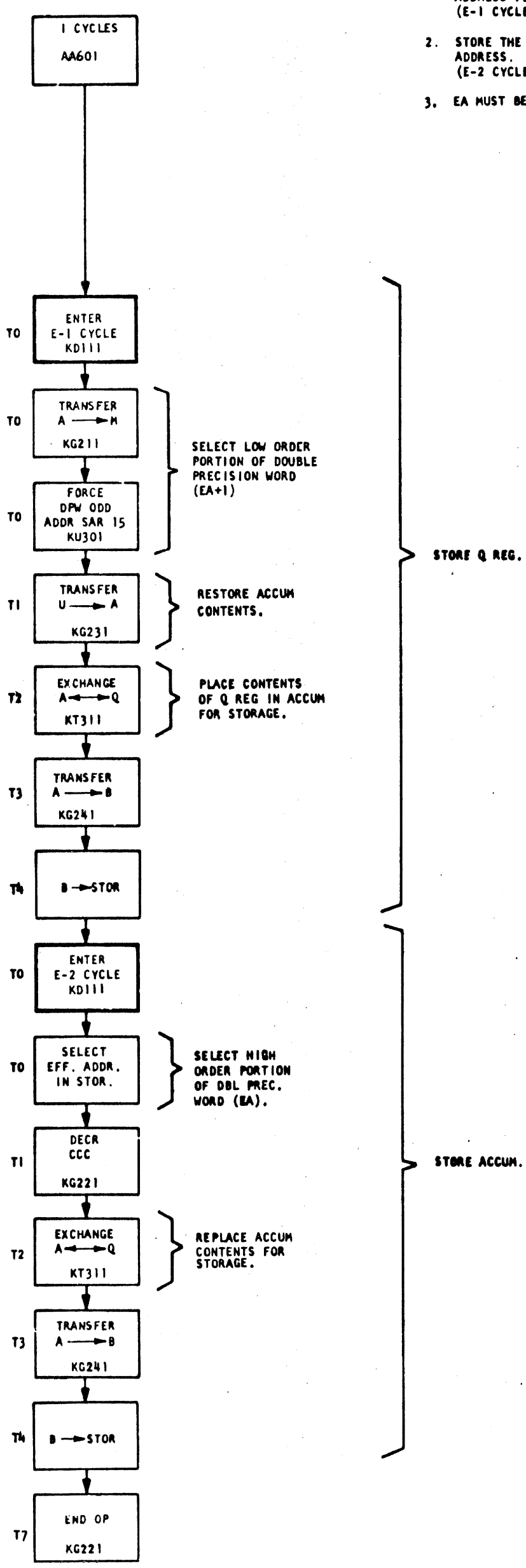
IBM

AA683

OP CODE 11011
DOUBLE PREC STORE

OBJECTIVES:

1. STORE THE Q REG. INTO THE EFFECTIVE ADDRESS PLUS ONE. (E-1 CYCLE)
2. STORE THE ACCUM INTO THE EFFECTIVE ADDRESS. (E-2 CYCLE)
3. EA MUST BE EVEN FOR CORRECT OPERATION.

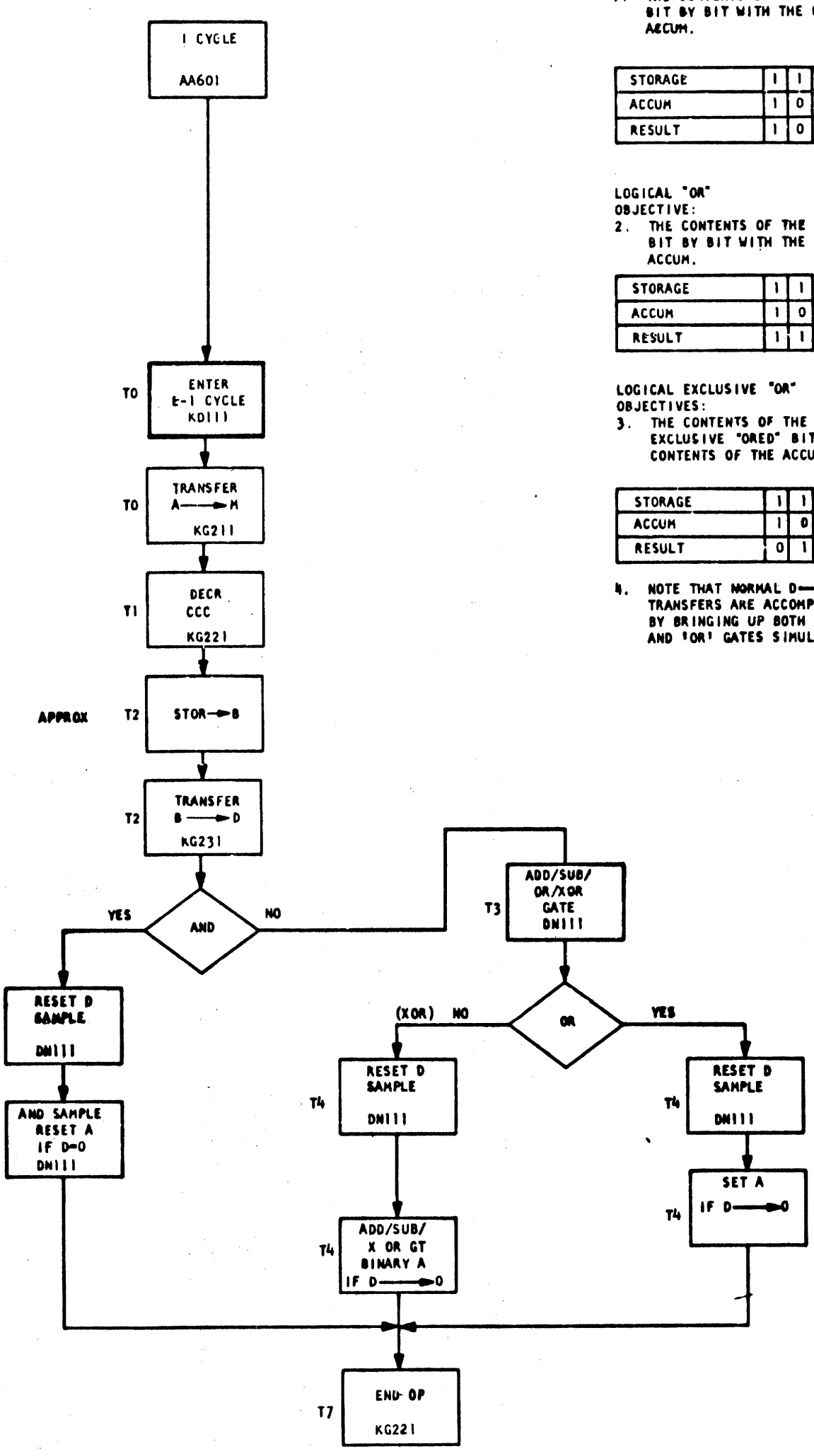


DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154830		
	4154480D		

0P CODE 11011			
DOUBLE PREC STORE			
DATE	5-24-65	P/N	2201458
		TYPE	1131

IBM AA684

OP CODE 11100 LOGICAL AND/OP CODE 11101 LOGICAL OR/OP CODE 11110 LOGICAL EXCLUSIVE OR



LOGICAL "AND"
OBJECTIVE:
1. THE CONTENTS OF THE EFF. ADDR ARE "ANDED" BIT BY BIT WITH THE CONTENTS OF THE ACCUM.

STORAGE	1	1	0	0
ACCUM	1	0	1	0
RESULT	1	0	0	0

LOGICAL "OR"
OBJECTIVE:
2. THE CONTENTS OF THE EFF. ADDR. ARE "ORED" BIT BY BIT WITH THE CONTENTS OF THE ACCUM.

STORAGE	1	1	0	0
ACCUM	1	0	1	0
RESULT	1	1	1	0

LOGICAL EXCLUSIVE "OR"
OBJECTIVES:
3. THE CONTENTS OF THE EFF. ADDR. ARE EXCLUSIVE "ORED" BIT BY BIT WITH THE CONTENTS OF THE ACCUM.

STORAGE	1	1	0	0
ACCUM	1	0	1	0
RESULT	0	1	1	0

4. NOTE THAT NORMAL D ⟶ A TRANSFERS ARE ACCOMPLISHED BY BRINGING UP BOTH 'AND' AND 'OR' GATES SIMULTANEOUSLY.

DATE	EC NUMBER	DATE	EC NUMBER
MAY-65	4154800		
AUG-65	4154801		
OCT 65	4154831		

OP CDE 11100 LOGICAL AND
OP CD 11101 LOGICAL OR OP CD
11110 LOGICAL EXCLUSIVE OR

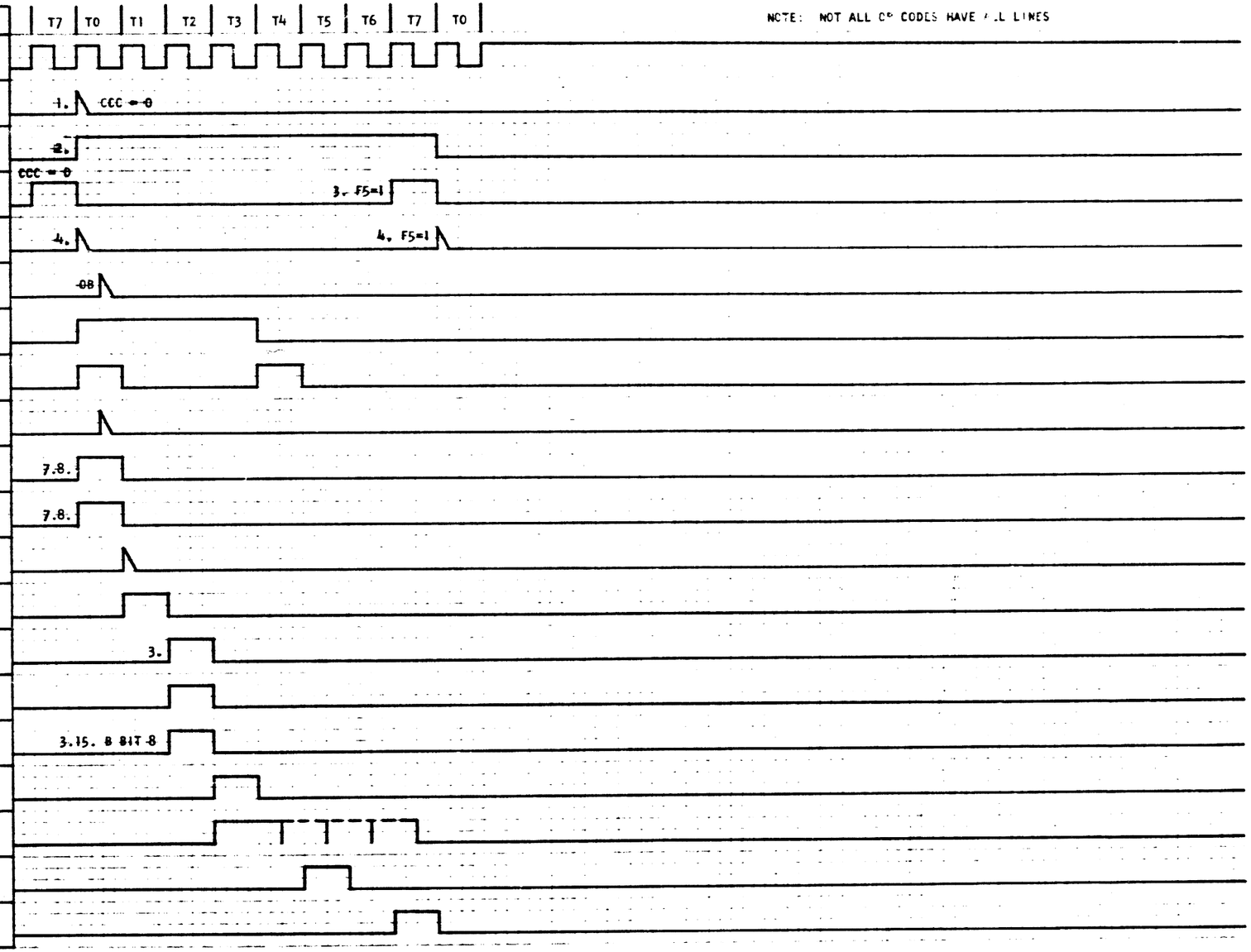
DATE 5-24-65 P/N 2201460
TYPE 1131

IBM

AA691

I1 CYCLE TIMING CHART

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	T CLOCK ADV SAMPLE	KA101 BC4	BA1C4G03	-
2	END TO SP	KT331 AR2	BA1B4D04	-
3	I 1 CYCLE (FF)	KD101 AS2	BA1G2J09	+
4	I TO M SPD GATE	KG211 AS4	BA1M2J06	-
5	I TO M SP 0-7 8-15	KG101 AL2	BB1F3B12	-
6	START IAR INCREMENT	KG101 AT2	BB1G5B03	-
7	STORAGE READ CYCLE	MC101 AQ4	BA1J2B13	+
8	STORAGE SELECT	MC101 AZ4	BA1J2B10	+
9	RESET D REG SP	KG151 AS2	BA1H2D02	-
10	DC RESET B 0-7	KU311 AR4	BA1H2D10	-
11	DC RESET OP REG AND OP FLAGS	KU311 AS4	BA1H2B07	-
12	A TO U SP 0-7	KG131 AL2	BB1F4B08	-
13	DC RESET A REG	KU311 AT4	BA1H2D04	-
14	GATE B BITS 0-9 TO OP REG	KD101 AZ4	BA1G2J06	+
15	GATE B TO D 8-15	KG231 AL4	BA1H4D02	+
16	DC SET D 0-7	KG231 AM4	BA1H4B10	-
17	GATE I TO A 0-7	KG231 BA4	BA1H4B02	+
18	ARITH CONTROL	KT121 AZ2	BA1H4J06	+
19	SET CCC 1	KG221 AF4	BA1E2G12	-
20	A TO M SPD GATE	KG211 BF4	BA1M2G05	-



DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	415483A		
22APR68	419675		

I1 CYCLE TIMING CHART

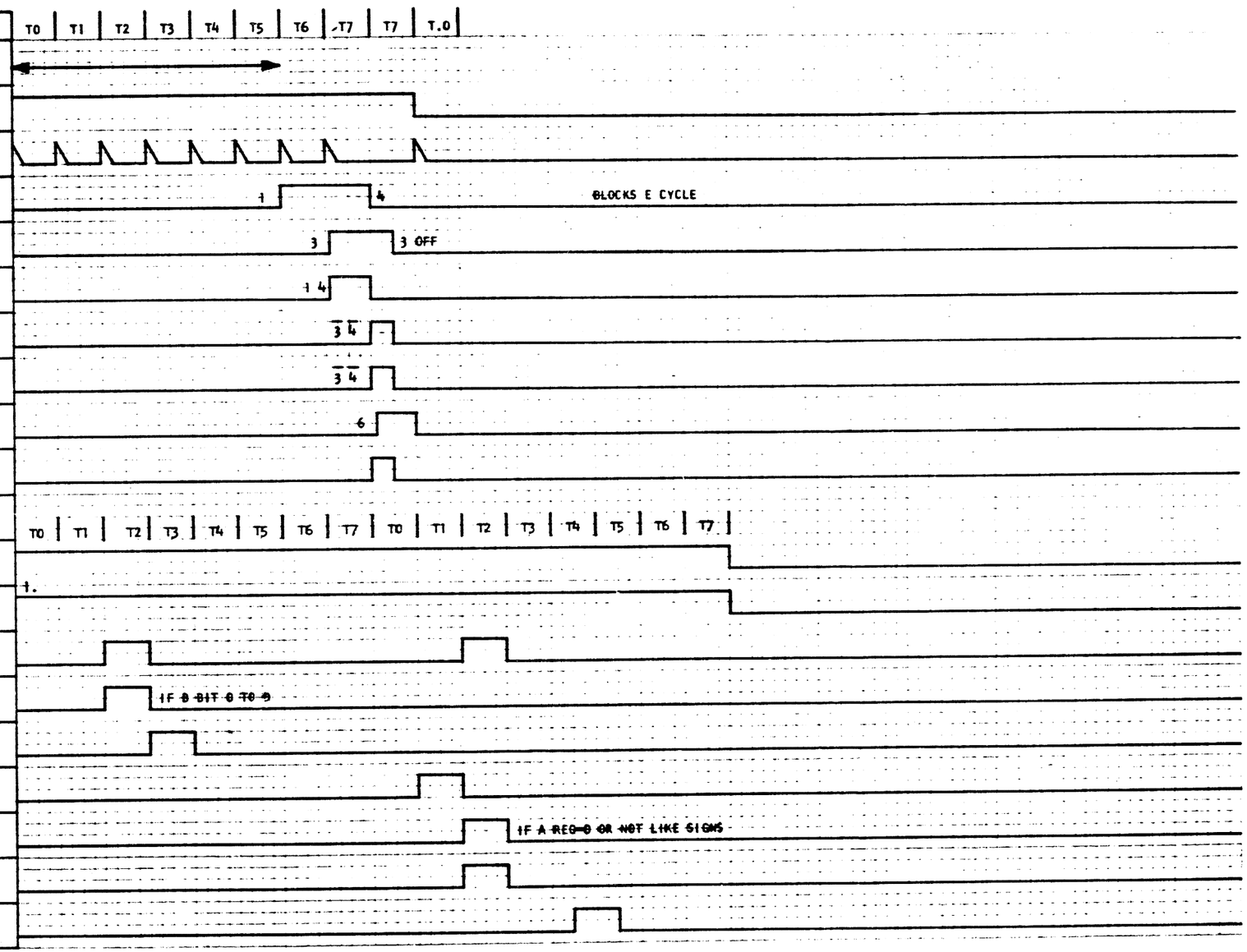
DATE | P N 2201299

TYPE 1130

IBM AA701

OP CODE 01110 MDX TIMING CHART

	NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
F=0 TAG=00	0	NORMAL I-1 STEPS	-	-	+
	1	MDX	KG241 AF4	BA1L2G13	-
	2	T CLOCK ADV SP	KA101 BH2	BA1C4D02	-
	3	BRANCH 1	KB101 AY2	BA1K2B10	+
	4	BRANCH 2	KB101 AZ2	BA1K2D12	+
	5	A TO M SPD SAMPLE	KB101 BA4	BA1K2B09	-
	6	DC RESET CCC	KG221 AK4	BA1E2B02	-
	7	M TO I SPD SAMPLE	KB101 BB4	BA1K2D06	-
	8	T7 END OP	KG221 AM4	BA1E2J13	+
	9	U TO A SPD SAMPLE	KG231 AZ4	BA1M4G07	-
F=0 TAG 01		E-1 & E2 CYCLES			
	1	IX INHIBIT SAR	KU301 AT2	BA1H2G02	+
	2	IX ADDR SAR 15	KU301 AW4	BA1H2J06	-
	3	GATE B TO D	KG231 AK4	BA1M4B13	+
	4	B BIT 0 LATCHED	KG251 AX2	BA1L2J12	+
	5	SET ARITH CONTRGL	KT201 AP4	BA1F4B04	-
	6	CCC DECREM SAMPLE	KG221 AW4	BA1E2B13	-
	7	INC IAR SAMPLE	KG211 BD4	BA1M2G13	-
	8	A TO B SPD GATE	KG241 AM4	BA1L2B07	-
	9	B TO STOR	-	-	

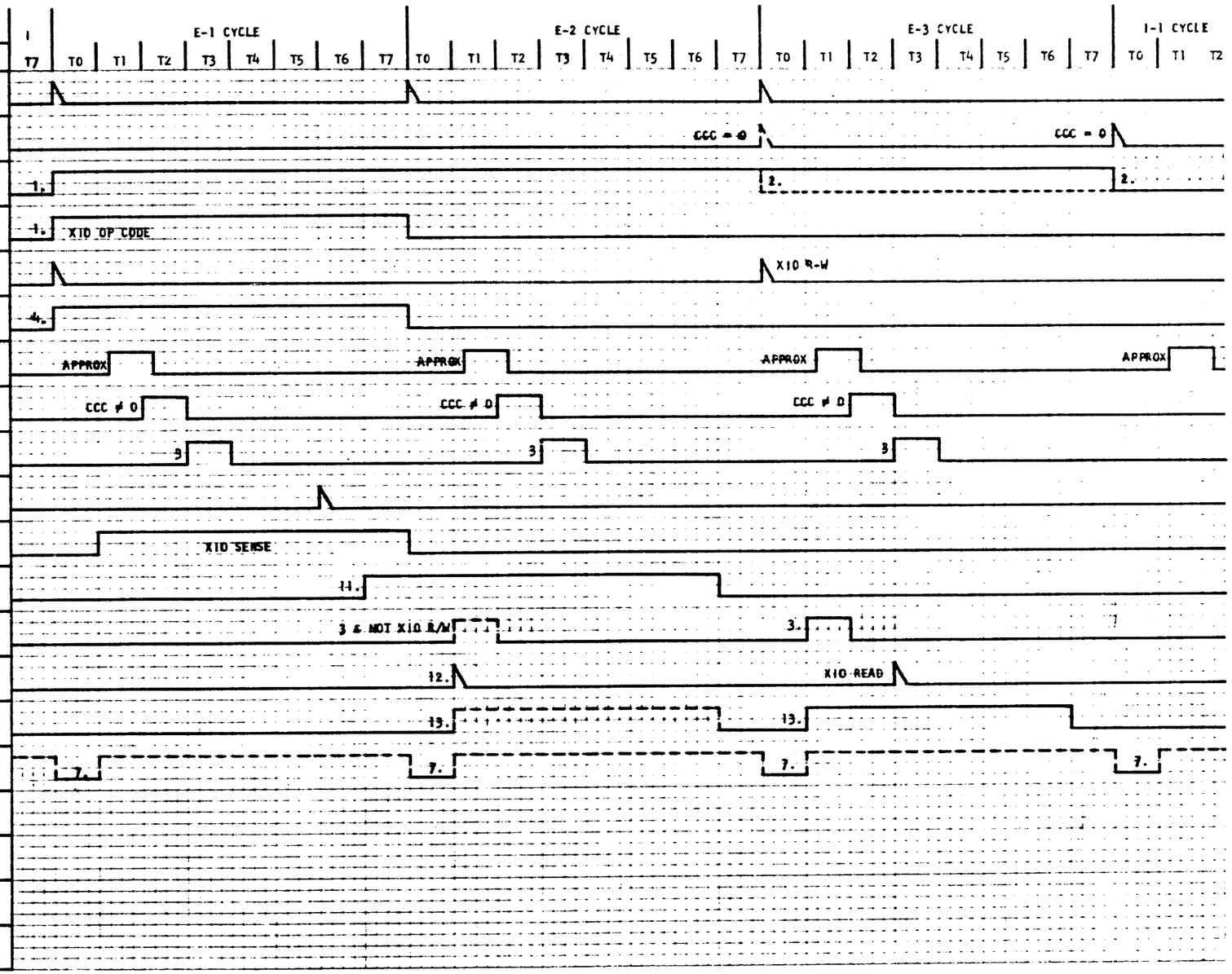


DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	415483A		
22APR68	419675		

OP CODE 01110 MDX
TIMING CHART
DATE
P/N 2201338
TYPE 1130
IBM
AA711

OP CODE 00001 - X10 TIMING CHART

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	NOT END OP TO SP	KT331 AQ2	BA1B4B10	-
2	END OP TO SP	KT331 AR2	BA1B4D04	-
3	E CYCLES	KD111 AZ6	BA1G2B07	-
4	DBL WORD ODD ADDR	RN111 AT6	BA182G12	-
5	A TO M SP 0-7	KG101 AJ2	BB1F3D04	-
6	DPW ODD ADDR SAR 15	KU301 AW4	BA1H2J06	-
7	STORAGE TO B			
8	GATE B TO D 0-7	KG231 AK4	BA1M4B13	+
9	ADD, SUB OR EOR GATE (D TO A)	DN111 AY4	BA1D2G09	-
10	A TO U SP 0-7	KG131 AL2	BB1F4B08	-
11	GATE SENSE INHIBIT STORAGE USE	DN201 AS4	BA1H7B10	-
12	NOT STORAGE USE	DN201 AB4	BA1J7B02	+
13	CCC DECREM SAMPLE	KG221 AW4	BA1E2B13	-
14	I/O TO B SP	KG121 AL2	BB1F4B12	-
15	X10 TIME GATE	DN201 BE4	BA1K7D06	-
16	B BIT 0 PWR	RB301 AA4	BB1K6D05	-



DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	415483A		
22APR68	419675		

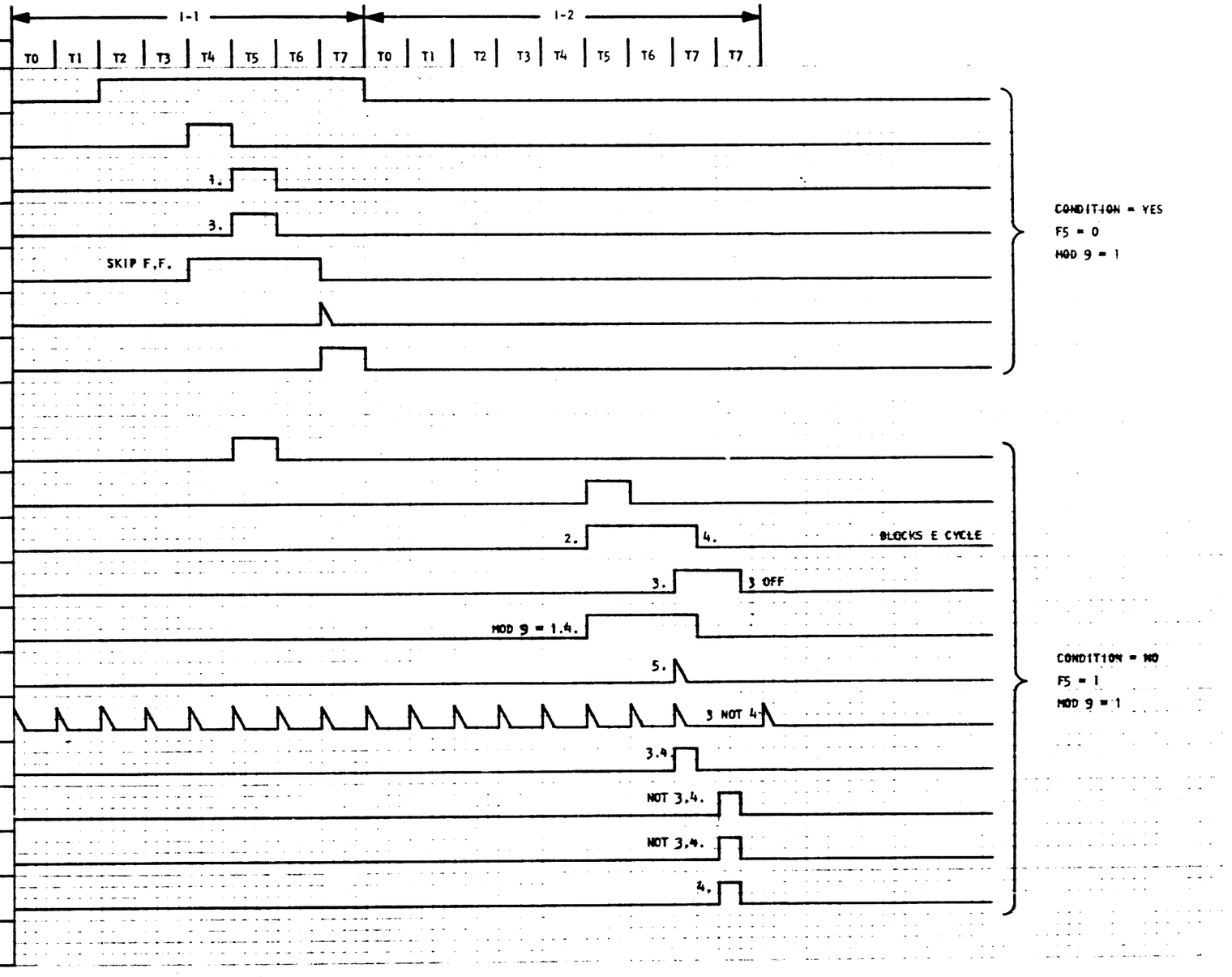
OP CODE 00001 - X10
TIMING CHART

DATE		P/N	2201297
		TYPE	1130

IBM AA721

OP CODE 01001 BSC TIMING CHART

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	SKIP CONDITION	KS111 AX4	BA1J4B08	-
2	BSI OR BSC RESET OVERFLOW	KB111 AX4	BA1K2B12	-
3	SKIP SAMPLE	KB111 AW4	BA1K2D04	-
4	INC IAR SAMPLE	KG211 BD4	BA1M2G13	-
5	BRANCH OUT	KB111 AY4	BA1K2J09	-
6	RESET INT LVLS SP	KT331 AM2	BA1B4B02	-
7	-U TO A SPD SAMPLE	KG231 AZ4	BA1M4G07	-
1	SET CCC 1	KG221 AF4	BA1E2G12	-
2	E GATE TURN ON	KD111 AB4	BA1G2D12	-
3	BRANCH 1	KB101 AY2	BA1K2B10	+
4	BRANCH 2	KB101 AZ2	BA1K2D12	+
5	BRANCH OUT	KB111 AY4	BA1K2J09	-
6	RESET INT LVLS SP	KT331 AM2	BA1B4B02	-
7	T CLOCK ADV SP	KA101 BH2	BA1C4D02	-
8	A TO M SPD SAMPLE	KB101 BA4	BA1K2B09	-
9	DC RESET CCC	KG221 AK4	BA1E2B02	-
10	M TO I SPD SAMPLE	KB101 BB4	BA1K2D06	-
11	U TC A SPD SAMPLE	KG231 AZ4	BA1M4G07	-



DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	415483A		
22APR68	419675		

OP CODE 01001 BSC
TIMING CHART

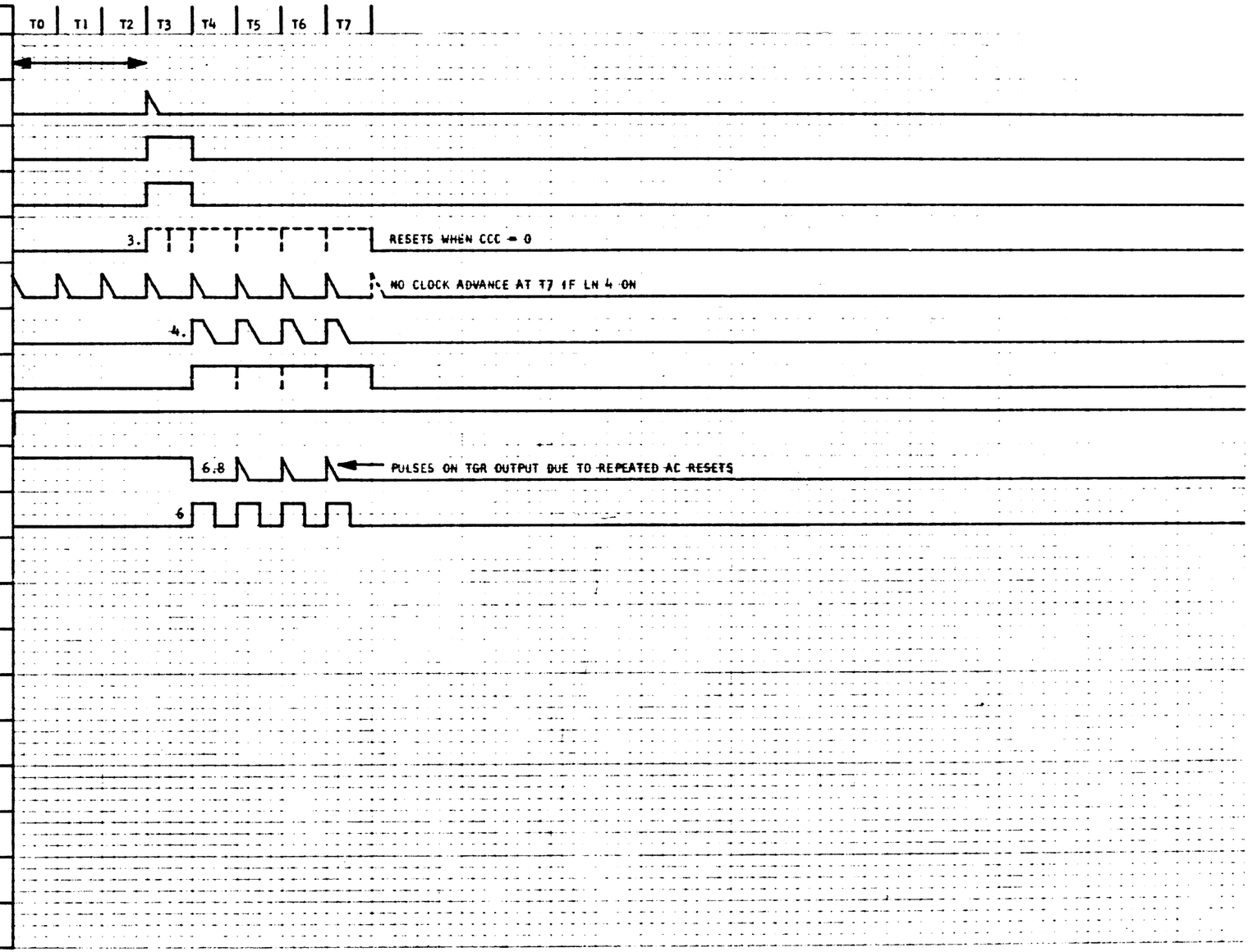
DATE		P N	2201340
		TYPE	1130

IBM AA731

2	3	4	5	6	7

OP CODE 00010 SLA TIMING CHART

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
	NORMAL I CYCLE STEPS			
1	U TO A SP 0-7	KG131 AM2	BB1F5B08	-
2	GT B10-15 TO CCC	KT301 BE4	BA1K4D06	+
3	SHIFT OP GATE T3	KT301 BB4	BA1K4B08	-
4	SHIFT CTRL	KT121 AY6	BA1H4G07	-
5	T CLOCK ADVANCE SP	KA101 BH2	BA1C4D02	-
6	SHIFT LEFT SAMPLE	KT311 AE4	BA1L4G12	-
7	CARRY	KS101 BD2	BA1J4D04	+
8	ACC BIT 15 SHIFT LT ENTRY	KT201 AZ4	BA1F4G07	+
9	A BIT 15	RA271 AU2	BB1L4J05	+
10	CCC DECREM SAMPLE	KG221 AW4	BA1EZB13	-



A B C D E

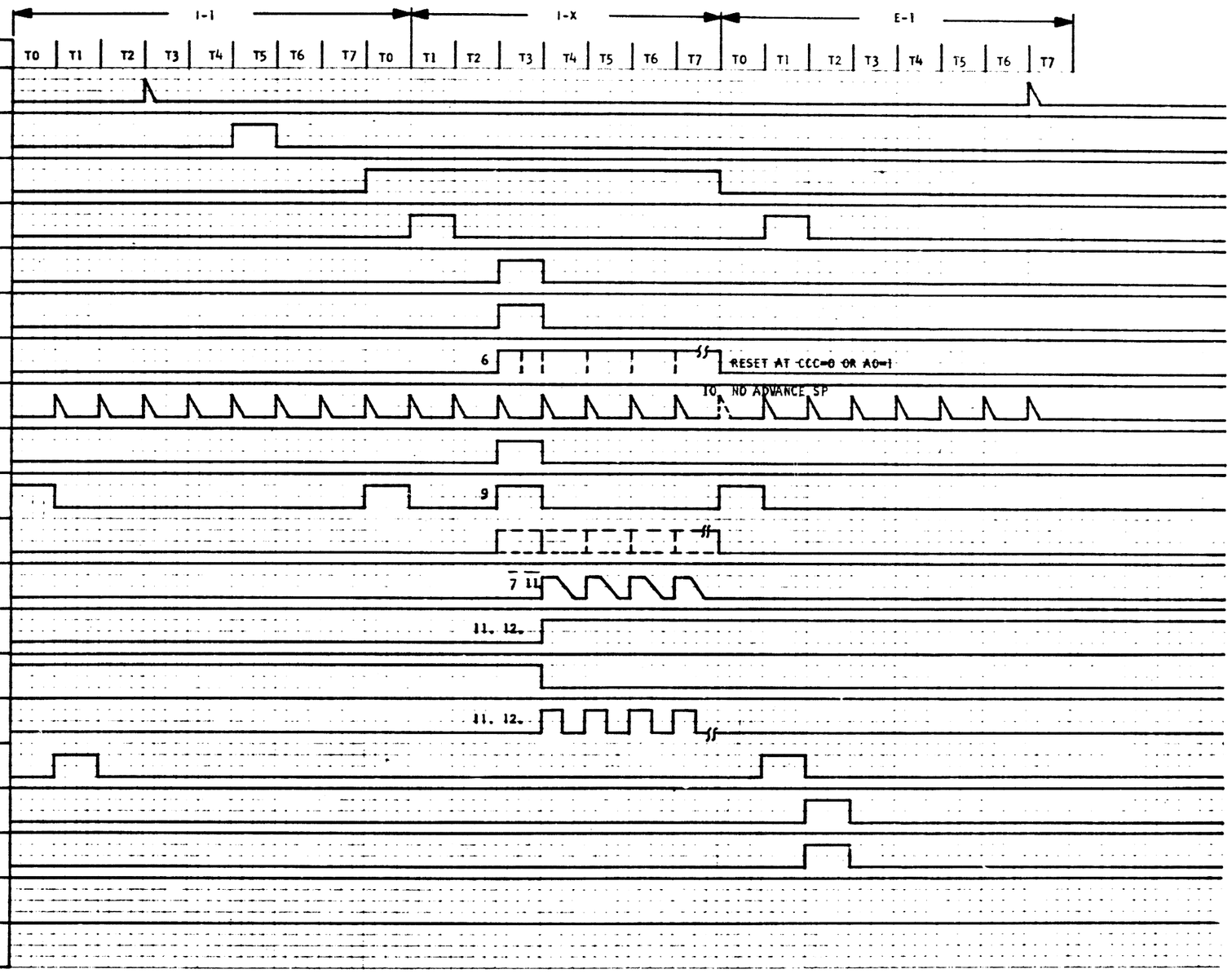
DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	415483A		
22APR68	419675		

OP CODE 00010 SLA
TIMING CHART
DATE
P/N 2201371
TYPE 1130
IBM
AA741

OP CODE 00010 SLCA TIMING CHART

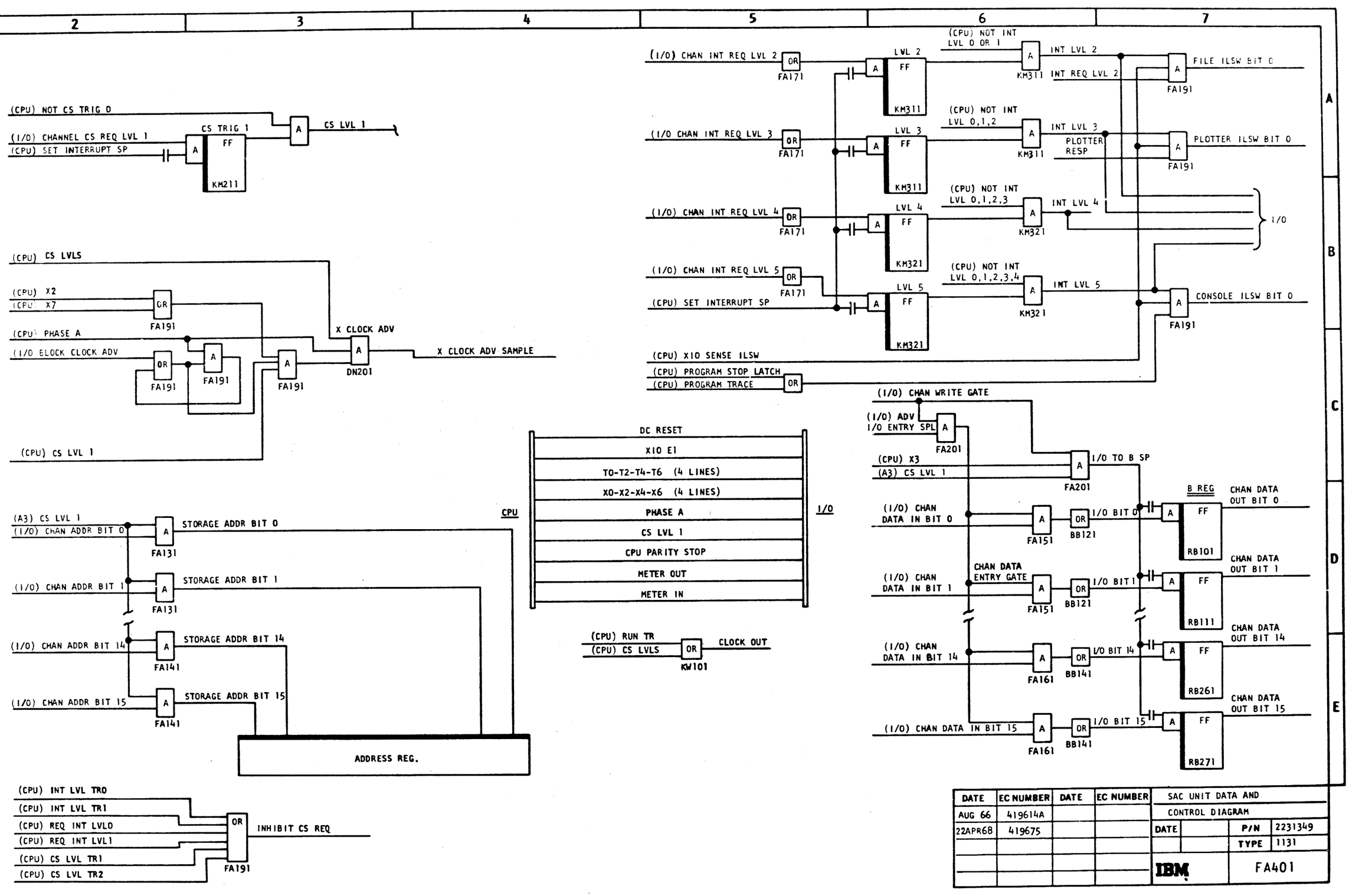
F=0 TAG≠00 MOD 9=1

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	U TO A SP	KG131 AM2	BB1F5B08	-
2	SET CCC 1	KG221 AF4	BA1E2G12	-
3	IX ADDR INHIBIT SAR	KU301 AT6	BA1H2J12	-
4	DC RESET CCC	KG221 AK4	BA1E2B02	-
5	GATE B10-15 TO CCC	KT301 BE4	BA1K4D06	+
6	SHIFT OP GATE	KT301 BB4	BA1K4B08	-
7	SHIFT CONTROL	KT121 AY6	BA1H4G07	-
8	T CLOCK ADVANCE SP	KA101 BH2	BA1C4D02	-
9	SLC RESET CARRY	KU301 AH4	BA1H2D12	-
10	DC RESET B 8-15	KU311 AQ4	BA1H2D11	-
11	A BIT 0	RA101 AU2	BB1B4D11	+
12	SHIFT LEFT SAMPLE	KT311 AE4	BA1L4G12	-
13	CARRY	KS101 BD2	BA1J4D04	+
14	BIT 15	RA271 AU2	BB1L4J05	+
15	CCC DECREM SAMPLE	KG221 AW4	BA1E2B13	-
16	A TO U SPD SAMPLE	KG231 AY4	BA1M4G12	-
17	GATE CCC TO A10-A15	KT301 AZ4	BA1K4B07	-
18	A TO B 8-15 SPD GATE	KG241 AQ4	BA1L2B04	-



DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	415483A		
22APR68	419675		

OP CODE 00010 SLCA
TIMING CHART
DATE | P/N 2201339
TYPE 1130
IBM AA751



DATE	EC NUMBER	DATE	EC NUMBER
AUG 66	419614A		
22APR68	419675		

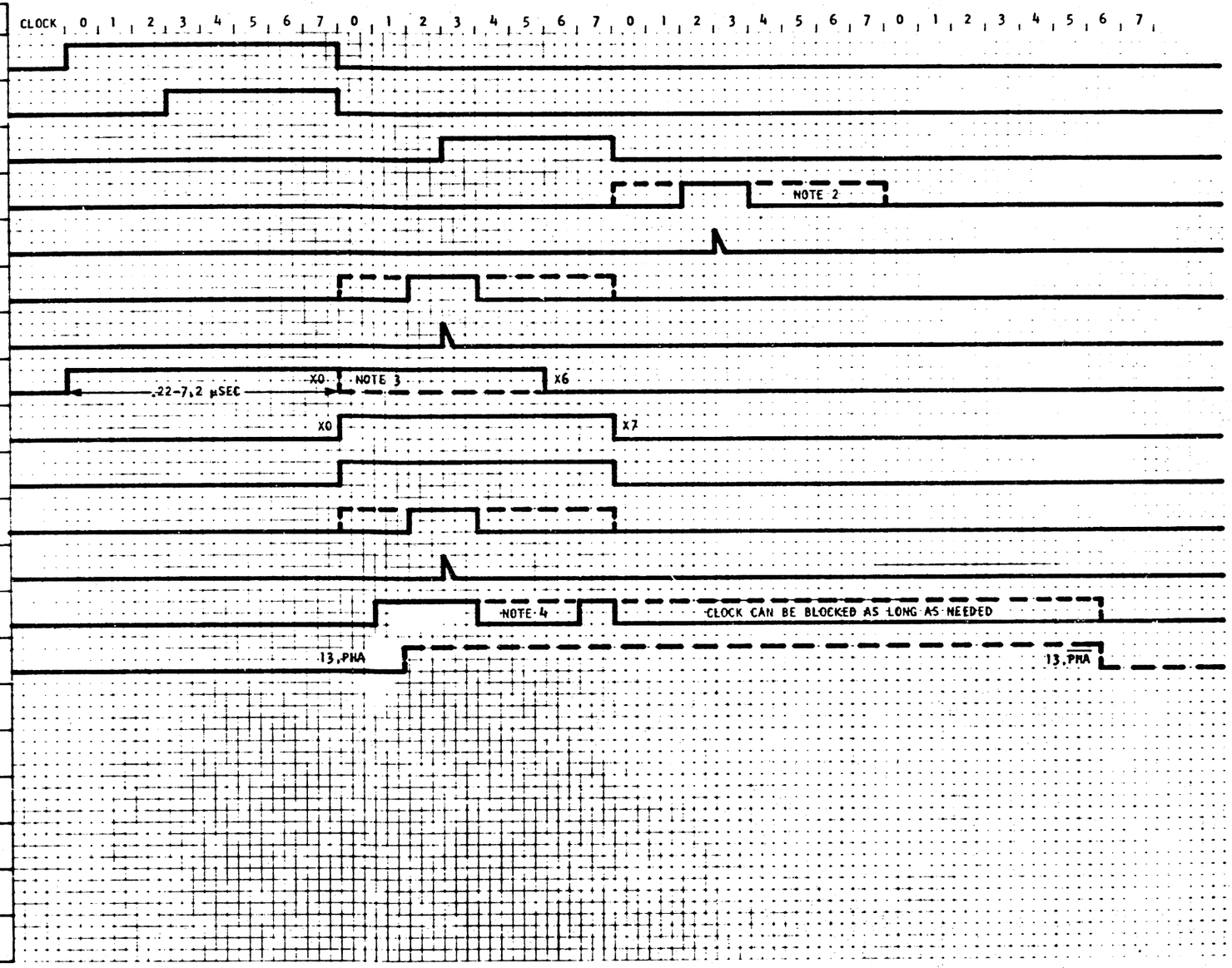
SAC UNIT DATA AND CONTROL DIAGRAM

DATE		P/N	2231349
		TYPE	1131

IBM

FA401

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	X10 E-1 CYCLE	FA101AM4	B-A1N6D07	-
2	CORE WORD IN B REG			
3	ADDR IN B REG			
4	CHANNEL WRITE GATE (X10 READ ONLY)	FA181BH4	B-B1B6D12	+
5	I/O BUSS TO B REG XFER (X10 READ ONLY)			
6	CHANNEL WRITE GATE (X10 SENSE)	FA181BH4	B-B1B6D12	+
7	I/O BUSS TO B REG XFER (X10 SENSE)			
8	CYCLE-STEAL REQ	FA101AL4	B-B1M7D12	-
9	CYCLE-STEAL LVL 1	FA201SK4	B-B1C6D06	-
10	CYCLE-STEAL ADDR GATE			
11	CHANNEL WRITE GATE (I/O TO STORAGE ONLY)	FR181BH4	B-B1B6D12	+
12	I/O BUSS TO B REG XFER (I/O TO STORAGE ONLY)			
13	BLOCK CLOCK ADV (IF REQUIRED)	FA181BP4	B-A1C7D09	-
14	BLOCK CLOCK LATCH	FA191AR4	B-A1M7D05	-



NOTES:

1. ALL TIMINGS SHOWN ARE IN REFERENCE TO SIGNALS AT THE CPU DRIVERS & TERMINATORS.
2. DOTTED LINES INDICATE MAXIMUM ALLOWABLE TIME SIGNAL CAN BE IN CPU.
3. CYCLE-STEAL REQ MAY BE RESET ANYTIME FROM X0 TO LEADING EDGE OF X6.
4. CLOCK MAY BE BLOCKED AT X2 OR X7.

OPERATION	LINES INVOLVED
X10 INITIATE READ	1,2,3
X10 INITIATE WRITE	1,2,3
X10 READ	1,2,3,4,5
X10 WRITE	1,2,3
X10 SENSE	1,2,6,7
CYCLE-STEAL	8,9,10,11,12,13,14

DATE	EC NUMBER	DATE	EC NUMBER
AUG 66	419614A		
22APR68	419675		

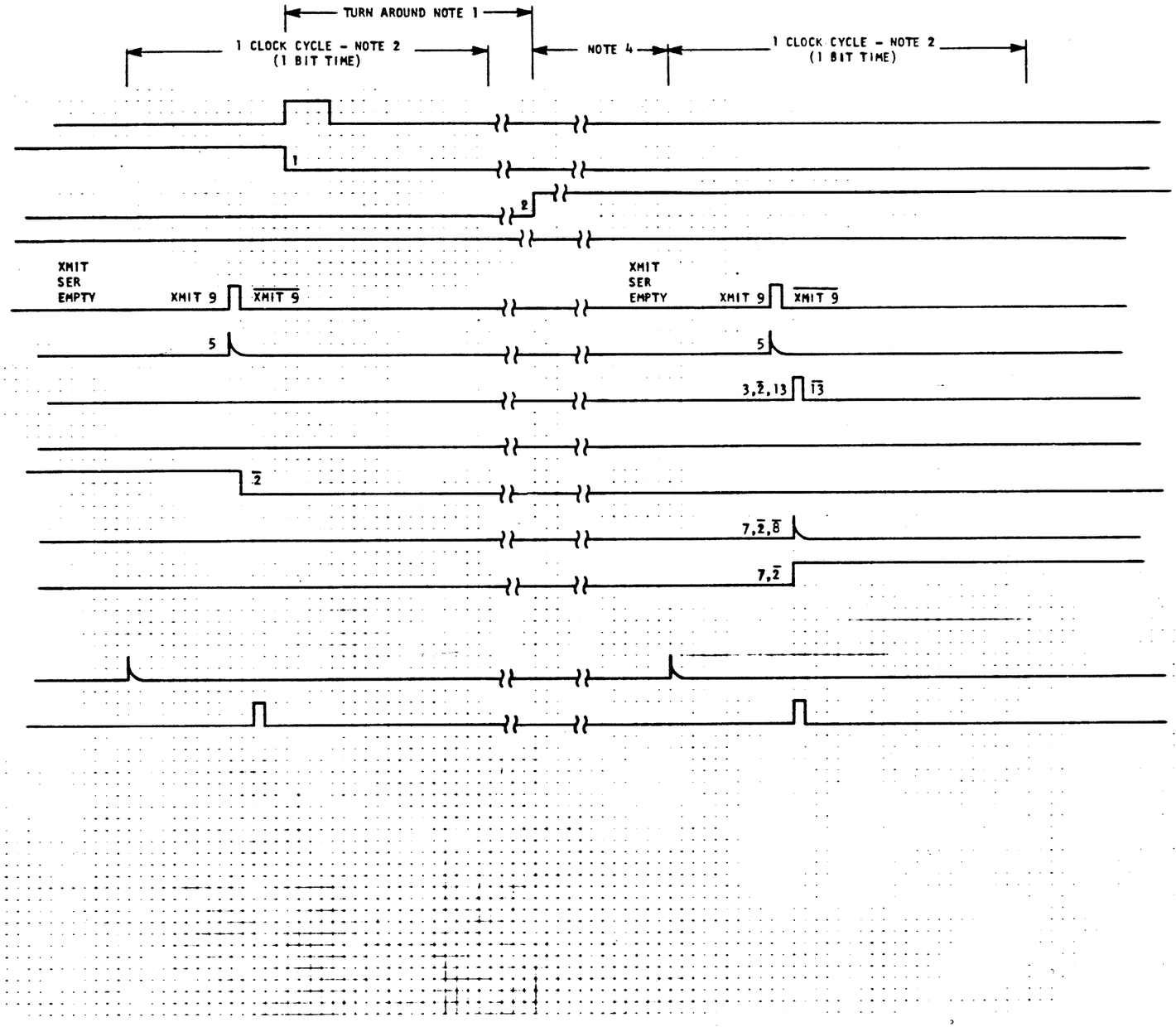
SAC TIMING

DATE | P/N 2231350

TYPE

IBM FA701

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	XIO START WRITE			
2	RCV MODE	FC311 TB4	C-A1B6B07	+
3	CLEAR TO SEND-NOTE 3 (FROM DATA SET)	FC361 AM4	C-A1D2D04	-
4	CLOCK GATE	FC111 AU1	C-A1G4B13	+
5	CHAR COMPLETE	FC641 BM2	C-A1F7D09	+
6	RESET XMIT SERIALIZER	FC741 BC2	C-A1C7D11	-
7	GATED 11	FC641 AS4	C-A1B6B02	-
8	BFR LOAD TRIGGER	FC741 AP1	C-A1G4B02	+
9	CHAR PHASE FL	FC531 BM1	C-A1L4D07	+
10	XFER SYN REG TO XMIT SER	FC741 AY2	C-A1C7D04	-
11	WRITE RESPONSE INTR	FC351 AL2	C-A1K5B09	+
12	XMIT SHIFT SPD	FC361 BV2	C-A1H2D04	-
13	XMIT 11	FC131 BH4	C-A1B2B12	-



NOTES:

1. 200 MS TURNAROUND TIME FROM DATA SET IF 2 WIRE
2. 1 CLOCK CYCLE TIME 600 BAUD IS 13.3 µSEC
   1200 BAUD IS 6.6 µSEC
   2000 BAUD IS — µSEC
   2400 BAUD IS 3.3 µSEC
3. CLEAR TO SEND IS ALWAYS ACTIVE DURING SCA OPERATION IF 4 WIRE
4. TIME WILL VARY FROM ZERO TO MAXIMUM OF 8 BIT TIME (OR 6 OR 7 IF 6 OR 7 BIT FRAME) BECAUSE CLEAR TO SEND IS ASYNCHRONOUS TO XMIT CLOCK

RED

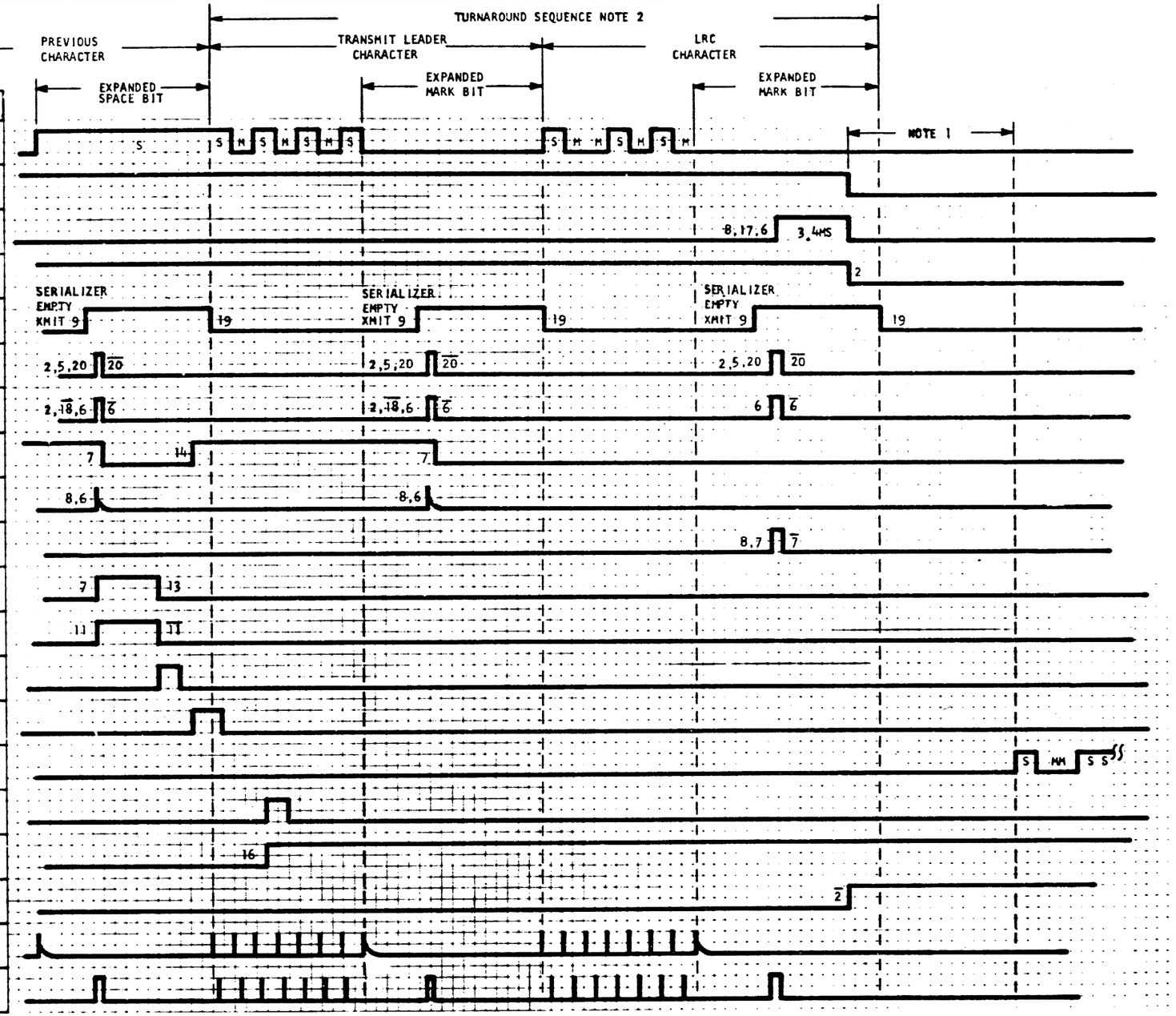
DATE	EC NUMBER	DATE	EC NUMBER
SEP 66	419632		
DEC 66	419644		
22APR68	419675		

SCA START WRITE TIMING BSC, STR. 2 OR 4 WIRE

DATE		P/N	2231301
		TYPE	1130

IBM FC702

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	TRANS LINE (LINE BIT)	FC631AL4	C-A1G6B10	+
2	XMIT MODE	FC311AX1	C-A1E3D02	+
3	RESET XMIT	FC741BB4	C-A1C2B08	+
4	CHAR PHASE	FC531BM1	C-A1L4D07	+
5	CHAR COMPLETE	FC641BM2	C-A1F7D09	+
6	GATED XMIT 11	FC641AS4	C-A1B6B02	-
7	SET WR RESP	FC641BM4	C-A1L2B10	-
8	BFR. LOAD TGR	FC741AP1	C-A1G4B02	+
9	XFR. BFR. TO XMIT SPD	FC741AJ2	C-A1C7B03	-
10	CHAR GAP	FC741AM4		+
11	WR. RESP	FC351AL2	C-A1K5B09	+
12	LVL 1 INT. REQ	FC351BD4	C-A1J3B07	+
13	X10 SENSE DSW	DU101AY4	C-A1M7B13	+
14	X10 WRITE	FC311AA4	C-A1H7B02	-
15	RCV SPACE	FC411BX4	C-A1J4D06	+
16	X10 START READ	FC311AB4	C-A1H7D10	-
17	RCV TR.	FC311AW1	C-A1E3D07	+
18	RCV MODE	FC311BB4	C-A1B6B07	-
19	XMIT SHIFT (STROBE SPD)	FC361BV2	C-A1H2D04	-
20	XMIT 11	FC131BM4	C-A1B2B12	-



NOTES: 1. 200 MS TURNAROUND TIME FROM DATA SET IF 2 WIRE TELEPHONE LINES
ZERO MS TURNAROUND TIME FROM DATA SET IF 4 WIRE TELEPHONE LINES
2. TWO CHARACTERS FOR STR: TL AND A ONE CHARACTER LRC CHAR THREE CHARACTERS FOR BSC: ETB AND A TWO CHARACTER CRC CHAR.

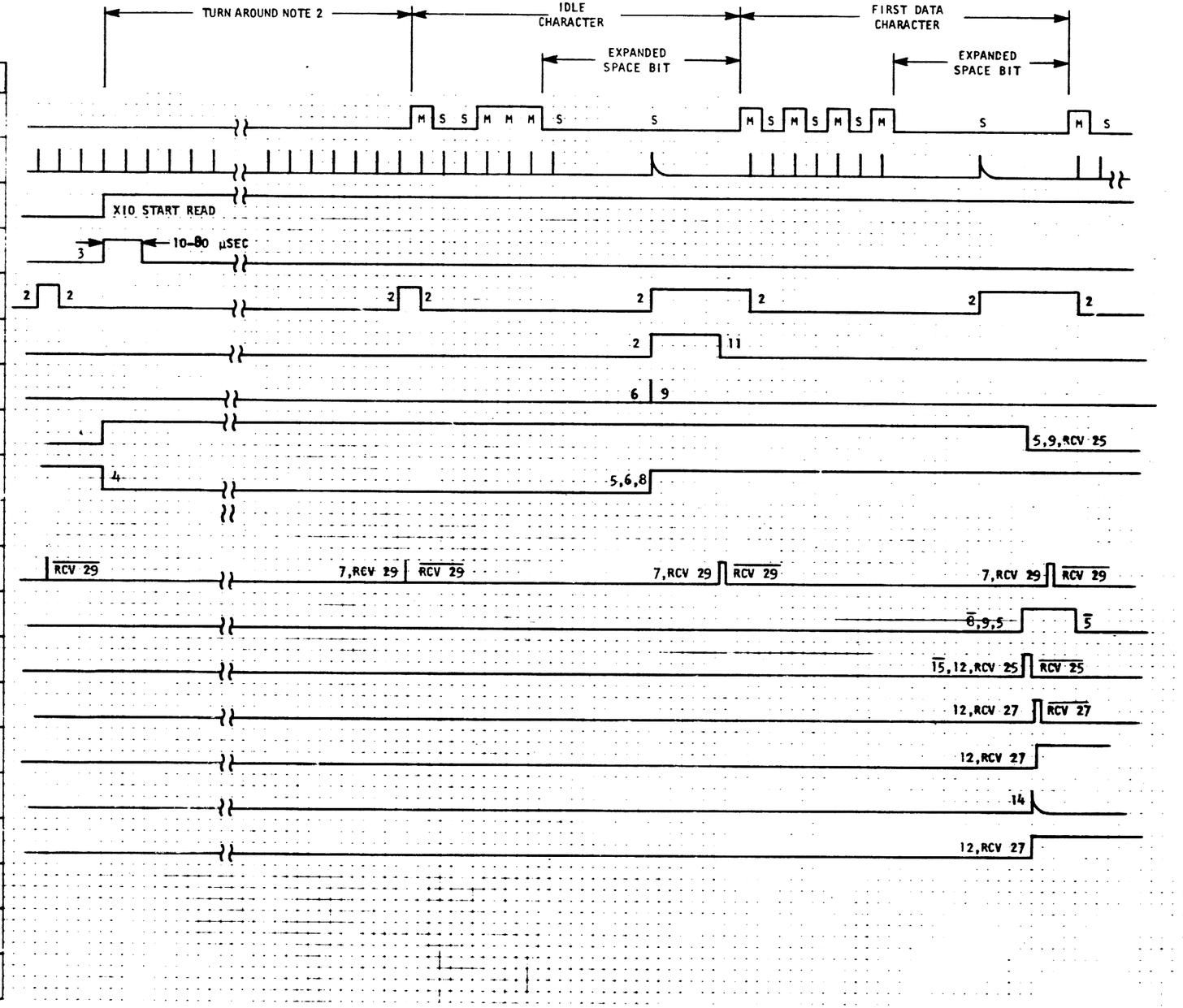
DATE	EC NUMBER	DATE	EC NUMBER
SEP 66	415632		
DEC 66	419644		
22APR68	419675		

CAT TRANSMIT TIMING - STR,BSC
END TRANS. SEQ. RCV MODE

DATE	AUG 66	P/N	2231302
		TYPE	1130

IBM FC703

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	RCV SPACE	FC411	C-A1C6D02	-
2	RCV SHIFT (STROBE SPD)	FC361 BU2	C-A1H2B08	-
3	RCV MODE			
4	ALL TURN AROUND S.S.			
5	TAG	FC521 BH4	C-A1F4B10	+
6	IDLE SYNC	FC421 BM4	C-A1H5D04	+
7	SET IDLE CHAR	FC421 BQ4	C-A1K4D06	-
8	IDLE CHAR TRIGGER	FC531 AU1	C-A1L4D02	+
9	CHAR PHASE	FC531 BH1	C-A1L4D07	+
10	CHAR PHASE MEMORY TRIG	FC371 BL1	C-A1E2D09	+
11	RST DESRL SET 0	FC531 AS4	C-A1K4B10	-
12	DATA PHASE OR DIAG.	FC531 BL4	C-A1J4D13	-
13	BFR RST	FC531 AX4	C-A1C2B10	-
14	XFER DESRL TO BFR	FC531 BN4	C-A1F6D02	+
15	BUFFER LOAD TGR	FC741 AP1	C-A1G4B02	+
16	BFR SET (SPD)	FC741 AR2	C-A1C7B12	-
17	LEVEL 1 INT REQ-READ RESPONSE	FC351 BE4	C-A1H5B10	-



NOTES:

1. BOTH STATIONS HAVE PREVIOUSLY ESTABLISHED SYNCHRONIZATION WITH THE EXCHANGE OF IDLE CHARACTERS. RECEIVING STATION IS SHOWN GOING FROM TRANSMIT MODE TO RECEIVE MODE TO RECEIVE THE BEGINNING OF A RECORD.
2. 200 MS TURNAROUND TIME FROM DATA SET IF 2 WIRE TELEPHONE LINES.
   ZERO MS TURNAROUND TIME FROM DATA SET IF 4 WIRE TELEPHONE LINES.

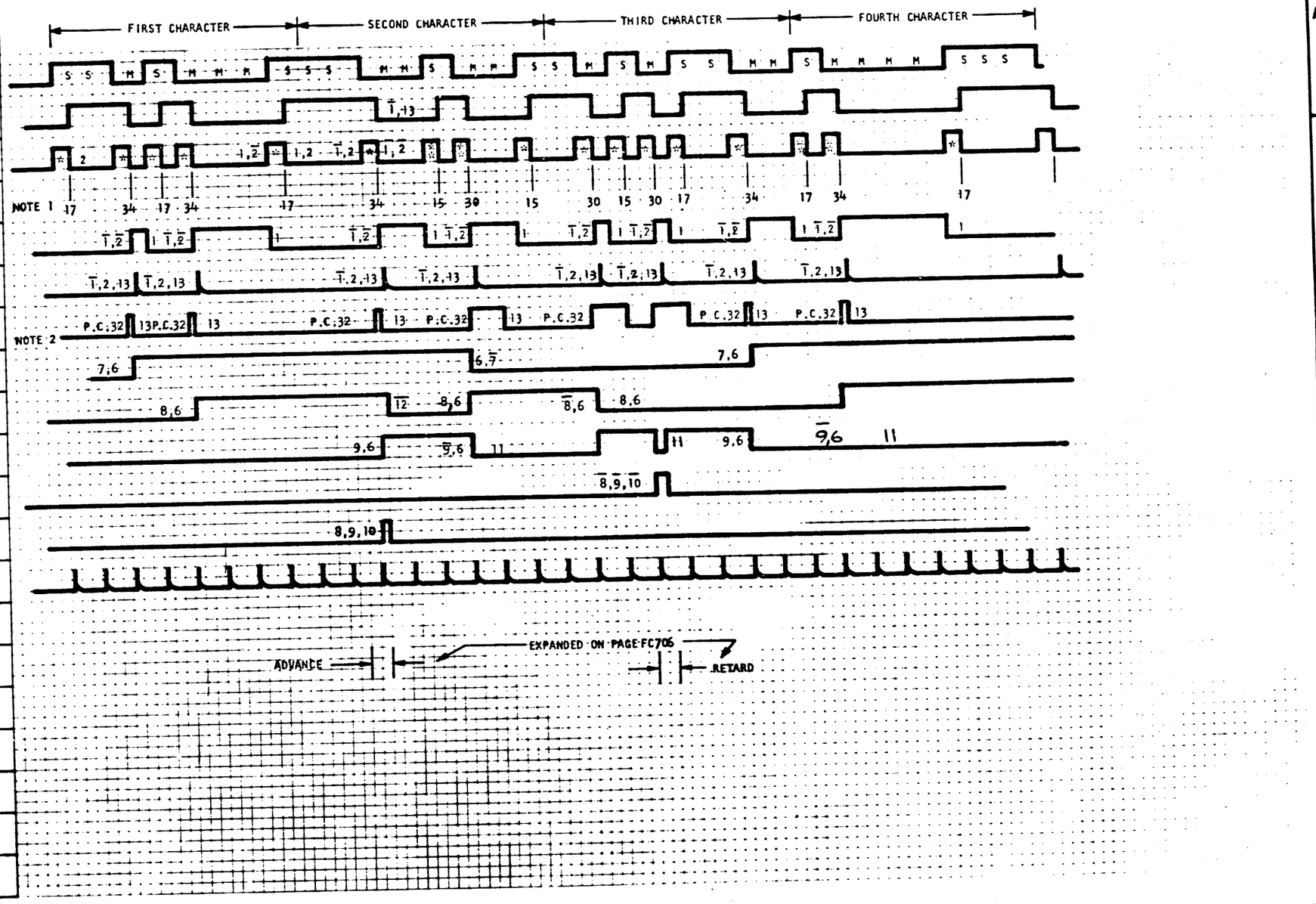
DATE	EC NUMBER	DATE	EC NUMBER
SEP 66	419632		
DEC 66	419644		
RED 22APR68	419675		

SCA X10 START READ TIMING STR-
2 OR 4 WIRE - SEE NOTE 1

DATE		P/N	2231303
		TYPE	1130

IBM FC704

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1.	RCV SPACE	FC411BX4	C-A1J4D06	+
2.	PHASE COUNTER CONTROL	FC211AE2	C-A1J2D09	+
3.	STEP PHASE COUNTER	FC211AM4	C-A1D5B09	-
4.	PHASE COUNTER VALUE	FC221		
5.	RESET PHASE COUNTER	FC211AN4	C-A1D5B08	-
6.	END CORRECTION CYCLE SPD	FC211BH2	C-A1H2B03	-
7.	MEMORY F.F.	FC231AS2	C-A1J2B09	+
8.	A/R1 F.F.	FC231AT2	C-A1J2B04	+
9.	A/R2 F.F.	FC231AU1	C-A1L3D07	+
10.	A/R3 F.F.	FC231AX1	C-A1L3D02	+
11.	RETARD	FC231AZ4	C-A1H7D04	-
12.	SET R1 (ADVANCE)	FC231AY4	C-A1J3B02	-
13.	RCV SHIFT (STROBE)	FC361BU2	C-A1H2B08	-



NOTES
1. VALUES OF 32 STEP COUNTER ARE SHOWN AT END OF PHASE COUNTER STEPPING
   FOR VALUES OF PHASE COUNTER SHOWN GREATER THAN 31, THE ACTUAL P.C. COUNT IS VALUE MINUS 32.
2. P.C. REFERS TO PHASE COUNT. THE MEMORY F.F. IS TURNED ON AS THE PHASE COUNT REACHES 32.
- ※ 17 STEP PHASE COUNTER PULSES
- ※※ 15 STEP PHASE COUNTER PULSES

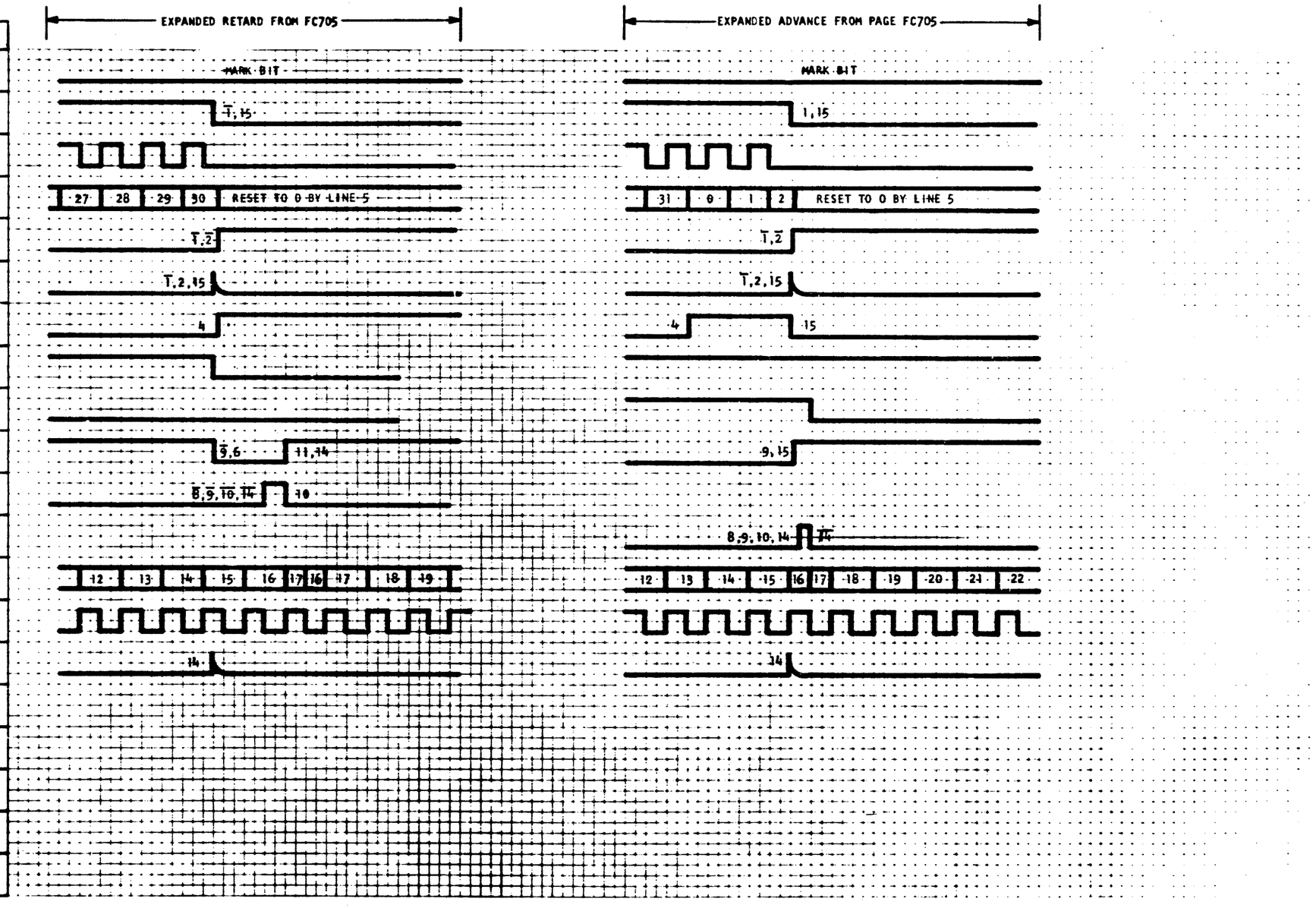
DATE	EC NUMBER	DATE	EC NUMBER
SEP 66	419632		
DEC 66	419644		
22APR68	419675		

CAT PHASE COUNTER - STR
ADVANCE /RETARD REV CLOCK

DATE	AUG 66	P/N	2231304
		TYPE	1130

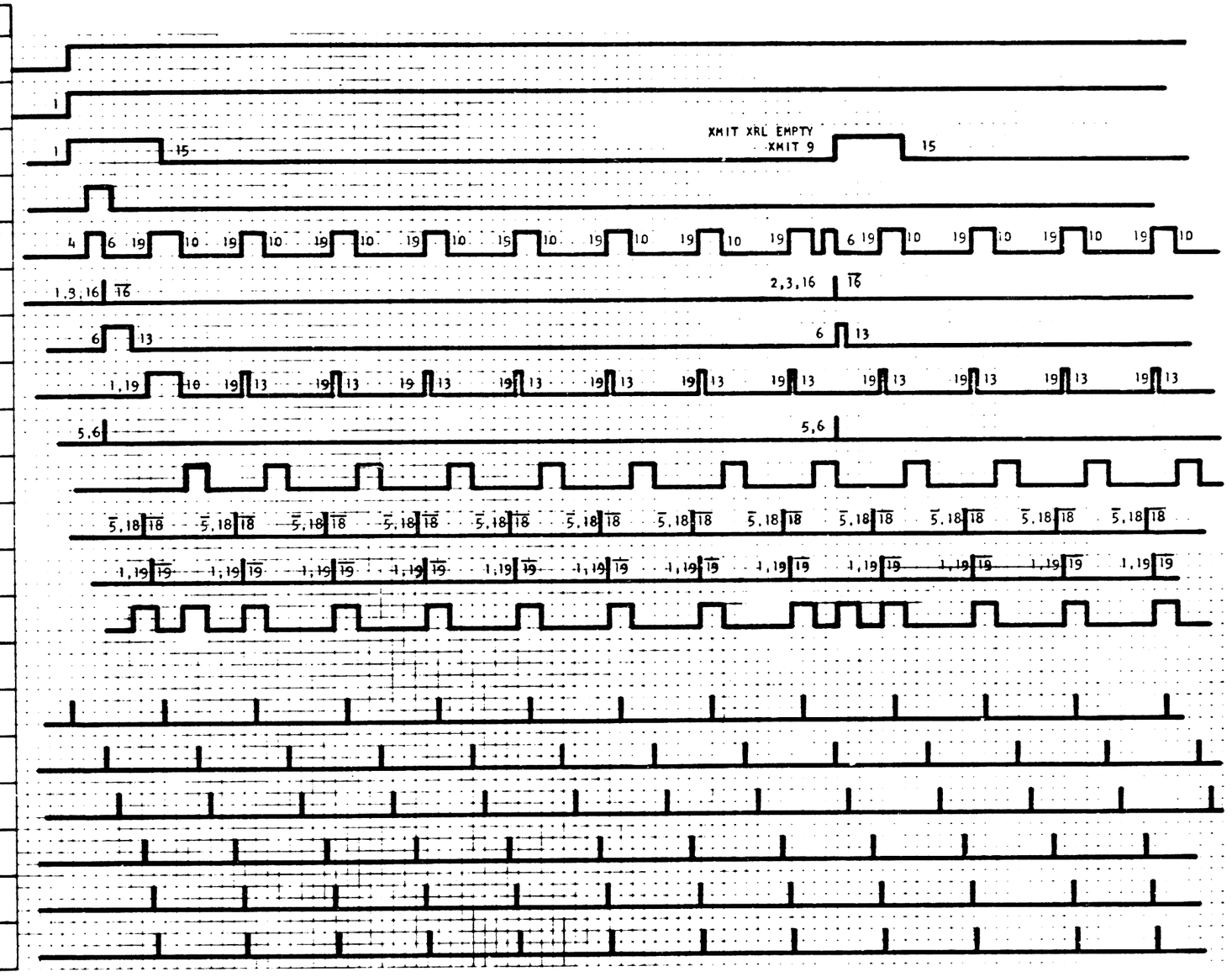
IBM FC705

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	RCV SPACE	FC411BX4	C-A1J4D06	+
2	PHASE COUNTER CONTROL	FC211AE2	C-A1J2D09	+
3	STEP PHASE COUNTER	FC211AN4	C-A1D5B09	-
4	PHASE COUNTER VALUE	FC221		
5	RESET PHASE CTR.	FC211AN4	C-A1D5B08	-
6	END CORRECTION CYCLE SPD	FC211BH2	C-A1H2B03	-
7	MEMORY F.F.	FC231AS2	C-A1J2B09	+
8	AR1 F.F.	FC231AT2	C-A1J2B04	+
9	AR2 F.F.	FC231AW1	C-A1L3D07	+
10	AR3 F.F.	FC231AX1	C-A1L3D02	+
11	RETARD	FC231AZ4	C-A1H7D04	-
12	SET R1 (ADVANCE)	FC231AY4	C-A1J3R02	-
13	RCV CLOCK	FC121		
14	GATED OSC. A	FC101BG4	C-A1E5B04	-
15	RCV SHIFT (STROBE)	FC361BU2	C-A1H2B08	-



DATE	EC NUMBER	DATE	EC NUMBER	CAT PHASE COUNTER - STR
SEP 66	419632			EXPANDED ADVANCE/RETARD
DEC 66	419644			DATE AUG 66 P/N 2231305
				TYPE 1130
				IBM FC706

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	DIAGNOSTIC MODE	FC311B04	C-A1F7BE2	+
2	CLOCK GATE	FC111AU1	C-A1G4B13	+
3	CHAR COMPLETE	FC641BM2	C-A1F7D09	+
4	X10 WRITE AREA 10			
5	BUFFER LOAD TGR	FC741AP1	C-A1G4B02	+
6	GATED 11	FC641AS4	C-A1B6B02	-
7	WRITE RESPONSE-INTRPT 1	FC351AL2	C-A1K5B09	+
8	READ RESPONSE-INTRPT 1	FC351BA2	C-A1K5D09	+
9	XFER BFR TO XMIT SRL (SPD)	FC741AJ2	C-A1C7B03	-
10	X10 READ			
11	BUFFER RESET	FC531AX4	C-A1C2B10	-
12	XFER RCV DSRL TO BUFFER	FC531BN4	C-A1F6D02	+
13	X10 SENSE DSW			
15	XMIT SHIFT (STROBE SPD)	FC361BV2	C-A1H2D04	-
16	XMIT 11	FC131BN4	C-A1B2B12	-
17	RECEIVE SHIFT (STROBE SPD)	FC361BU2	C-A1H2B08	-
18	RECEIVE 25	FC121BN4	C-A1C3B07	-
19	RECEIVE 27	FC121BJ4	C-A1C3D12	-
20	RECEIVE 29	FC121BK4	C-A1B2B02	-



DATE	EC NUMBER	DATE	EC NUMBER
SEP 66	419632		
DEC 66	419644		
22APR68	419675		

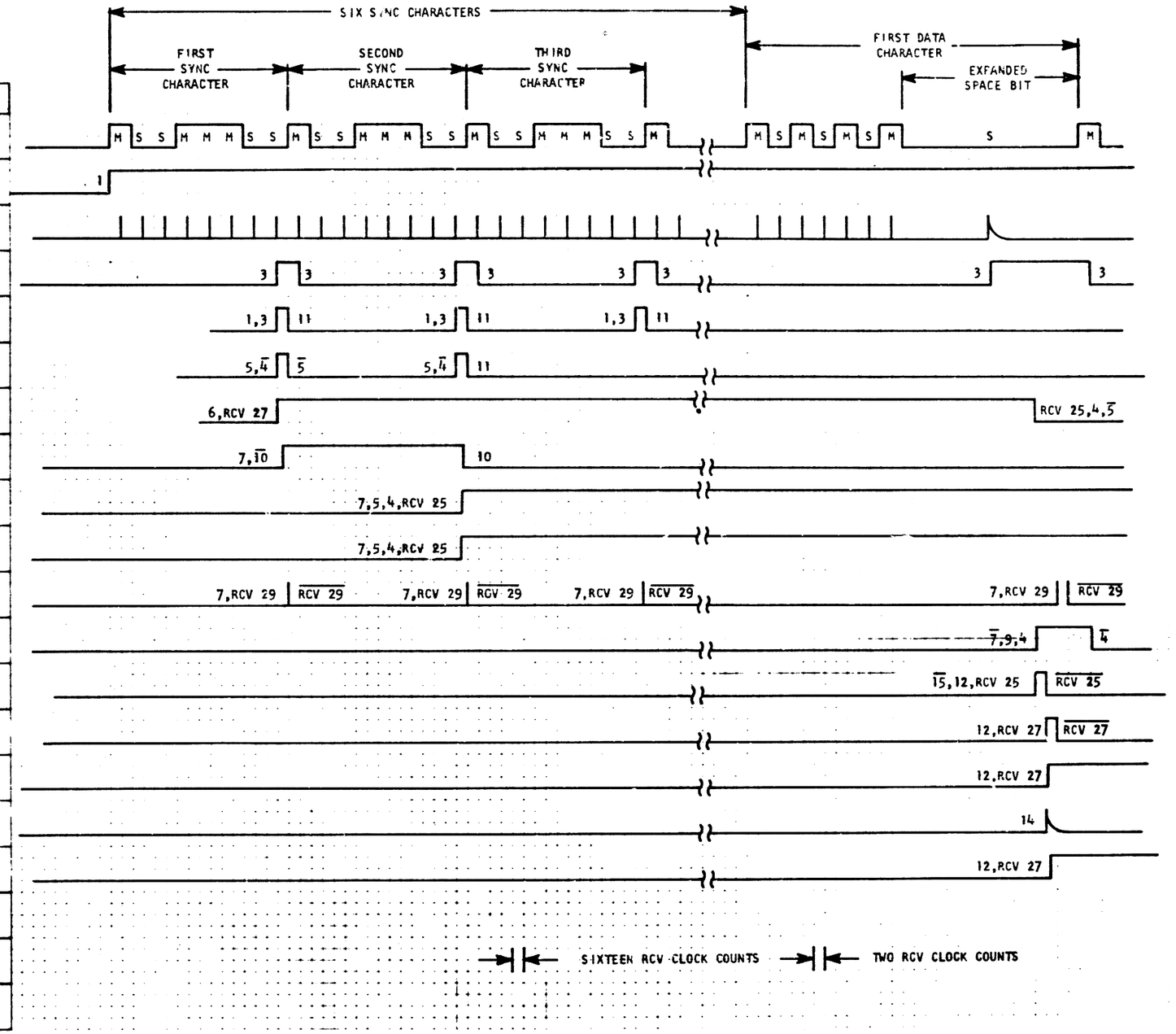
SCA DIAGNOSTIC MODE

STR TIMING

DATE	AUG 66	P/N	2231353
		TYPE	1130

IBM FC707

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	RCV SPACE	FC411	C-A1C6D02	-
2	CLOCK GATE			
3	RCV SHIFT (STROBE SPD)	FC361 BU2	C-A1H2B08	-
4	TAG	FC521 BH4	C-A1F4B10	+
5	IDLE SYNC	FC421 BM4	C-A1H5D04	+
6	SET IDLE CHAR	FC421 BQ4	C-A1K4D06	-
7	IDLE CHAR TRIG	FC531 AU1	C-A1L4D02	+
8	PSUEDO TAG	FC531 BU4	C-A1L2B02	-
9	CHAR PHASE	FC531 BM1	C-A1L4D07	+
10	CHAR PHASE MEMORY TRIG	FC371 BL1	C-A1E2D09	+
11	RST DESRL SET 0	FC531 AS4	C-A1K4B10	-
12	DATA PHASE OR DIAG.	FC531 BL4	C-A1J4D13	-
13	BFR RST	FC531 AX4	C-A1C2B10	-
14	XFR DESRL TO BFR	FC531 BN4	C-A1F6D02	+
15	BUFFER LOAD TGR	FC741 AP1	C-A1G4B02	+
16	BFR SET (SPD)	FC741 AR2	C-A1C7B12	-
17	LEVEL 1 INT REQ-READ RESPONSE	FC351 BE4	C-A1H5B10	-



DATE	EC NUMBER	DATE	EC NUMBER
22APR68	419675		

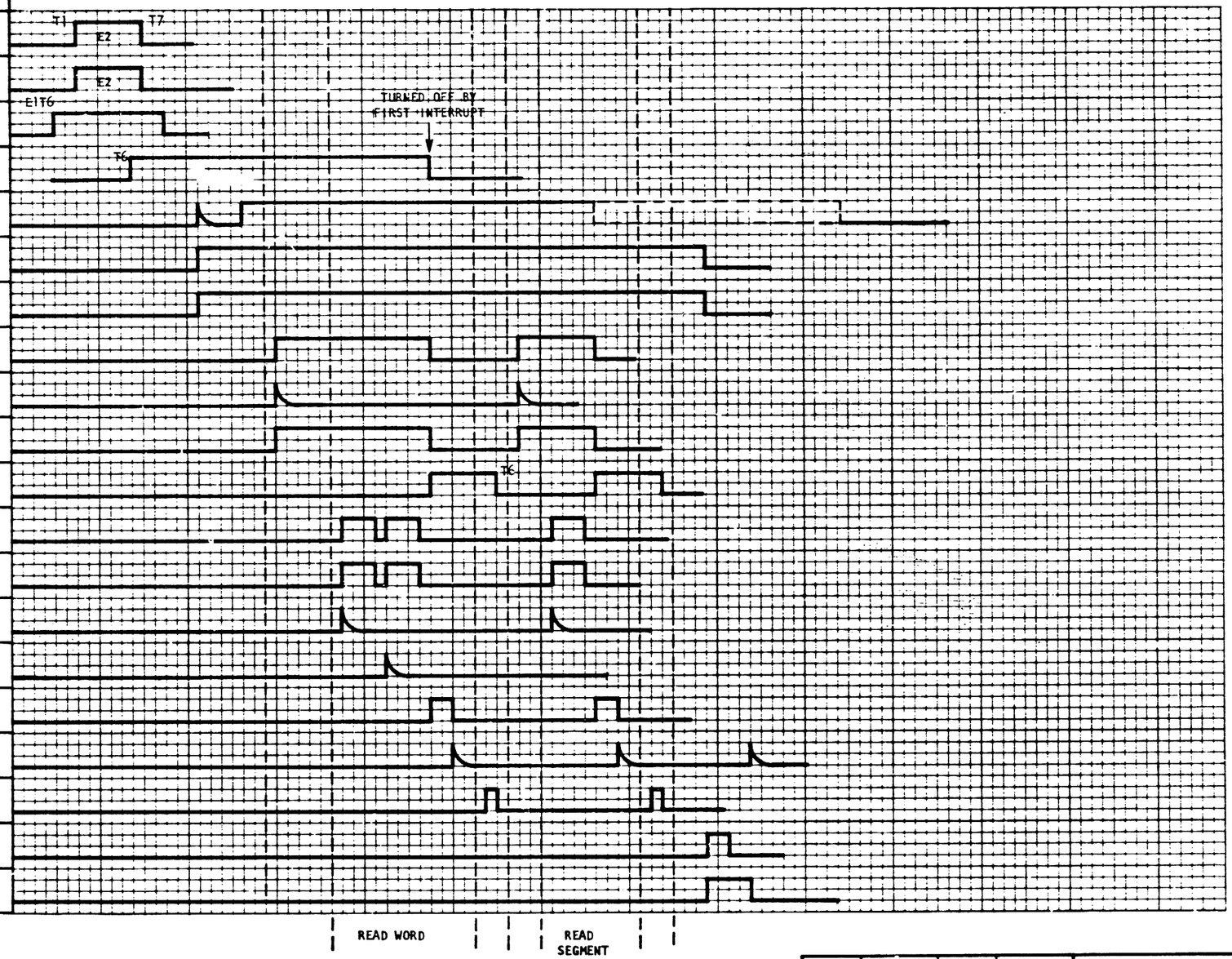
SCA X10 START READ TIMING BSC - 2 OR 4 WIRE

DATE | P N 2231977

TYPE 1130

IBM FC708

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	X10 CONTROL	DU101BD4	A-A1F5D07	+
2	AREA 8	DU111BE4	A-A1F5B09	+
3	U REG 13 PWR	DU111AC4	A-A1F5D11	+
4	FEED DOCUMENT OR FEED BUSY	FD301BL4	A-A1G4D10	+
5	OMPR READ GATE	FD201BC4	A-A1C5D10	+
6	READ OPERATION	FD301AX2	A-A1E4B09	+
7	SELECT I/O ATCH (READ OP)	FD301AX6	A-A1C6D02	-
8	READ CALL	FD311AZ4	A-A1D7B07	-
9	RESET DATA BUF	FD311BE4	A-A1D4B03	_
10	BUFFER FULL MAS BUFFER FULL	FD311AA4	A-A1F5D04	+
11	READ BUSY	FD311AS2	A-A1C4B09	+
12	SERVICE REQUEST	FD201AM4	A-A1B5D10	+
13	SERVICE RESPONSE	FD311AC4	A-A1D7D10	-
14	SET DATA REG A	FD311BF4	A-A1D4B12	-
15	SET DATA REG B	FD311BG4	A-A1D4D07	-
16	READ RESPONSE	FD321AX6	A-A1B4D02	-
17	X10 SENSE RESET 15 AREA 8 T6	FD321AD4	A-A1G4B10	-
18	X10 READ CHARACTER AREA 8 (ENTRY GATE)	FD361BR4	A-A1F4B03	+
19	SET END OPERATION	FD301AZ4	A-A1E4D05	-
20	END OF RESPONSE	FD301AY2	A-A1E4B04	+



DATE	EC NUMBER	DATE	EC NUMBER
OCT 66	419640		

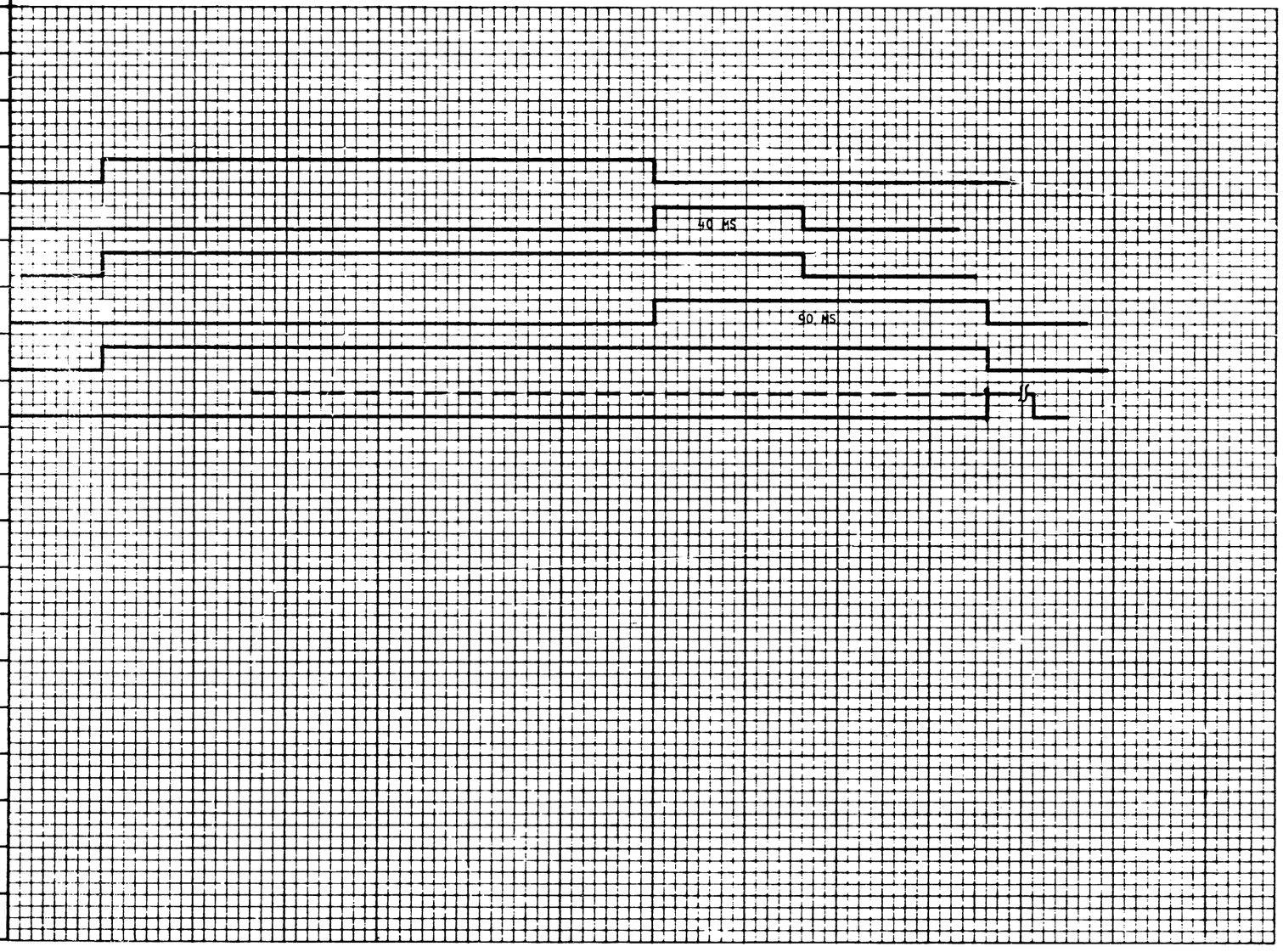
1231 ATTACHMENT TIMING CHART 1.

DATE	JUN 66	P/N	2231964
		TYPE	1130

IBM FD701

2	3	4	5	6	7

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	READ GATE	FD201BC4	A-A1C5D10	+
2	SELECT SS	FD321AN4	A-A1C7D12	-
3	ENABLE SELECT	FD321AU4	A-A1D7D04	+
4	TMG MK CK BUSY	FD321AP4	A-A1C7D11	-
5	TMG MK CK BUSY	FD321BK4	A-A1F5D06	+
6	END OF RESPONSE	FD301AY2	A-A1E4B04	+



A
B
C
D
E

DATE	EC NUMBER	DATE	EC NUMBER
OCT 66	419640		

1231 ATTACHMENT TIMING CHART 2

DATE	JUNE 66	P/N	2231965
		TYPE	1130

IBM FD711

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	FEED CB 1	CR181SV4	A-A1A5D02	+
2	FEED CB 2	CR181SE4	A-A1A5D04	+
3	FEED CB 3	CR181SQ4	A-A1A5D05	+
4	START KEY	FR111SN4	A-A1B4D11	+
5	START FL.	FR131TH4	A-A1C4B02	+
6	MOTOR RELAY	FR131TE4	A-A1C4B07	-
7	CR MOTOR READY	FR131TD4	A-A1C4G07	+
8	EXECUTE COMMAND	FR151SE4	A-A1G4J07	+
9	FEED ALLOW FL.	FR151ST4	A-A1G4G02	+
10	FEED CYCLE FL.	FR151SU4	A-A1L6D09	+
11	HOPPER MAGNET	FR151SV4	A-A1G4D02	-
12	FEED SOLENOIDS	FR151SW4	A-A1C4B02	-
13	CARD LEVER 1 (SC)	CR191SV4	A-A1A5B04	+
14	CARD IN PREREAD	FR161SS4	A-A1G4G04	+
15	READY FL.	FR171SY4	A-A1C4G08	+
16	CR CYCLE RUN	FR151TC4	A-A1G4J12	-

NOTES:

1. 360° = 60 MSEC

DATE	EC NUMBER	DATE	EC NUMBER
SEP 66	419632		

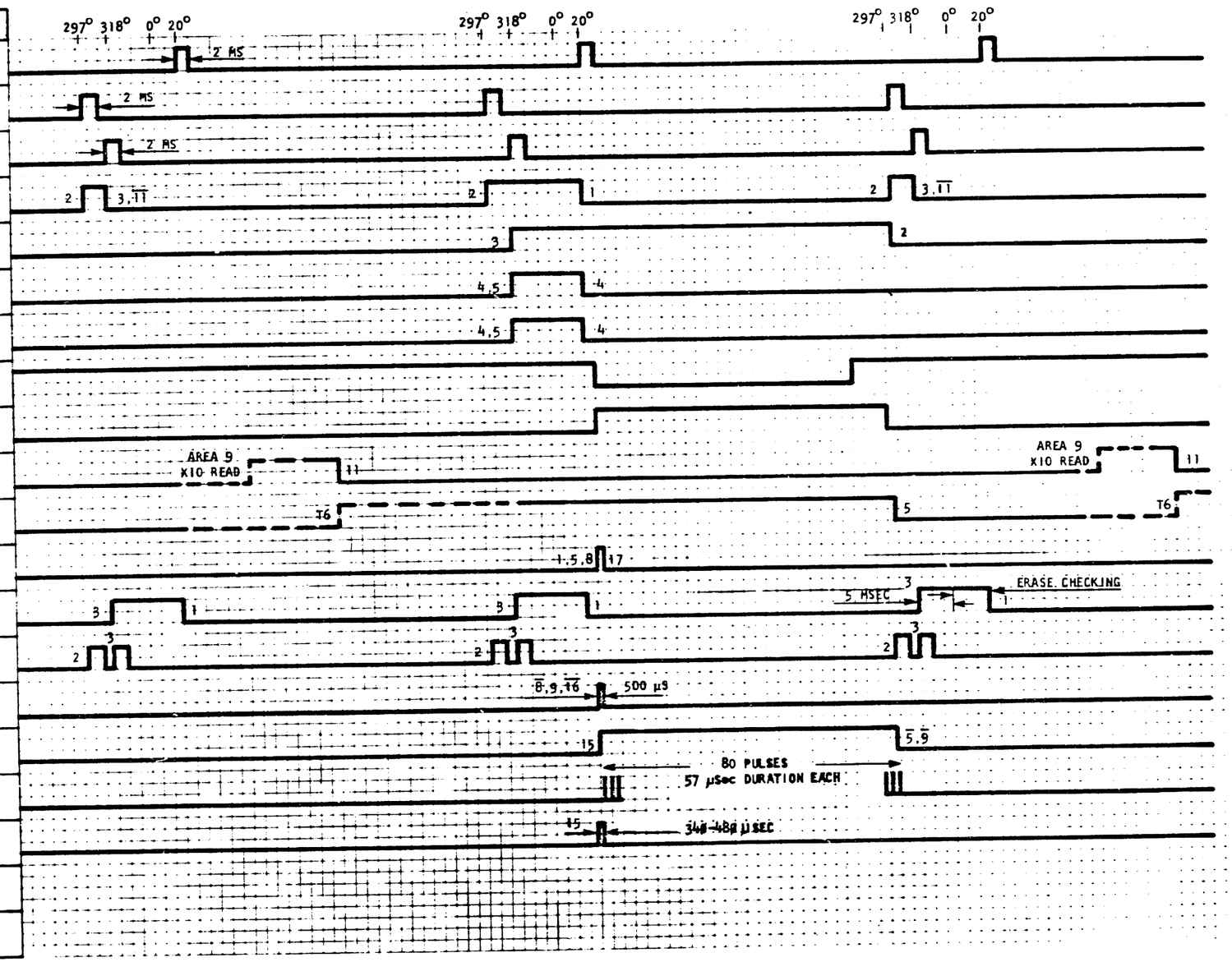
2501 CARD READER

RUN IN

DATE	SEP 66	P/N	2231337
		TYPE	1130

IBM FR701

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	FEED CB1	CR181SV4	A-A1A5D02	+
2	FEED CB2	CR181SE4	A-A1A5D04	+
3	FEED CB3	CR181SQ4	A-A1A5D05	+
4	FEED ALLOW FL.	FR151ST4	A-A1G4G02	+
5	FEED CYCLE FL.	FR151SU4	A-A1L6D09	+
6	HOPPER MAGNET	FR151SV4	A-A1G4D02	-
7	FEED SOLENOID	FR151SW4	A-A1G4B02	-
8	CARD IN PREREAD	FR161SS4	A-A1G4G04	+
9	ANY CELL DARK	FR121SP4	A-A1D4J11	+
10	CR READ INITIATE	FR171SX4	A-A1E5D10	+
11	READ REQUEST FL.	FR171ST2	A-A1E6D09	+
12	WRITE CK	FR161SQ4	A-A1G4B03	+
13	ERASE CK	FR161SE4	A-A1F4B13	+
14	ERASE EMITTER	FR161TA4	A-A1F4B08	-
15	RECORD EMITTER	FR161TB4	A-A1F4D05	-
16	ALLOW COL EM	FR161SM4	A-A1H4D10	+
17	CR COL EM	FR161TD4	A-A1K6D06	+
18	BLOCK READ EM	CR121SE4	A-A1H4B04	-



NOTES:

1. 360° = 60 MSEC

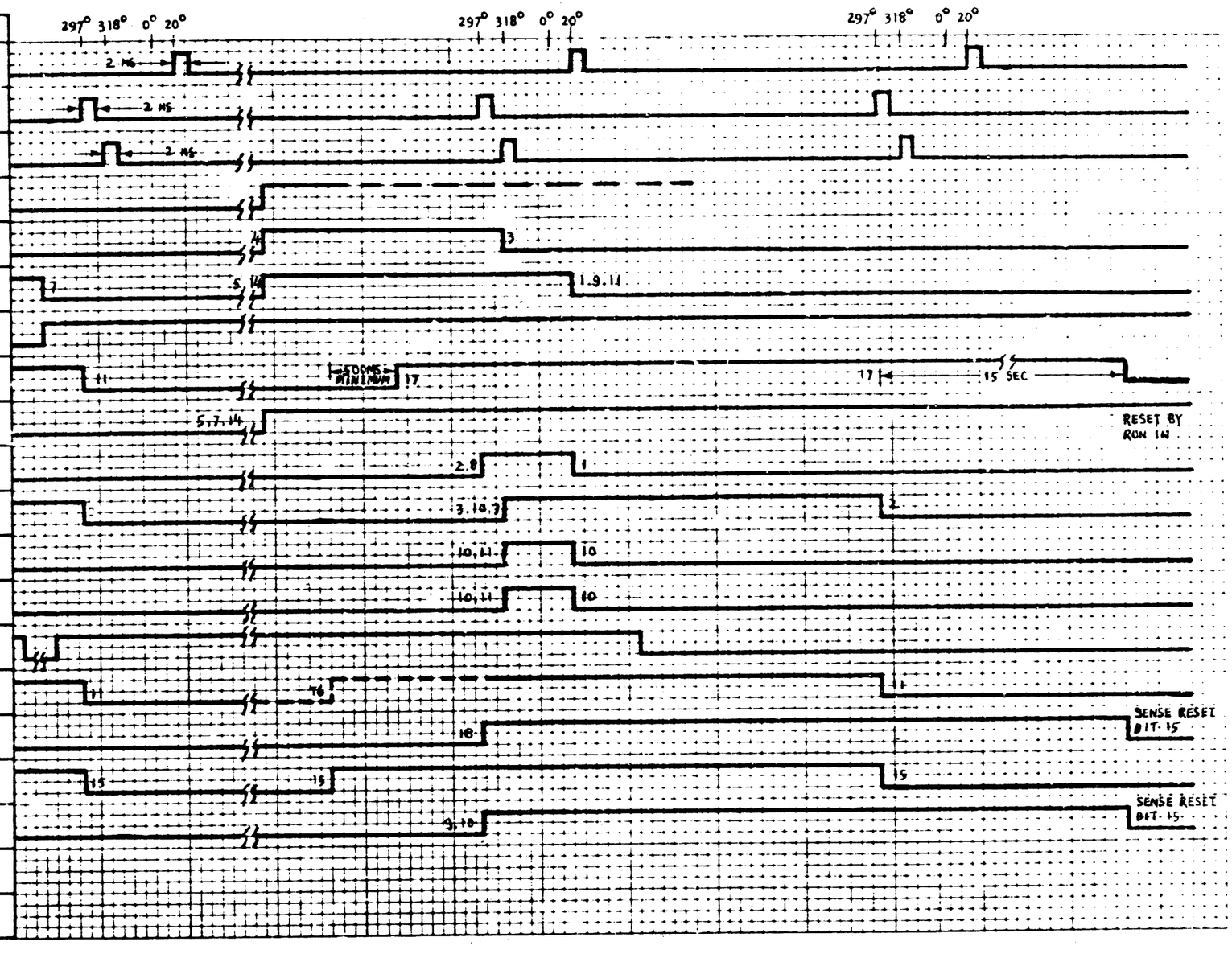
DATE	EC NUMBER	DATE	EC NUMBER
SEP 66	419632		
MAY67	419652		
22APR68	419675		

2501 CARD READER
READ CARD

DATE	SEP 66	P/N	2231338
		TYPE	1130

IBM FR711

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	FEED CB 1	CR181SV4	A-A1A5D02	+
2	FEED CB 2	CR181SE4	A-A1A5D04	+
3	FEED CB 3	CR181SQ4	A-A1A5D05	+
4	START KEY	FR111SN4	A-A1B4D11	+
5	START FL.	FR131TH4	A-A1C4B02	+
6	READY FL.	FR171SY4	A-A1C4G08	+
7	HOPPER EMPTY CONTACT	FR111SK2	A-A1C6B07	-
8	CR MOTOR READY	FR131TD4	A-A1C4G07	+
9	LAST CARD TRIG.	FR231SV2	A-A1E6B09	+
10	FEED ALLOW FL.	FR151ST4	A-A1C4G02	+
11	FEED CYCLE FL.	FR151SU4	A-A1L6D09	+
12	HOPPER MAG.	FR151SV4	A-A1C4D02	-
13	FEED SOL	FR151SW4	A-A1C4B02	-
14	CARD IN PREREAD FL.	FR161SS4	A-A1C4G04	+
15	READ REQ FL.	FR171ST2	A-A1E6D09	+
16	CR DSW BIT 3	FR351SH4	A-A1K5D04	-
17	EXECUTE COMMAND	FR151SE4	A-A1C4J07	+
18	LAST CARD LATCH	FR231UD4	A-A1F6B07	+



NOTES:

1. 360° = 60 MSEC

DATE	EC NUMBER	DATE	EC NUMBER
SEP 66	419632		

2501 CARD READER

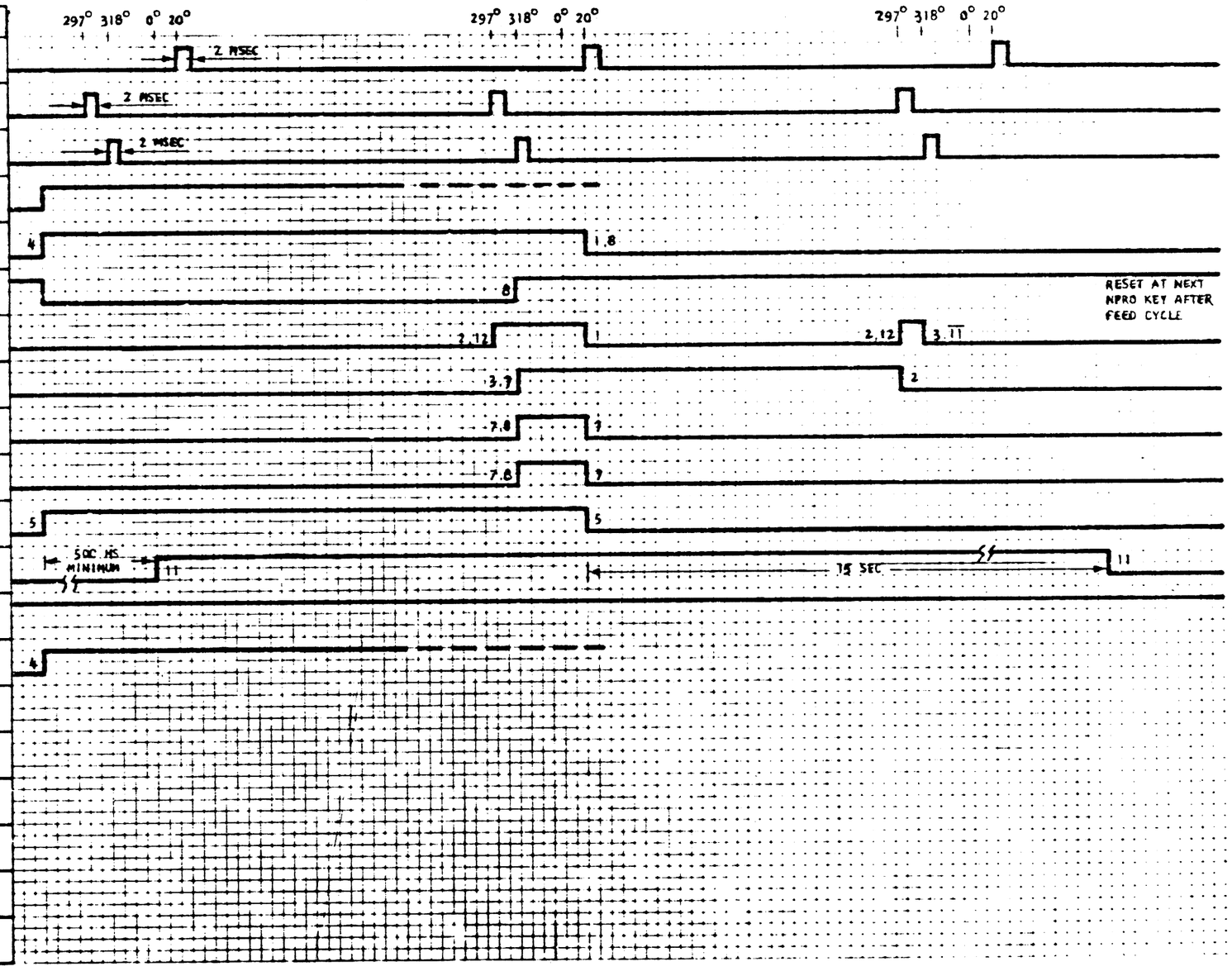
LAST CARD

DATE	SEP 66	P/N	2231340
		TYPE	1130

IBM

FR731

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	FEED CB 1	CR181SV4	A-A1A5D02	+
2	FEED CB 2	CR181SE4	A-A1A5D04	+
3	FEED CB 3	CR181SQ4	A-A1A5D05	+
4	NPRO KEY	FR111SL2	A-A106B10	+
5	NPRO FL.	FR131SX4	A-A1C4D07	+
6	NPRO INTK FL.	FR141SG4		+
7	FEED ALLOW FL.	FR151ST4	A-A1G4G02	+
8	FEED CYCLE FL.	FR151SU4	A-A1L6D09	+
9	HOPPER MAG.	FR151SV4	A-A1G4D02	-
10	FEED SOL.	FR151SW4	A-A1G4B02	-
11	EXECUTE COMMAND	FR151SE4	A-A1G4J07	+
12	CR MOTOR READY	FR131TD4	A-A1C4G07	+
13	HOPPER EMPTY	FR111SK2	A-A1C6B07	-
14	CR RESET	FR141SL4	A-A1D4G07	-



NOTES:

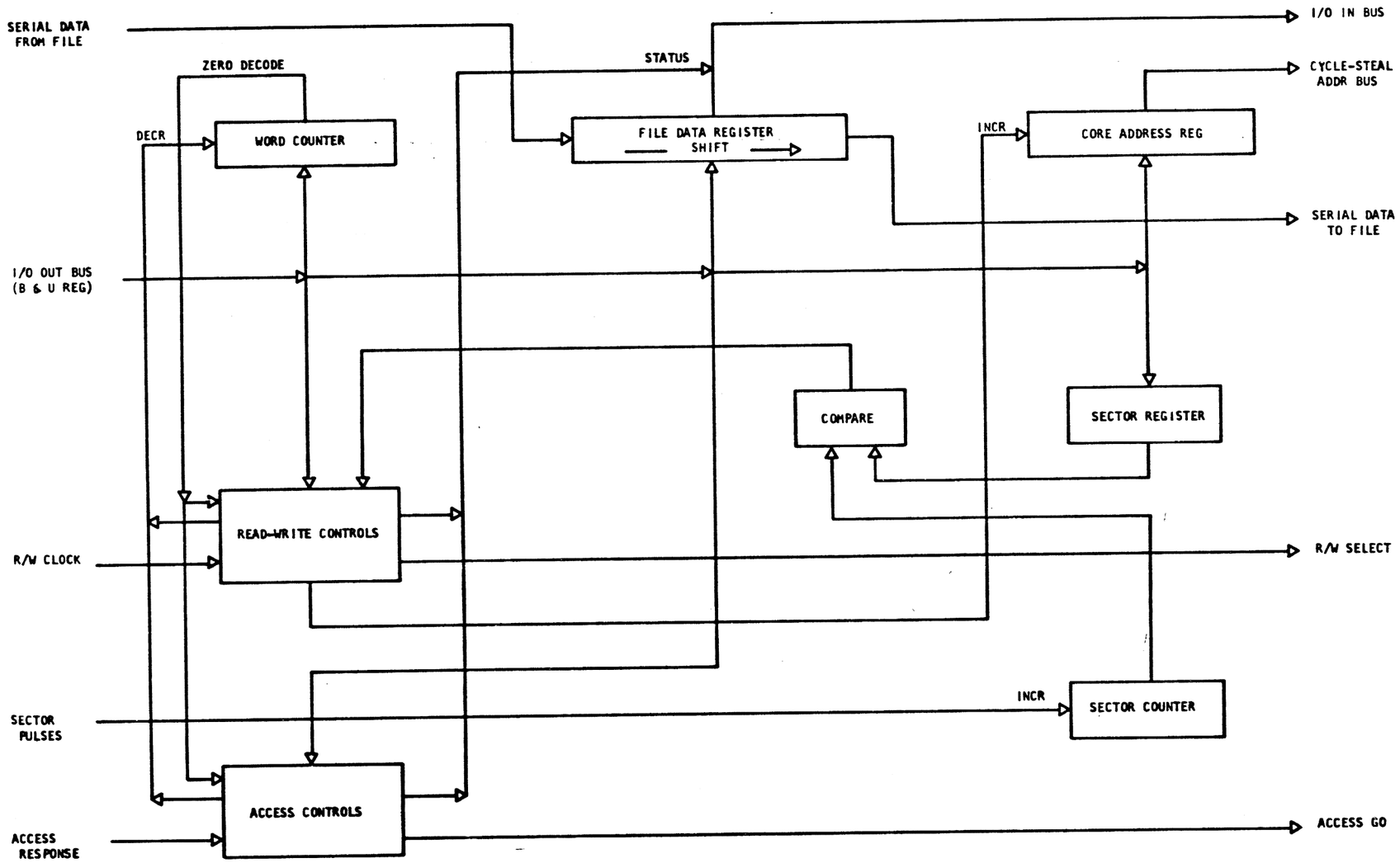
1. 360° = 60 MSEC

DATE	EC NUMBER	DATE	EC NUMBER
SEP 66	419632		

2501 CARD READER NPRO

DATE	SEP 66	P/N	2231342
		TYPE	1130

IBM FR751



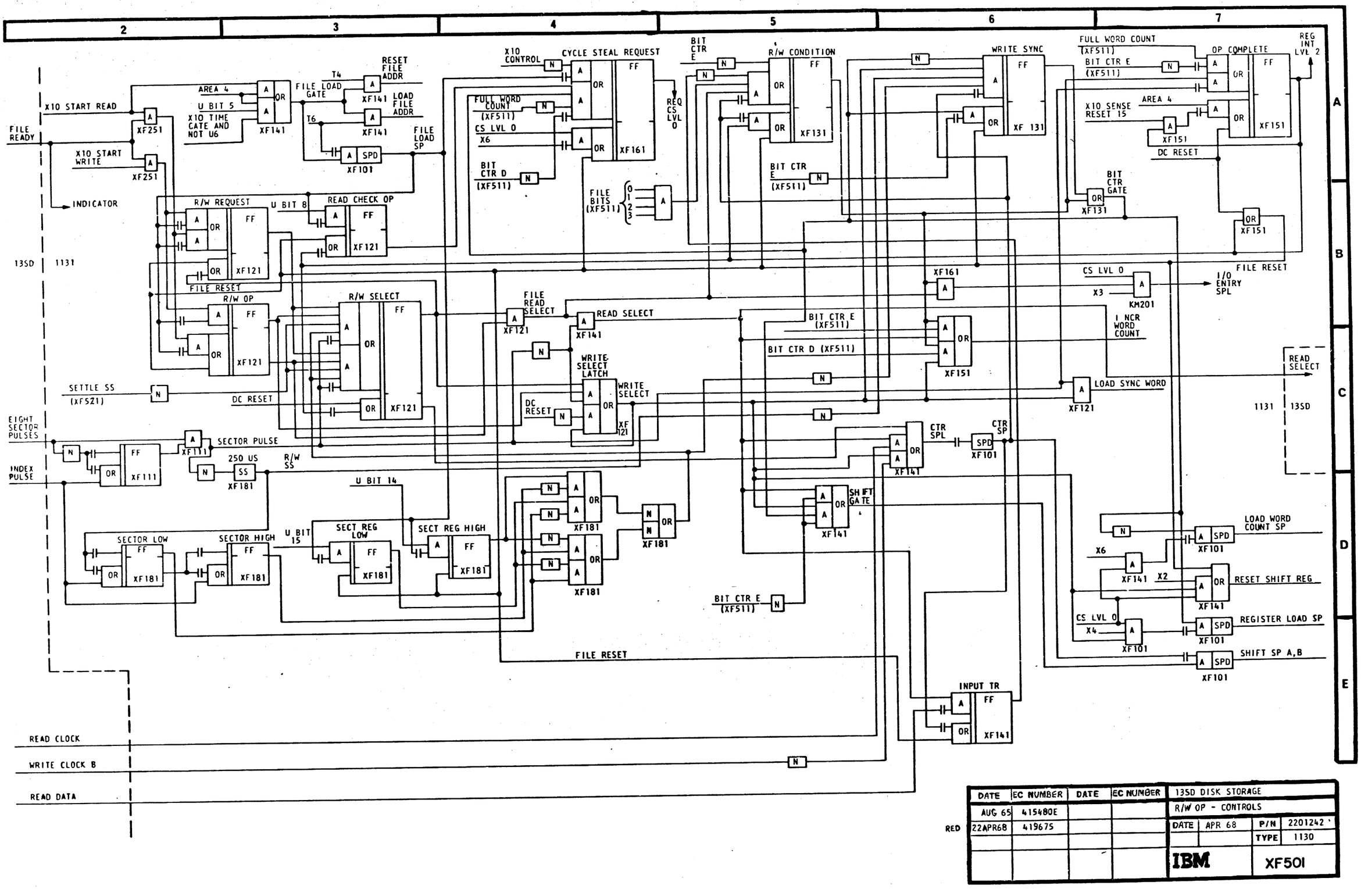
DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		

DISK FILE UNIT DATA
AND CONTROL DIAGRAM

DATE		P/N	2201241
		TYPE	1130

IBM XF401

XF401



DATE	EC NUMBER	DATE	EC NUMBER
AUG 65	415480E		
RED 22APR68	419675		

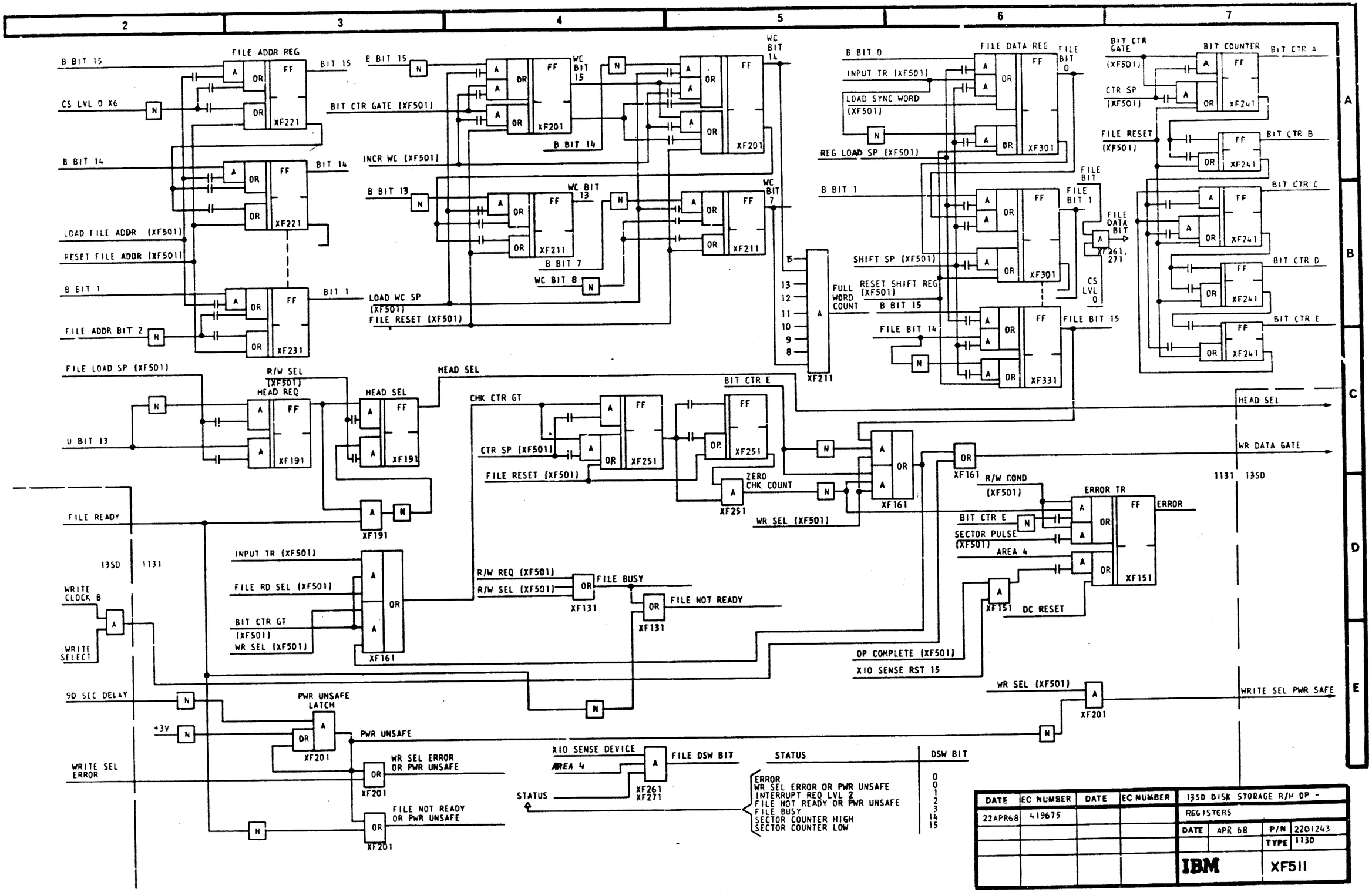
1350 DISK STORAGE

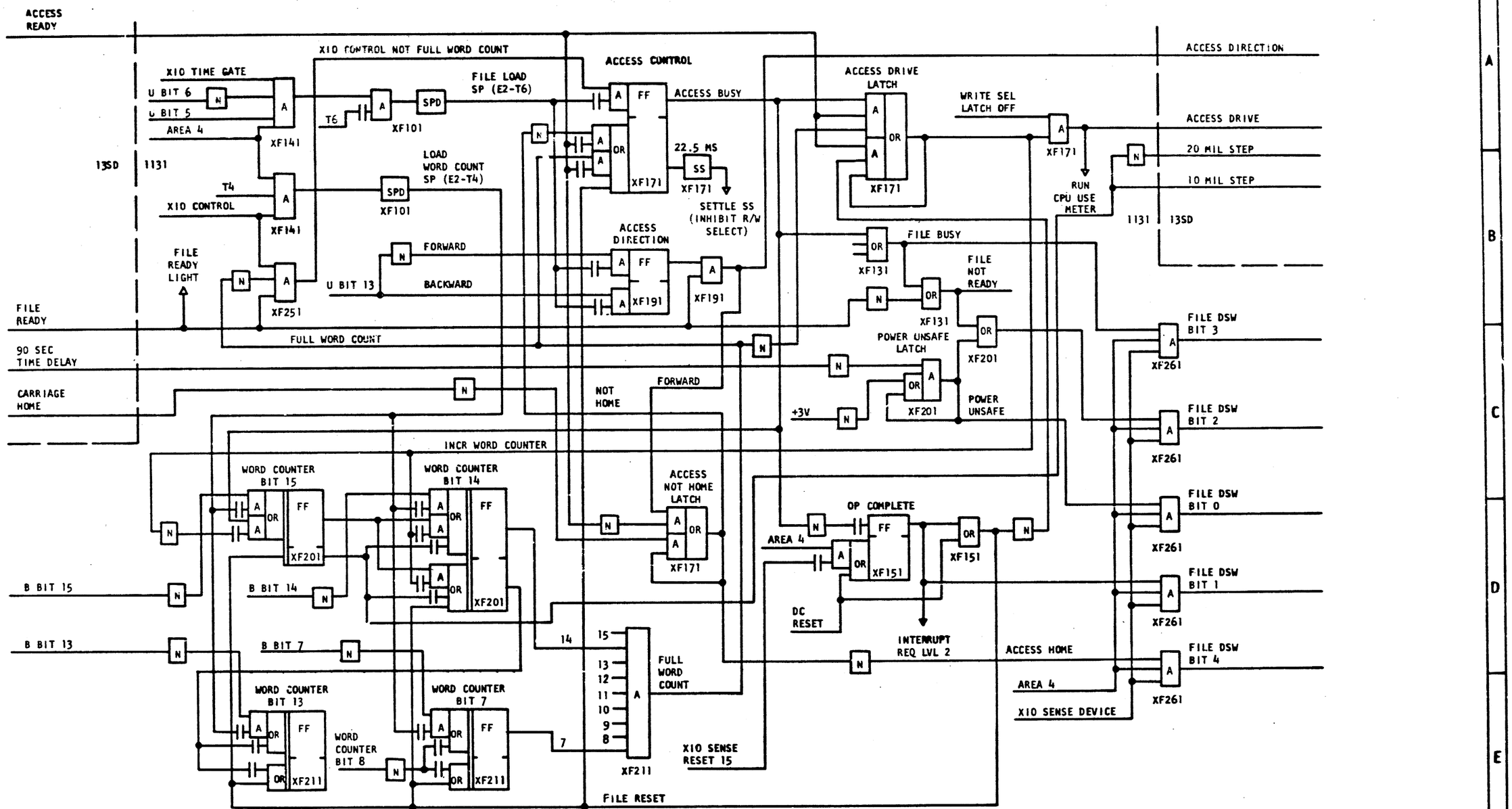
R/W OP - CONTROLS

DATE APR 68 P/N 2201242

TYPE 1130

IBM XF501


2
3
4
5
6
7
A
B
C
D
E
FILE ADDR REG
B BIT 15
BIT 15
XF221
CS LVL 0 X6
B BIT 14
BIT 14
LOAD FILE ADDR (XF501)
RESET FILE ADDR (XF501)
B BIT 1
BIT 1
XF231
FILE ADDR BIT 2
BIT CTR GATE (XF501)
INCR WC (XF501)
WC BIT 15
XF201
B BIT 14
WC BIT 13
XF211
B BIT 7
WC BIT 8
LOAD WC SP (XF501)
FILE RESET (XF501)
WC BIT 14
WC BIT 7
XF211
FILE DATA REG
B BIT 0
INPUT TR (XF501)
LOAD SYNC WORD (XF501)
REG LOAD SP (XF501)
XF301
FILE BIT 0
FILE BIT 1
SHIFT SP (XF501)
RESET SHIFT REG (XF501)
FULL WORD COUNT
B BIT 15
FILE BIT 14
XF331
FILE BIT 15
FILE DATA BIT
XF261, 271
CS LVL 0
BIT CTR GATE (XF501)
CTR SP (XF501)
FILE RESET (XF501)
BIT COUNTER
BIT CTR A
XF241
BIT CTR B
BIT CTR C
BIT CTR D
BIT CTR E
FILE LOAD SP (XF501)
U BIT 13
R/W SEL (XF501)
HEAD REQ
XF191
HEAD SEL
FILE READY
13SD
1131
WRITE CLOCK B
WRITE SELECT
INPUT TR (XF501)
FILE RD SEL (XF501)
BIT CTR GT (XF501)
WR SEL (XF501)
XF161
R/W REQ (XF501)
R/W SEL (XF501)
FILE BUSY
XF131
FILE NOT READY
CHK CTR GT
CTR SP (XF501)
FILE RESET (XF501)
XF251
ZERO CHK COUNT
WR SEL (XF501)
HEAD SEL
WR DATA GATE
1131 13SD
R/W COND (XF501)
ERROR TR
ERROR
BIT CTR E
SECTOR PULSE (XF501)
AREA 4
XF151
DC RESET
OP COMPLETE (XF501)
X10 SENSE RST 15
WR SEL (XF501)
WRITE SEL PWR SAFE
90 SEC DELAY
+3V
PWR UNSAFE LATCH
PWR UNSAFE
WRITE SEL ERROR
WR SEL ERROR OR PWR UNSAFE
FILE NOT READY OR PWR UNSAFE
X10 SENSE DEVICE
AREA 4
FILE DSW BIT
STATUS
STATUS | DSW BIT
ERROR | 0
WR SEL ERROR OR PWR UNSAFE | 0
INTERRUPT REQ LVL 2 | 1
FILE NOT READY OR PWR UNSAFE | 2
FILE BUSY | 3
SECTOR COUNTER HIGH | 14
SECTOR COUNTER LOW | 15
DATE | EC NUMBER | DATE | EC NUMBER
22APR68 | 419675
13SD DISK STORAGE R/W OP - REGISTERS
DATE APR 68
P/N 2201243
TYPE 1130
IBM
XF511



DATE	EC NUMBER	DATE	EC NUMBER
AUG 65	415480E		
OCT 65	415483A		
22APR68	419675		

RED

DISK FILE-CONTROL OP (ACCESS)

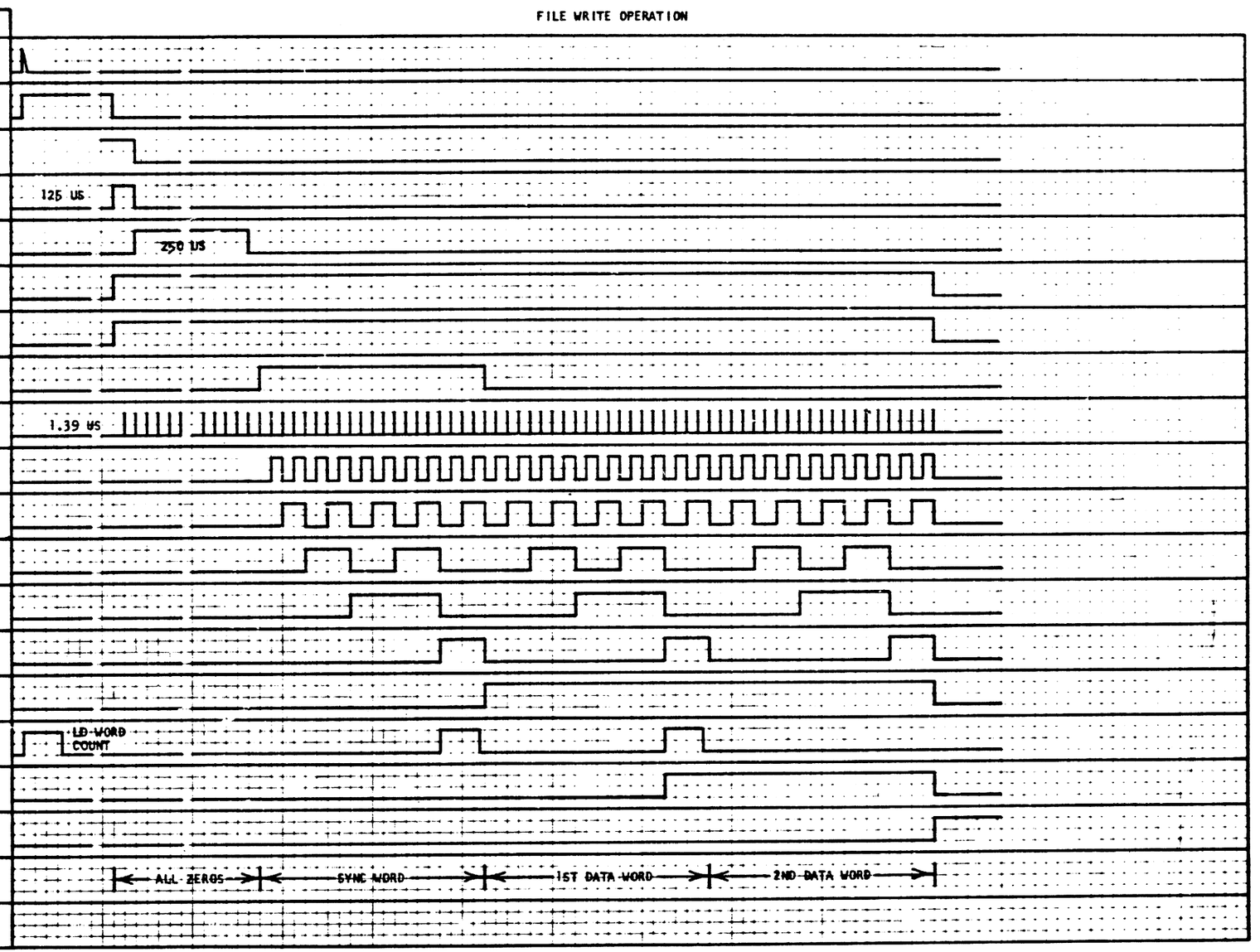
DATE	APR 68	P/N	2201244
		TYPE	1130

IBM

XF521

2	3	4	5	6	7

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
-	FILE LOAD SP (X10 E-2 T-6)	XF101AR2	A-C1H6D11
-	R-W REQUEST	XF121AN6	A-C1J6B04
+	SECTOR EQUAL	XF181BH4	A-C1H6D11
+	SECTOR PULSE	XF181AB4	A-C1H6G10
-	R-W SINGLE SHOT	XF181AQ4	A-C1H6J13
-	R-W SELECT	XF121AY6	A-C1J6B07
+	WRITE SELECT	XF121BH4	A-C1J6J07
+	WRITE SYNC	XF131AQ4	A-C1J6G13
-	COUNTER SP	XF101AP2	A-C1H6B08
+	BIT CTR A	XF241AJ2	A-C1L6J10
+	BIT CTR B	XF241AY2	A-C1L6B03
+	BIT CTR C	XF241AK2	A-C1L6D05
+	BIT CTR D	XF241BA2	A-C1L6B05
+	BIT CTR E	XF241AZ2	A-C1L6B13
+	R-W CONDITION	XF131AR2	A-C1J6G05
+	CYCLE STEAL REQ	XF161AQ2	A-C1L6B08
-	FULL WORD COUNT	XF211BT4	A-C1G6B04
+	OP COMPLETE	XF151AR2	A-C1K6D12
	FILE DATA		



A
B
C
D
E

DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
22APR68	419675		

DISC FILE

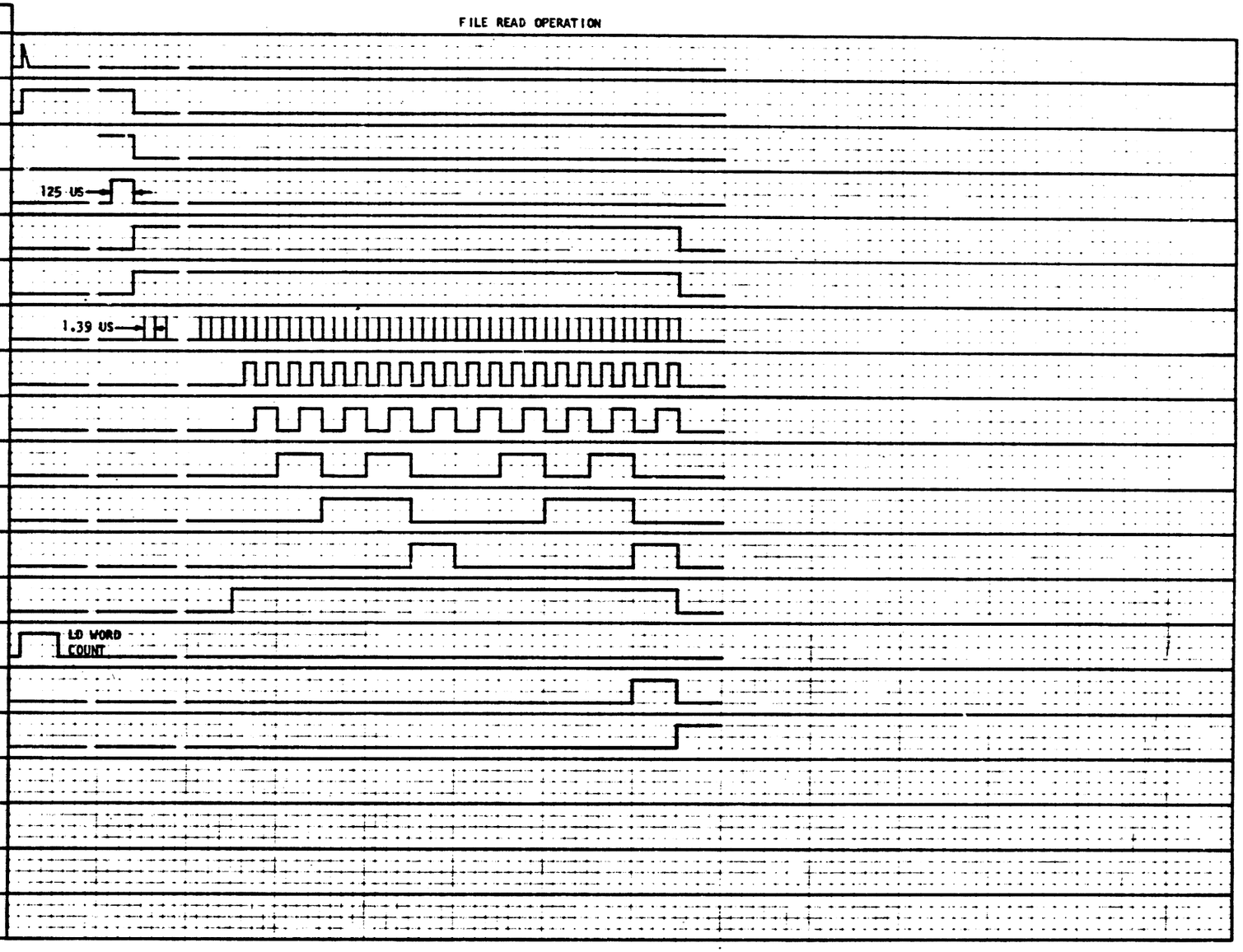
WRITE TIMING

DATE	3-18-65	P/N	2201245
		TYPE	1130

IBM XF701

2	3	4	5	6	7

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
-	FILE LOAD SP (X10 E-2 T-6)	XF101AR2	A-C1H6D11
-	R-W REQUEST	XF121AN6	A-C1J6B04
+	SECTOR EQUAL	XF181BH4	A-C1H6D11
+	SECTOR PULSE	XF181AB4	A-C1H6G10
-	R-W SELECT	XF121AY6	A-C1J6B07
+	FILE READ SELECT	XF121BG4	A-C1J6B10
-	COUNTER SP	XF101AP2	A-C1H6B08
+	BIT CTR A	XF241AJ2	A-C1L6J10
+	BIT CTR B	XF241AY2	A-C1L6B03
+	BIT CTR C	XF241AK2	A-C1L6D05
+	BIT CTR D	XF241BA2	A-C1L6B05
+	BIT CTR E	XF241AZ2	A-C1L6B13
+	R-W CONDITION	XF131AR2	A-C1J6G05
+	CYCLE STEAL REQ	XF161AQ2	A-C1L6B08
-	FULL WORK COUNT	XF211BT4	A-C1G6B04
+	OP COMPLETE	XF151AR2	A-C1K6D12



A
B
C
D
E

DATE	EC NUMBER	DATE	EC NUMBER
AJG-65	415480 E		
22APR68	419675		

DISC FILE

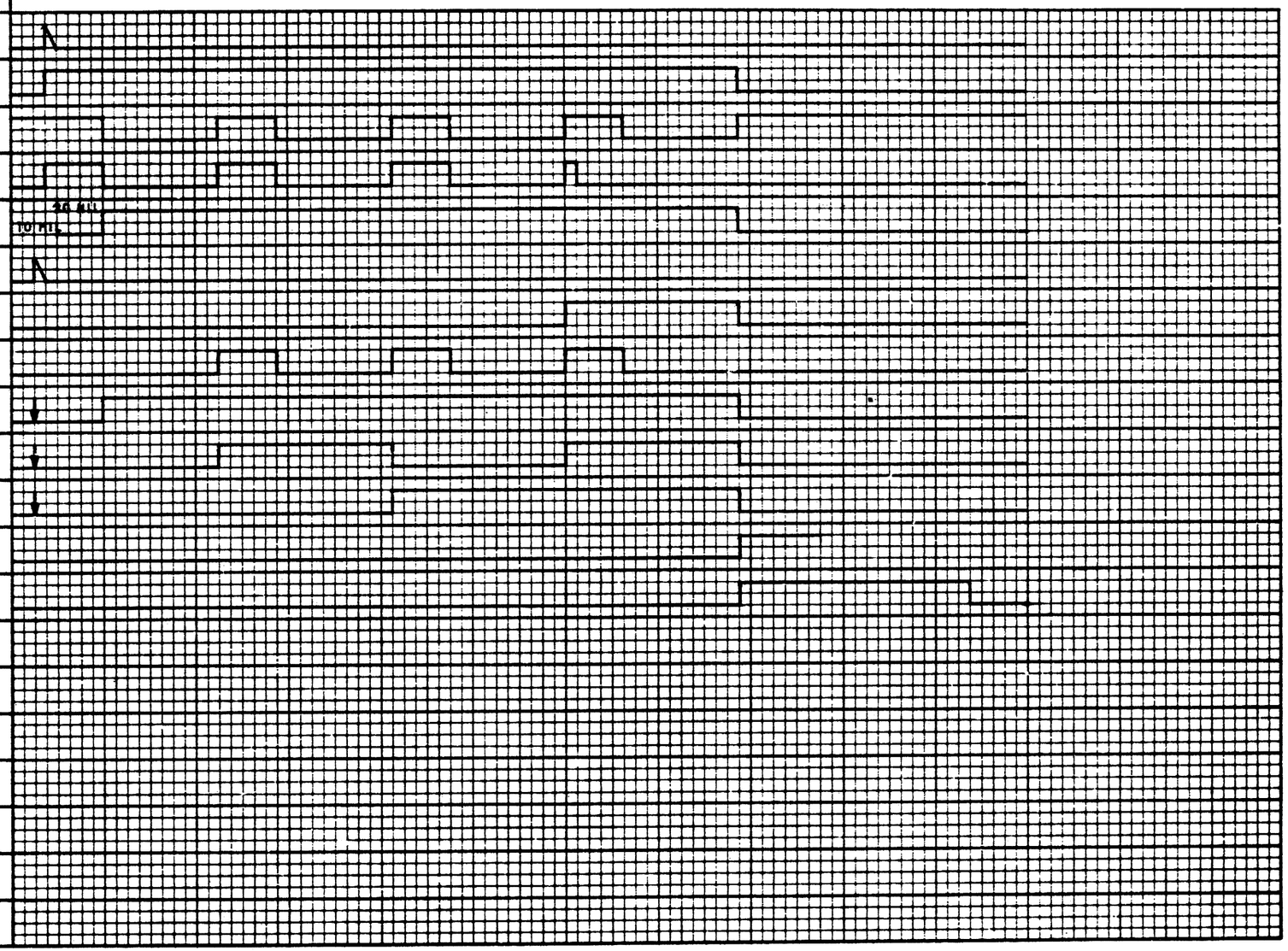
READ TIMING

DATE 3-17-65 P/N 2201246

TYPE 1130

IBM XF711

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
1	- FILE LOAD SP (X10 - E - 2 T - 6)	XF101AR2	A-C1H6D11
2	+ ACCESS CONTROL TGR	XF171AH2	A-C1H6B10
3	+ ACCESS READY PWR	XF171AX4	A-C1E7B12
4	+ ACCESS DRIVE	XF171AN4	A-C1H6G04
5	- STEPPING MODE	XF201AG2	A-C1H6G12
6	- LOAD WORD CTR SP (X10 E - 2 · T - 4)	XF101AS2	A-C1H6D04
7	- FULL WORD COUNT	XF211BT4	A-C1G6B04
8	- INCR WORD COUNT	XF151AQ4	A-C1K6B05
9	+ WORD COUNTER 15	XF201AG2	A-C1H6G12
10	+ WORD COUNTER 14	XF201AS2	A-C1H6G09
11	+ WORD COUNTER 13	XF211AN2	A-C1G6D10
12	+ OP COMPLETE	XF151AR2	A-C1K6D12
13	- SETTLE S-S	XF171AQ4	A-C1L2D13

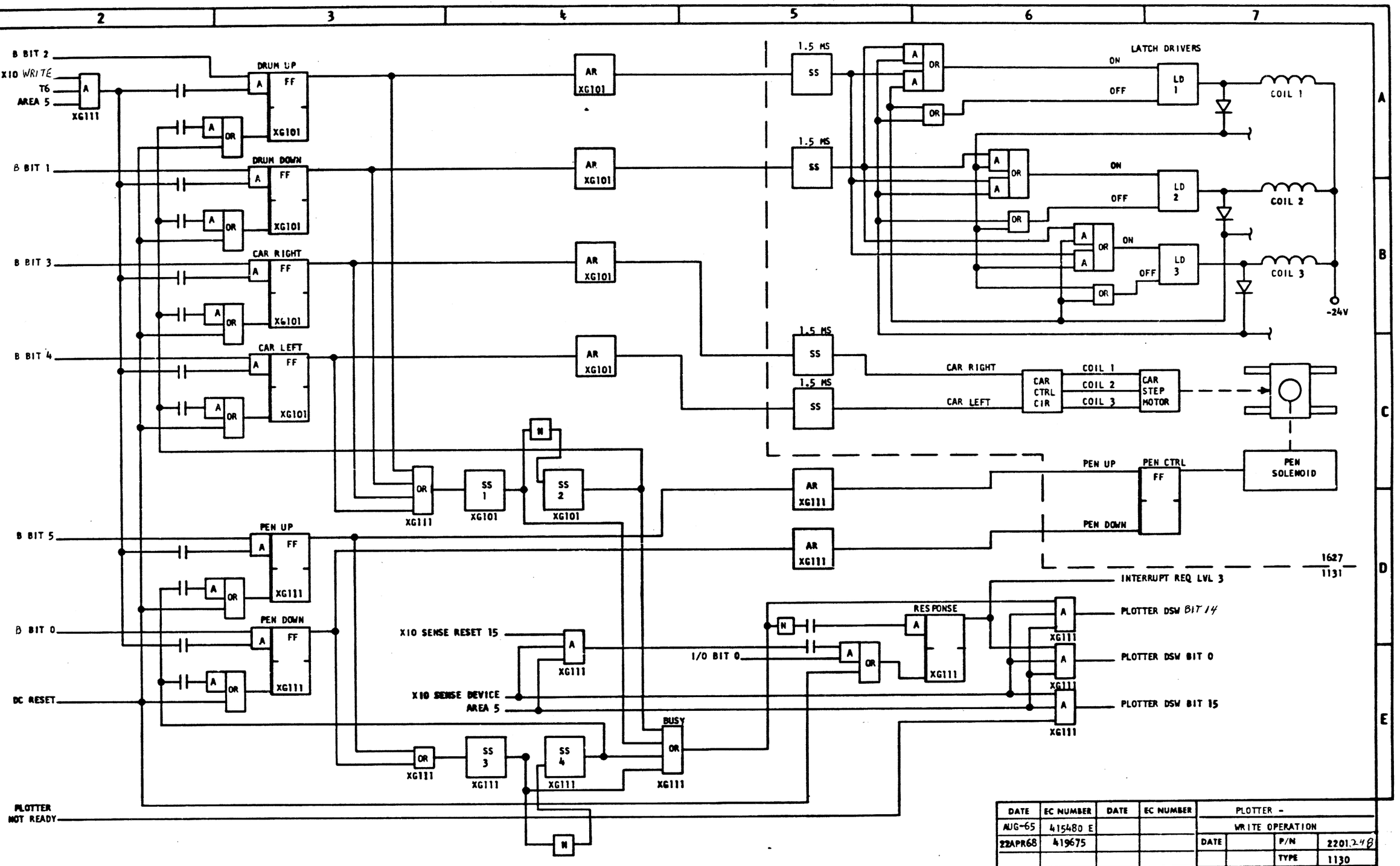


DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
22APR68	419675		

DISK FILE -
ACCESS TIMING

DATE	3-19-65	P/N	2201247
		TYPE	1130

IBM XF721



DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
22APR68	419675		

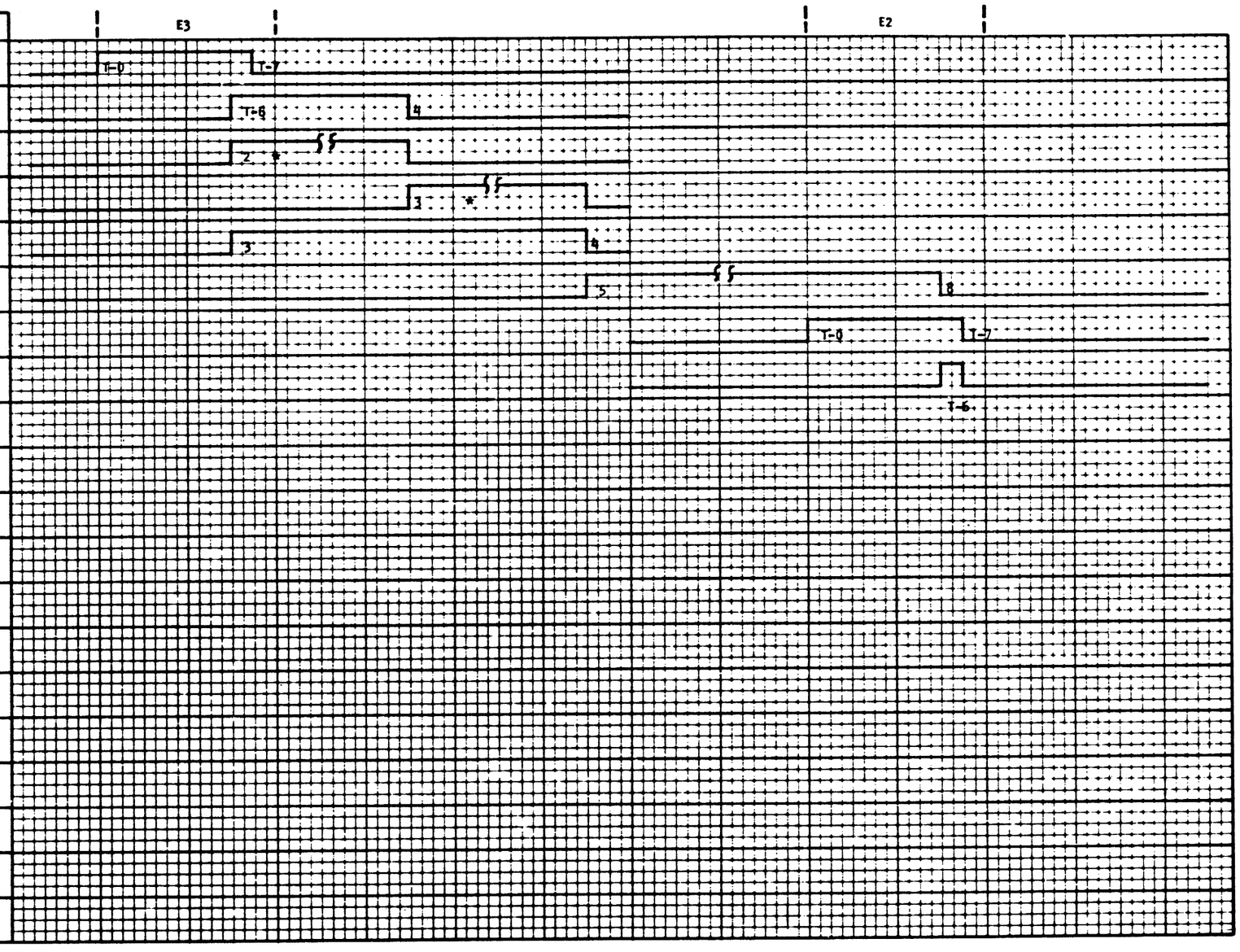
PLOTTER - WRITE OPERATION

DATE		P/N	2201248
		TYPE	1130

IBM XG501

XG701

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
1	+ XIO WRITE	DU101BE4	A-C1M4J12
2	- CONTROL TRIGGERS	XG101 XG111	A-C1M4
3	- SS-1 OR - SS-3	XG101BC4 XG111AZ4	A-C1M4J07 A-C1M4J09
4	- SS-2 OR - SS-4	XG101BD4 XG111BA4	A-C1M4G04 A-C1M4G10
5	+ BUSY	XG111BC4	A-C1M4G08
6	- PLOTTER RESPONSE	XG111BB6	A-C1M4B09
7	+ XIO SENSE DEVICE	DU101AY4	A-C1M4D11
8	+ XIO SENSE RESET 15	DU111AM4	A-C1M4D09



NOTE: DRUM OR CARRIAGE : 1.9 MS FOR 12° 1627
2.9 MS FOR 30° 1627

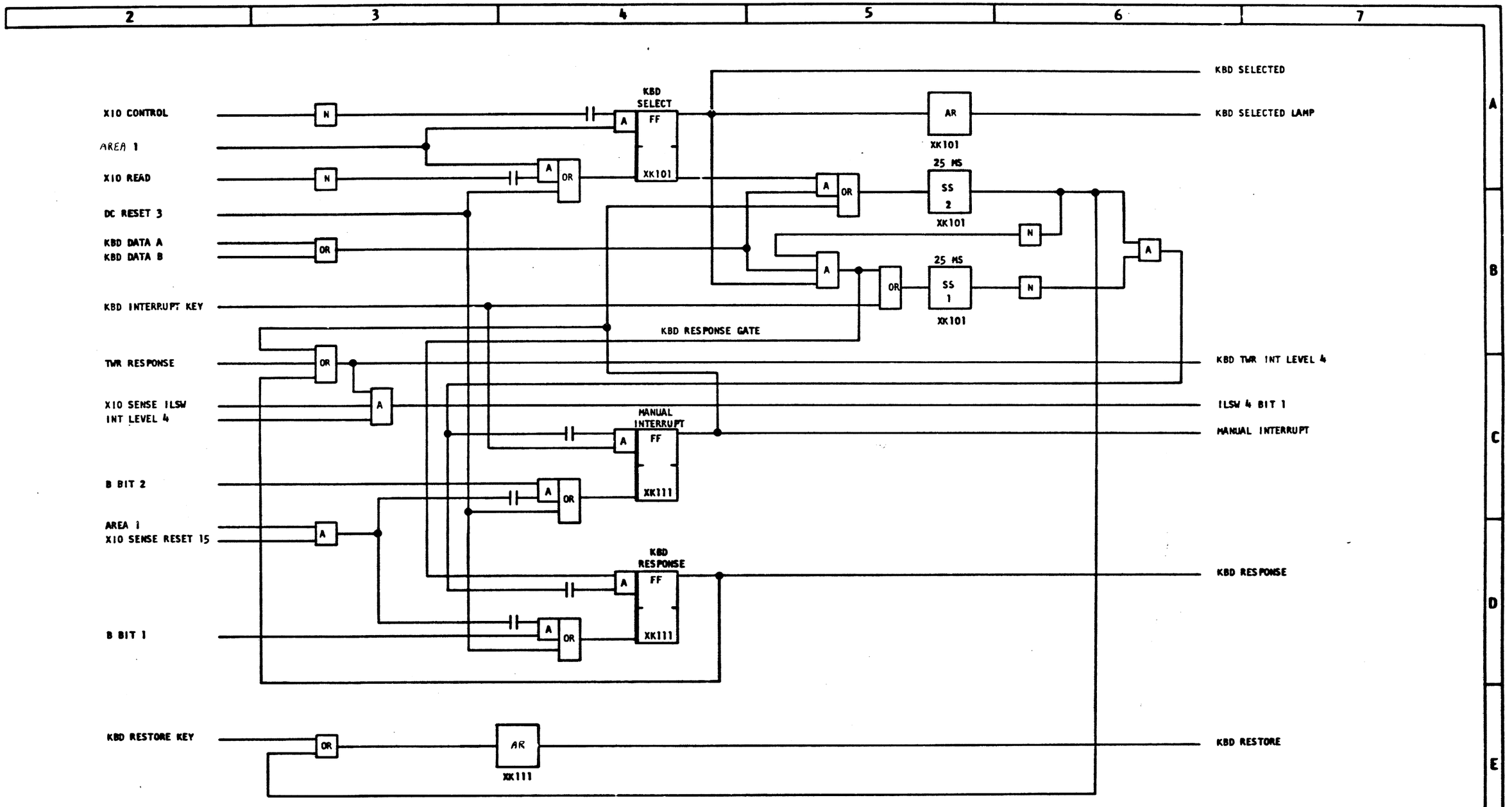
PEN : 50 MS

DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		

PLOTTER
WRITE TIMING
DATE | P/N 2201249
TYPE 1130
IBM
X6701

XG701

XG701



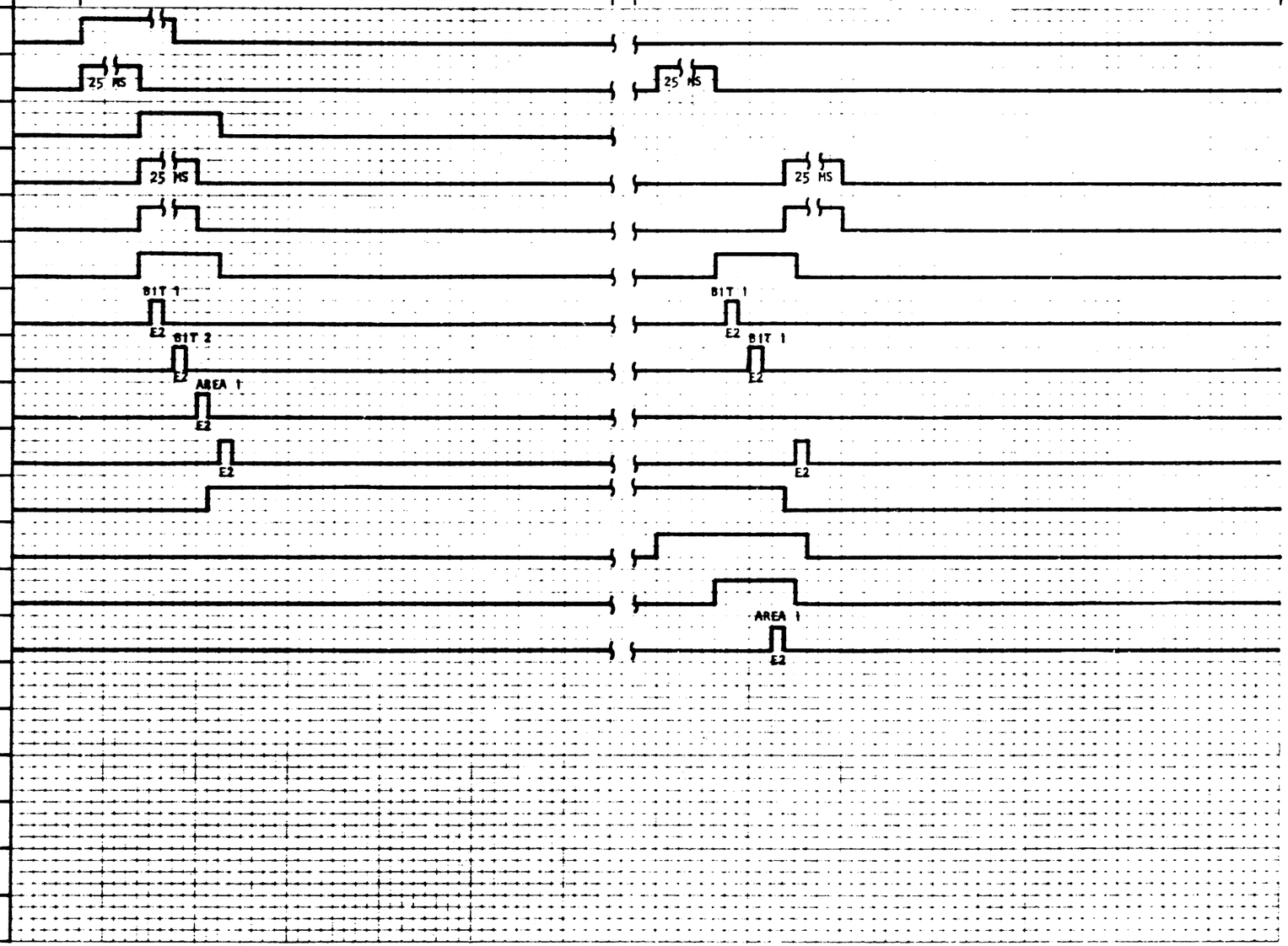
DATE	EC NUMBER	DATE	EC NUMBER	KEYBOARD READ & CONTROL OPS			
AUG-65	415480 E						
22APR68	419675			DATE	6-28-65	P/N	2201250
						TYPE	1130
				IBM		XK501	

2	3	4	5	6	7

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	KBD INTER KEY	XK111AW4	A-C1D3B07	+
2	KBD SS 1	XK101AU4	A-C1E3B03	-
3	MANUAL INTERRUPT	XK111AR2	A-C1E2B04	+
4	KBD SS 2	XK101AT4	A-C1E3B07	-
5	KBD RESTORE	XK111AT4	A-C1D5D06	-
6	KBD-TWR INTERRUPT LVL 4	XK101AJ4	A-C1D3B03	-
7	XIO SENSE ILSW	DU101BA4	A-C1G4B12	+
8	XIO SENSE DEVICE	DU101AY4	A-C1G3B12	+
9	XIO CONTROL	DU101BD4	A-C1E2D12	+
10	XIO SENSE RST 15	DU111AM4	A-C1F2B02	+
11	KBD SELECT	XK101AK2	A-C1E2D09	+
12	KBD DATA (A OR B)	XK101AE4	A-C1D2D06	+
13	KBD RESPONSE	XK111AS2	A-C1E2B09	+
14	XIO READ	DU101BB4	A-C1E2D13	+

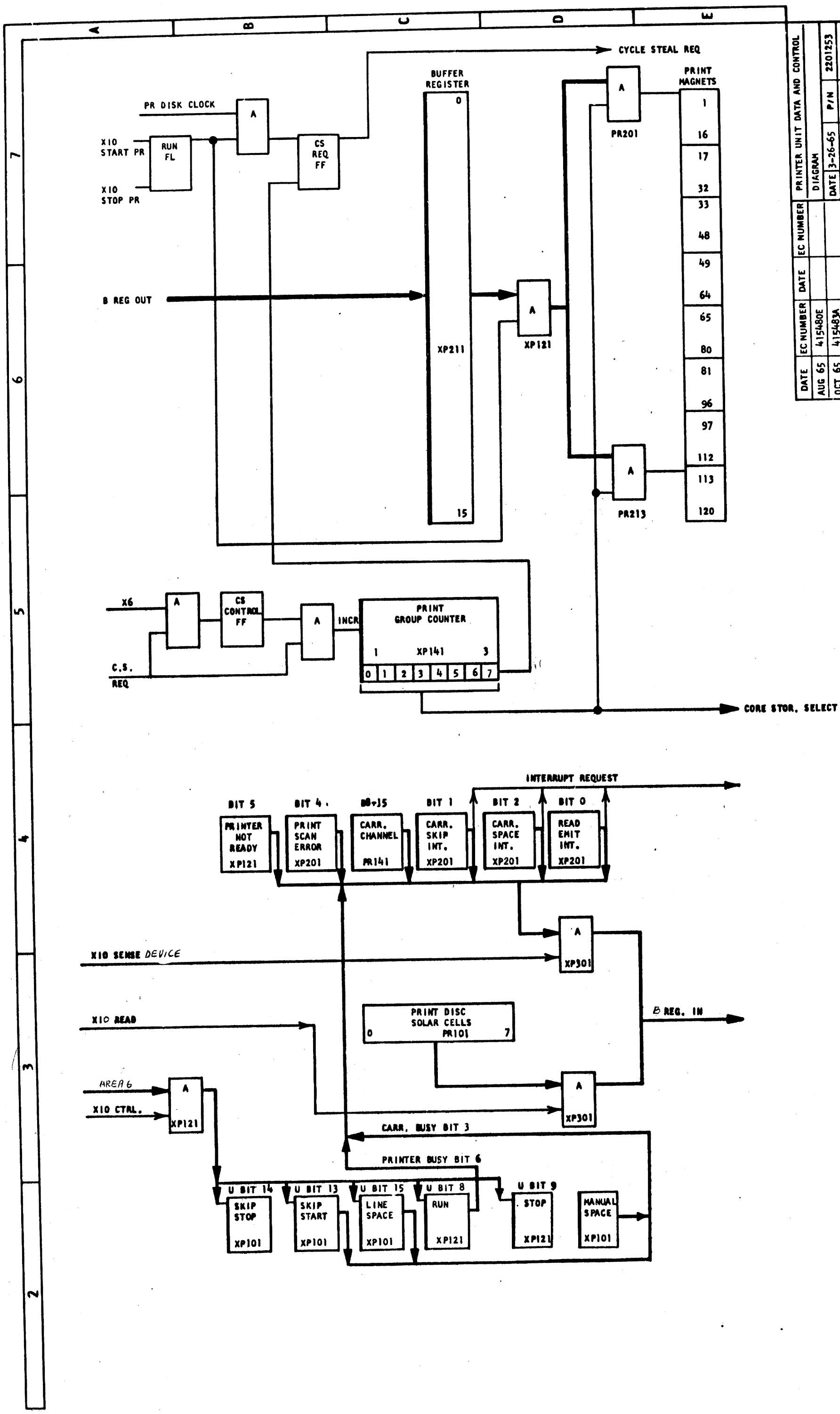
1. KBD INTERRUPT REQUEST KEY DEPRESSED
2. LVL 4 INTERRUPT & KBD RESTORE
3. PROGRAM INTERROGATION OF ILSW AND DSW
4. KBD SELECT LATCH SET
5. RESET INTERRUPT & RETURN TO MAINLINE PROGRAM

1. DEPRESS CHARACTER KEY
2. LVL 4 INTERRUPT
3. PROGRAM INTERROGATION OF ILSW AND DSW
4. READ CHARACTER INTO B REGISTER & RESET KBD SELECT
5. KBD RESTORE, RESET INTERRUPT, AND RETURN TO MAINLINE PROGRAM



DATE	EC NUMBER	DATE	EC NUMBER	KEYBOARD
OCT 65	415483A			READ & CONTROL TIMING
				DATE / P/N 2201251
				TYPE 1130
				IBM XK701

A B C D E



DATE	EC NUMBER	DATE	EC NUMBER
AUG 65	415480E		
OCT 65	415483A		
22APR68	419675		

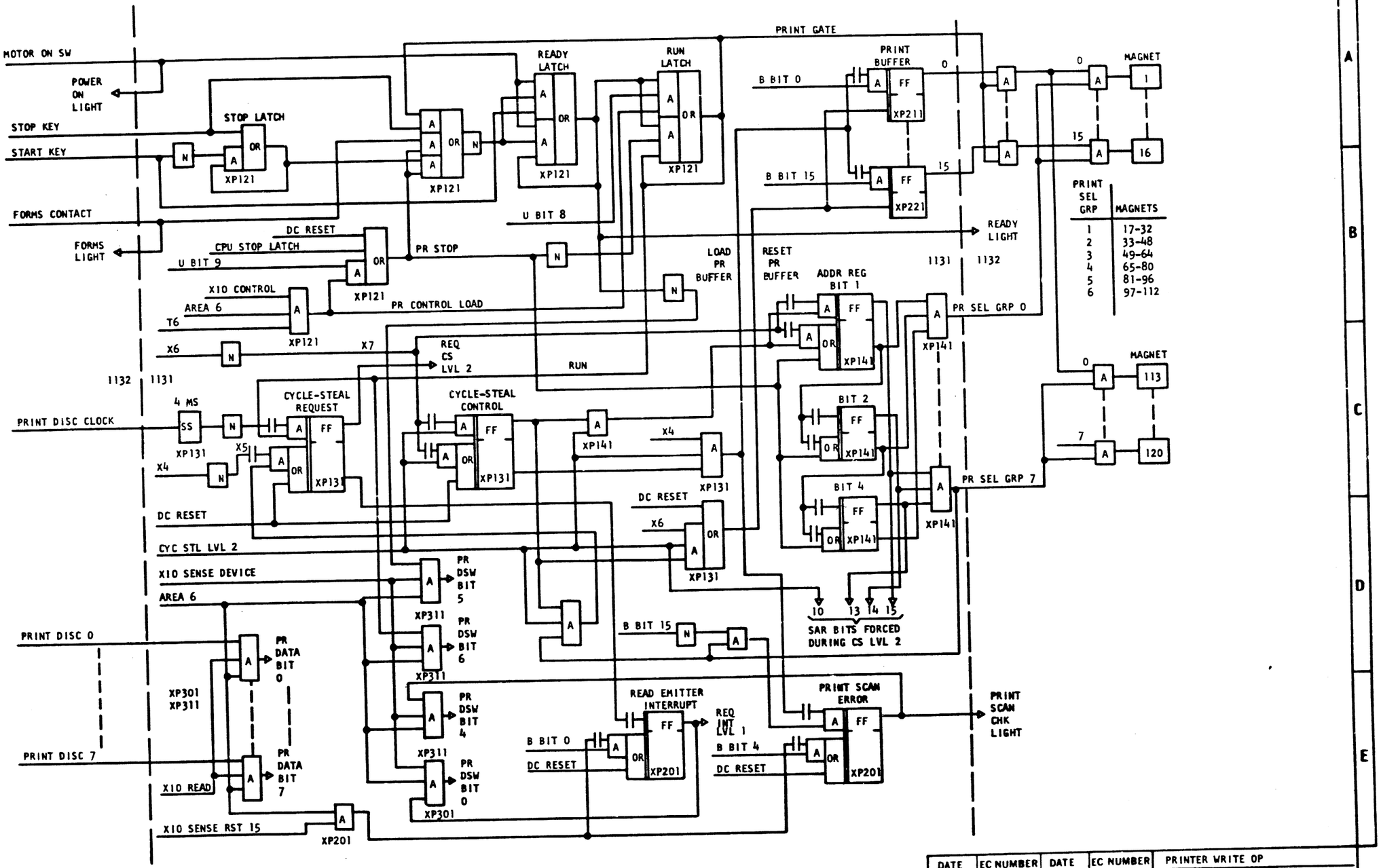
PRINTER UNIT DATA AND CONTROL

DIAGRAM

DATE 3-26-65 | P/N 2201253 | TYPE 1130

IBM

XP401



DATE	EC NUMBER	DATE	EC NUMBER
AUG 65	415480E		
22APR68	419675		

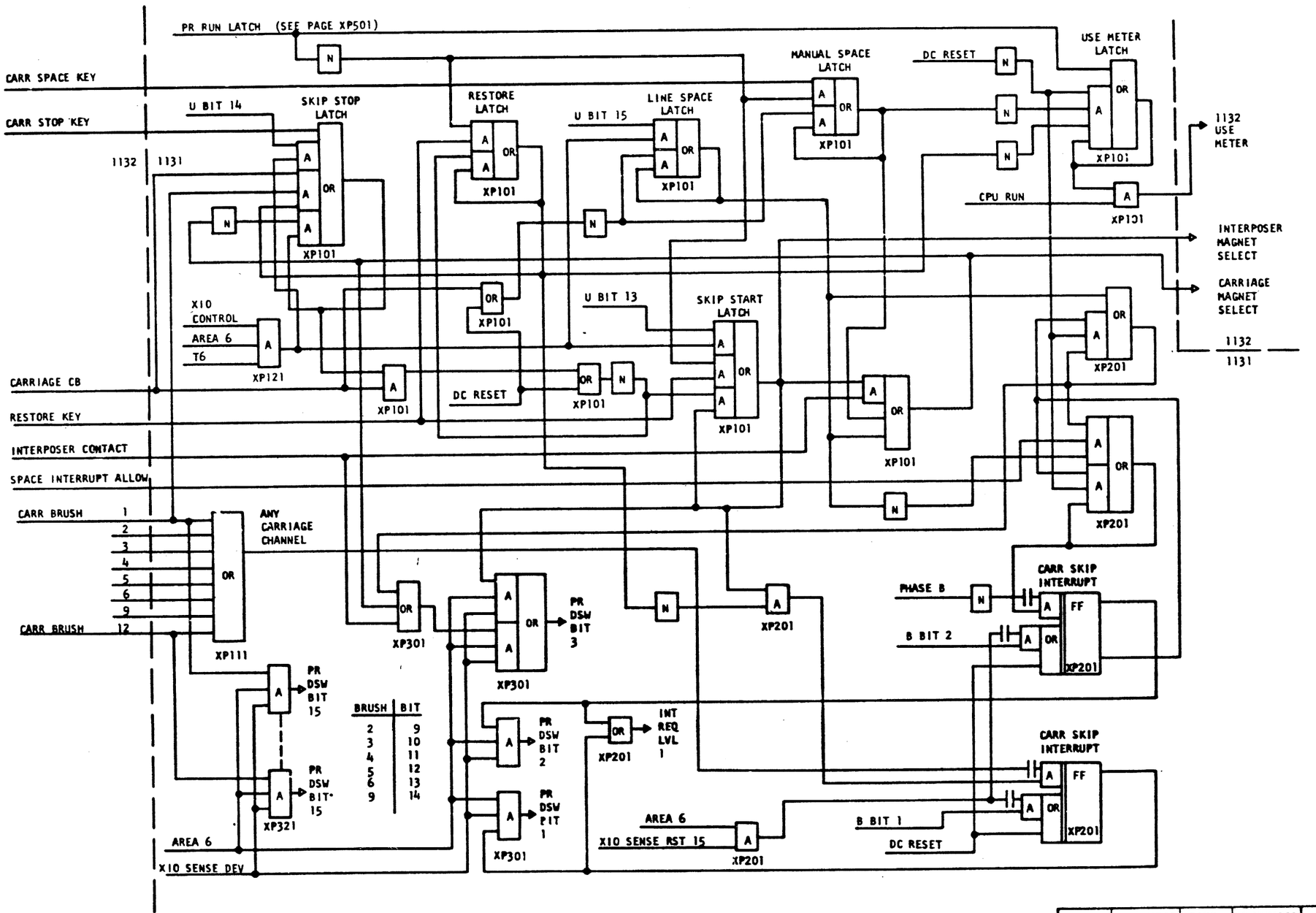
RED

PRINTER WRITE OP

(READ EMITTER, PRINT)

DATE	APR 68	P/N	2201254
		TYPE	1130

IBM XP501



DATE	EC NUMBER	DATE	EC NUMBER
AUG 65	415480E		
OCT 65	415483A		
AUG 66	419622		
22APR68	419675		

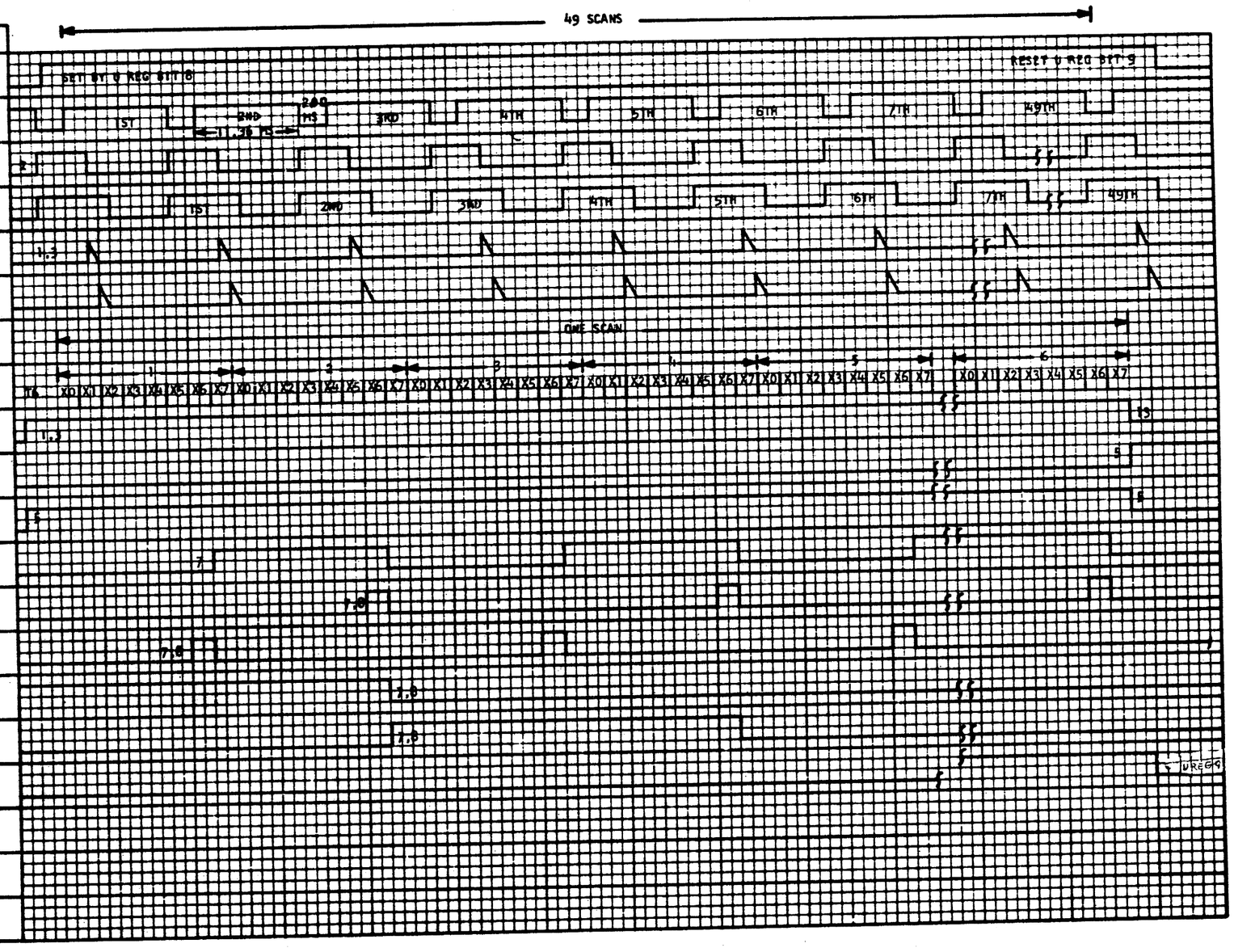
PRINTER CONTROL OP
(START, STOP, SPACE)

DATE	APR 68	P/N	2201255
		TYPE	1130

IBM XP511

RED

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
1	- RUN LATCH	XP121AP4	A-A1H2B03
2	+ PRINT DISC CLOCK	XP331AM3	A-A1J3D12
3	+ PRINT DISC CLOCK SS	XP131BD4	A-A1J3D11
4	+ PRINT DISC CODE	XP331	A-A1A4
5	+ PRINTER CS REQ	XP131AN2	A-A1H2B04
6	+ READ EMIT INT	XP201AU2	A-A1J2D09
5	+ PRINTER CS REQ. + CS REQUEST	XP131AN2	A-A1H2B04
6	+ READ EMIT INT	XP201AU2	A-A1J2D09
7	- CS LEVEL 1	KM211AS4	A-A1H2B07
8	- PRINTER CS CONTROL	XP131AP6	A-A1H2D06
9	- RESET PRINT BUFFER	XP131AZ4	A-A1G2B07
10	- LOAD PRINT BUFFER	XP131AU4	A-A1K2B09
11	+ PRINT SELECT GROUP 0	XP141BD4	A-A1D2B12
12	+ PRINT SELECT GROUP 1	XP141BE4	A-A1D2B13
13	+ PRINT SELECT GROUP 7	XP141BL4	A-A1D2B09



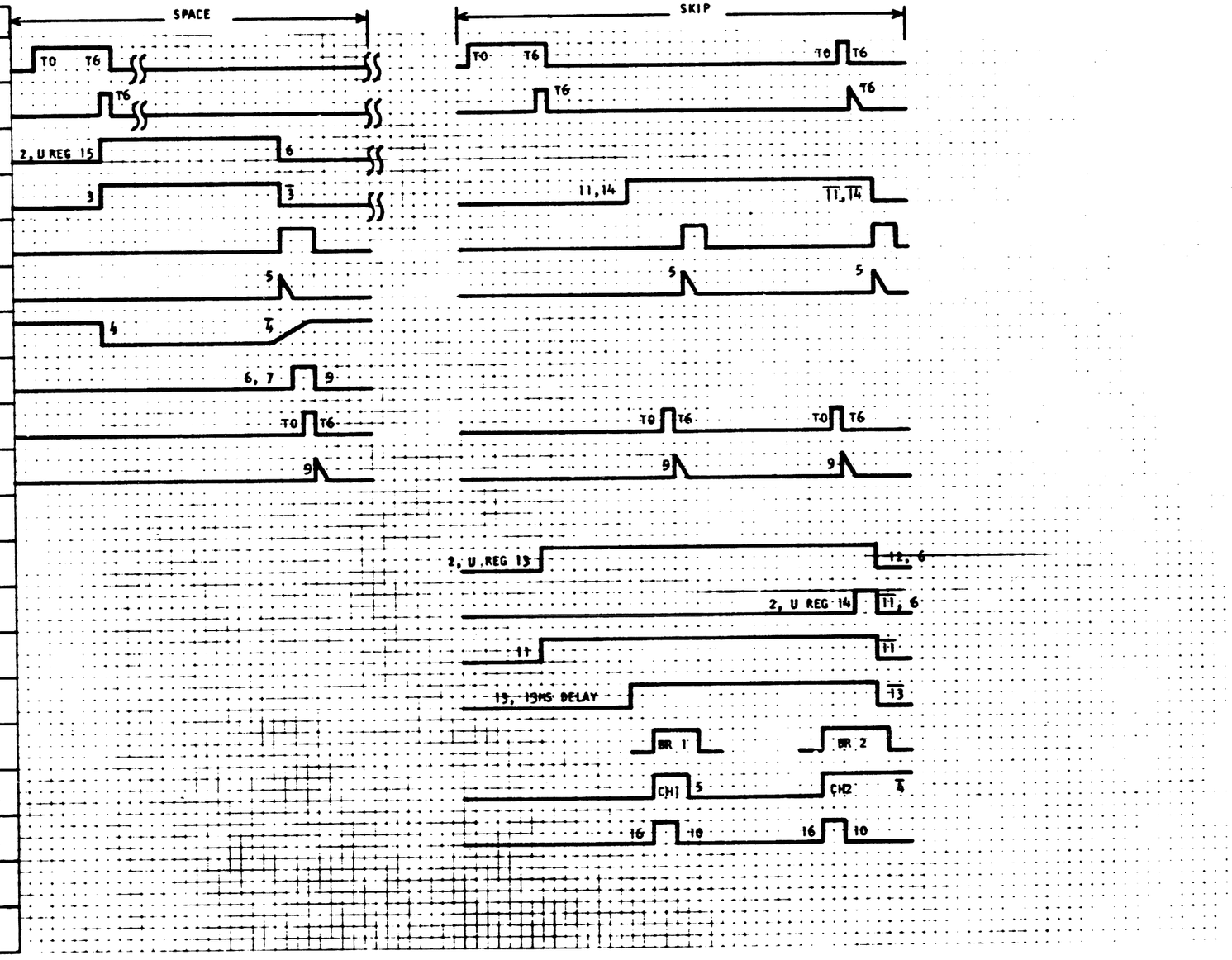
DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
22APR68	419675		

PRINTER WRITE TIMING
(READ EMITTER, PRINT)

DATE		P/N	2201256
		TYPE	1130

IBM XP701

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	X10 CONTROL	DU101 BD4	A-A1G2D10	+
2	PRINTER CONTROL LOAD	XP121 AD4	A-A1G2D09	-
3	LINE SPACE LATCH	XP101 AY4	A-A1D3D10	-
4	CARRIAGE MAGNET SELECT	XP101 BD4	A-A1F3D12	-
5	CARRIAGE CB	PR131 AR4	LTCHCDC2	-
6	CARRIAGE CB PULSE	XP101 CM4	A-A1G3D04	+
7	SPACE INT ALLOW	XP331 AP6	A-A1B3B05	+
8	CARRIAGE SPACE INT	XP201 AW2	A-A1J2B04	+
9	X10 SENSE DEVICE	DU 101AY4	A-A1L3B13	+
10	X10 SENSE, AREA 6 RESET BIT 15	XP201 BH4	A-A1M2B02	-
11	SKIP START LATCH	XP101 AU4	A-A1D3B03	+
12	SKIP STOP LATCH	XP101 AR4	A-A1D3D04	-
13	INTERPOSER MAG SELECT	XP101 AZ4	A-A1G3D11	-
14	INTERPOSER CONTACT	XP331 AM1	A-A1E3D09	+
15	CARRIAGE BRUSH	PR141		+
16	ANY CARRIAGE CHANNEL	XP111 AS4	A-A1F3B02	-
17	CARRIAGE SKIP INT	XP201 AV2	A-A1J2B09	+



DATE	BC NUMBER	DATE	BC NUMBER
AUG 65	415480		
AUG 66	419622		
22APR68	419675		

PRINTER CONTROL TIMING

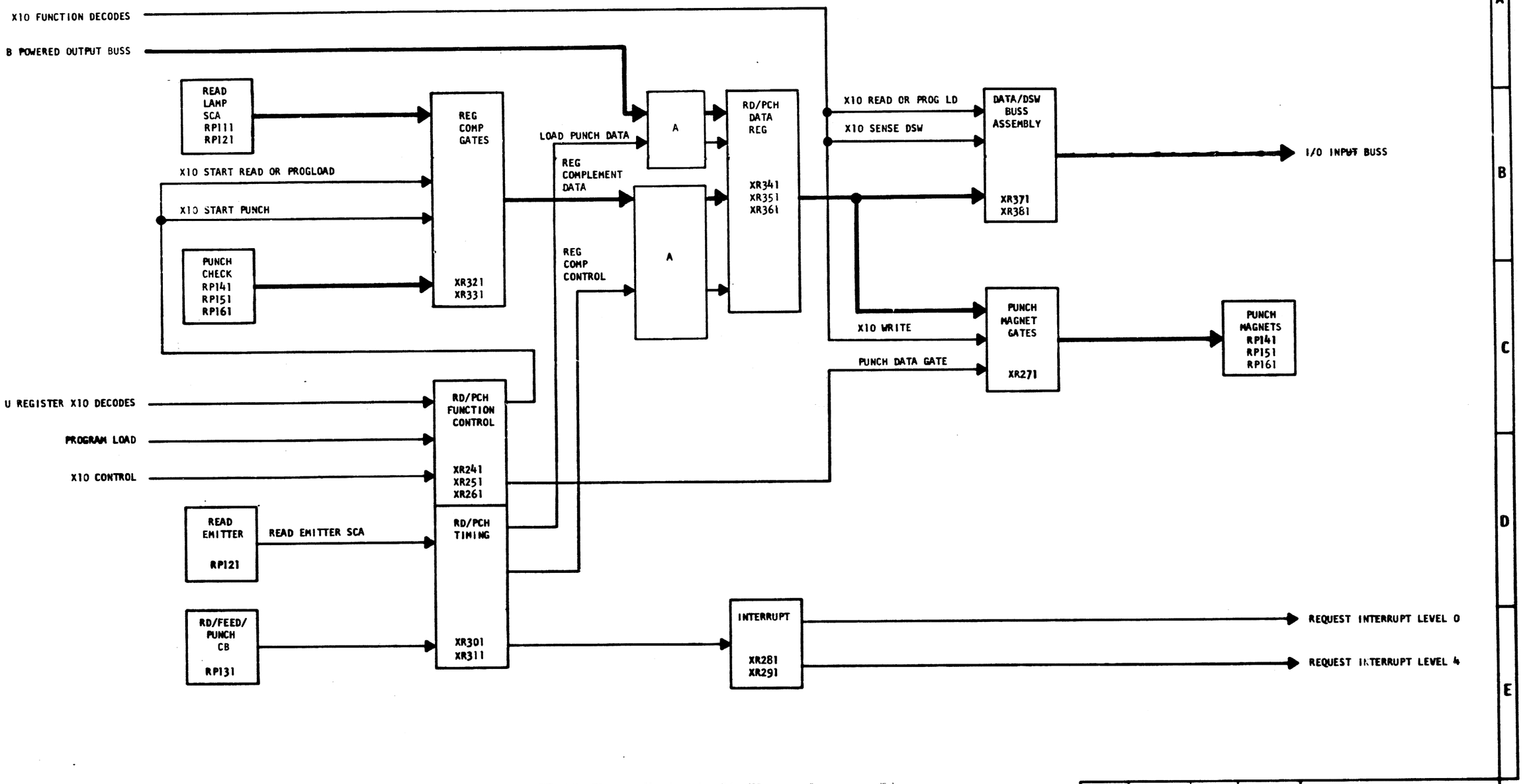
START, STOP, SPACE

DATE | P/N 2201257

TYPE 1130

IBM XP711

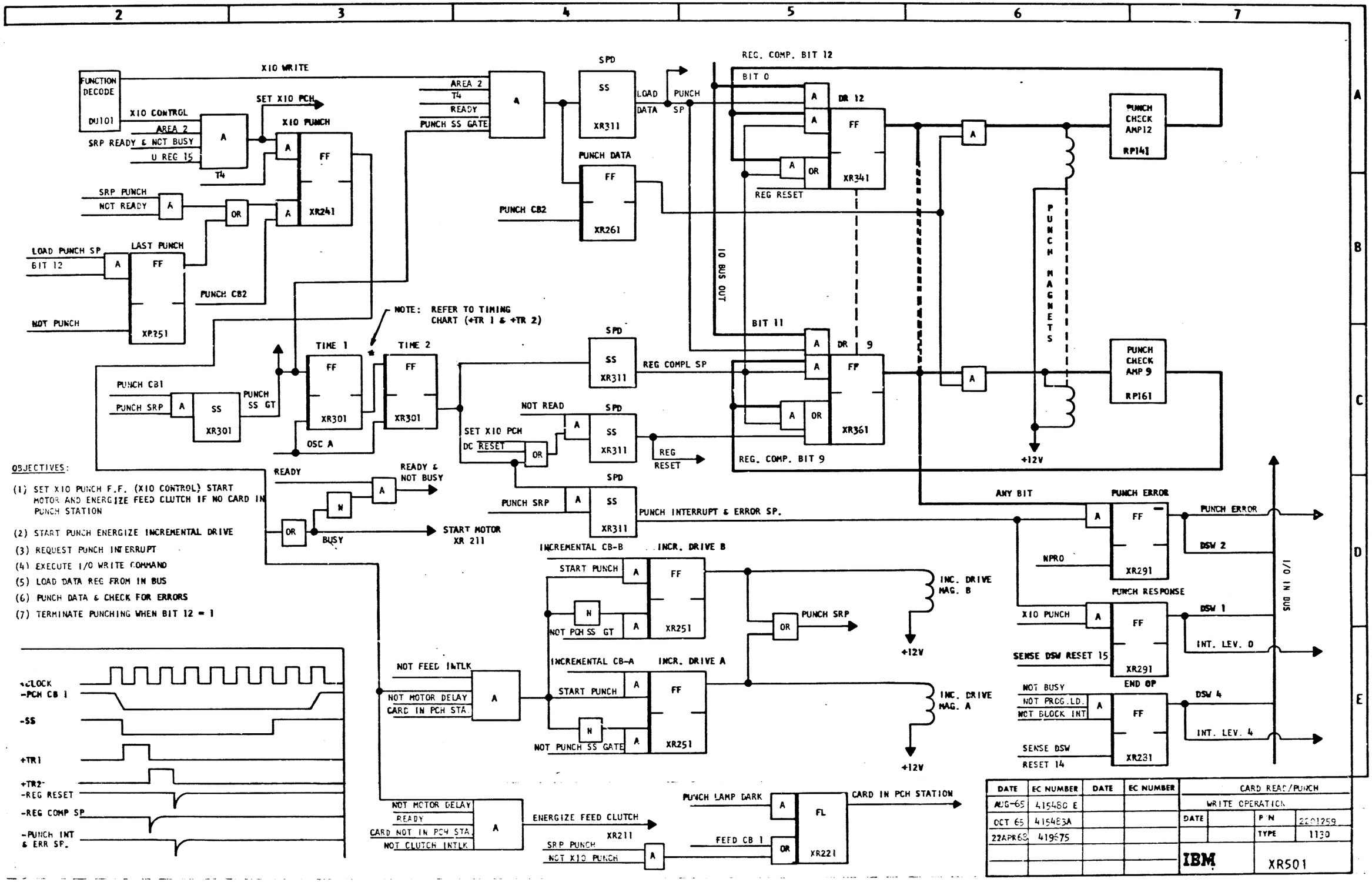
XP711



DATE	EC NUMBER	DATE	EC NUMBER	CARD READ/PUNCH UNIT DATA AND CONTROL DIAGRAM			
AUG-65	415480 E			DATE	3-25-65	P/N	2201258
						TYPE	1130
				IBM		XR401	

XR401

XR401



OBJECTIVES:

(1) SET X10 PUNCH F.F. (X10 CONTROL) START MOTOR AND ENERGIZE FEED CLUTCH IF NO CARD IN PUNCH STATION

(2) START PUNCH ENERGIZE INCREMENTAL DRIVE

(3) REQUEST PUNCH INTERRUPT

(4) EXECUTE I/O WRITE COMMAND

(5) LOAD DATA REG FROM IN BUS

(6) PUNCH DATA & CHECK FOR ERRORS

(7) TERMINATE PUNCHING WHEN BIT 12 = 1

DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
OCT 65	415483A		
22APR68	419675		

CARD READ/PUNCH
WRITE OPERATION

DATE		P N	2201259
		TYPE	1130

IBM

XR501

2 | 3 | 4 | 5 | 6 | 7

A | B | C | D | E

FUNCTION DECODE

X10 READ

X10 CNTRL

AREA 2

SRP NOT BUSY & READY

U REG. BIT 13

A XR241

T4

CB2

READ EMITTER

SCA RP121

X10 READ A FF XR241

X10 FEED A FF XR241

A

READ SS 100 US

SS XR301

N

READ 12 11 0 — SCA 9 — RP111, 121

A A A — A

AREA 2 A

A SS XR311

REG. COMP. SP

SRP DR 12 A FF XR341 (A OR)

SRP DR 9 A FF SR361 (A OR)

A DATA 0

A DATA 11

SPD SS XR311

REG. RESET SP.

TIME 1 OR FF XR301 A

TIME 2 A FF XR301 A

OSC A

NOT READ SS

RD/PCH TIME 2

A SS XR311

READ INT. & ERROR SP.

ANY BIT

DATA ERR A FF XR291

DSW 2

MPRO RESET

READ RESP. A FF XR291

DSW 0

LEVEL 0

AREA 2

X10 SENSE DSW BIT 15 A

NOT BUSY

NOT PROG. LOAD

NOT BLOCK END OP

END OP A FF XR281

DSW 4

LEVEL 4

T4

X10 SENSE DSW BIT 14 A

READY

N

A NOT BUSY & READY

OR BUSY

START MOTOR XR211

MOTOR ON

TD XR211 850 MS DELAY

A ENERGIZE FEED CLUTCH XR211

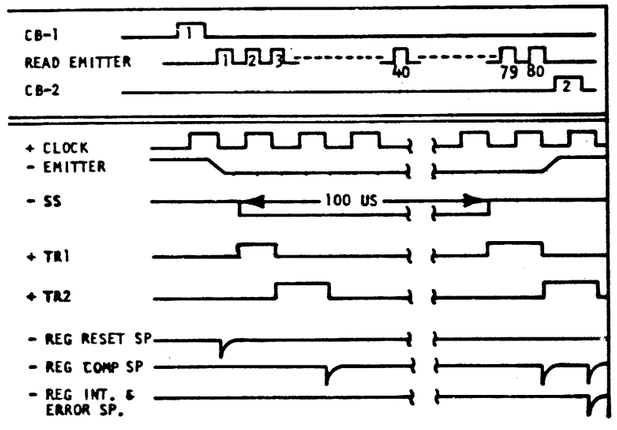
NOT FEED INTLK

FEED CB 3

OR CLUTCH INTERLOCK

OBJECTIVES:

1) SET READ & FEED FF
2) START MOTOR & ENERGIZE FEED CLUTCH
3) GATE DATA TO DATA REGISTER
4) CHECK FOR ERROR AND REQUEST INTERRUPT
5) GATE DATA TO IN BUS
6) END OP AT END OF CARD



DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
OCT 65	415483A		
22APR68	419675		

CARD READ/PUNCH - READ OPERATION

DATE 3-25-65 P/N 2201260

TYPE 1130

IBM XR511

XR521

READY
FL
XR201

1442 READY

PROG LD KEY

CPU RESET COND

A
XC141

CARD FEED CB-2
RP131

1442 FEED CB-2

PROG LD

A
XC141

OSC A

I/O RESET 1 CTR

(TO KU311)

PROG LD
A
A
FF
XC141

NOT PROG LD

OR
KT241

BLOCK B TO D/OP TRANS
(TO KD101, KG231)

PROG LOAD

A
KM201

INHIBIT RUN TRGR
(TO KA101)

CLOCK T70B

A
KM201

DOT OR DELAY START TRGR
(TO KA111)

OR
DU101

I/O TO B SAMPLE
(TO KG121)

NOT PROG LD

NOT INT DELAY SW
COUNT 0

A
KM201

GATE INT LVL

NOT READ RESPONSE LVL 0

X10 FEED
FF
XR241

OR
XR241

FEED OR PROG LD

MOTOR DELAY
CLUTCH INTLK

A
A
A
A
FEED CLUTCH LATCH
FL
OR
XR211

FEED CLUTCH

DR
RP171

FEED CLUTCH MAGNET

OR
XR261

BUSY

A
A
A
FL
OR
XR211

MOTOR CLUTCH

DR
RP171

MOTOR RELAY

X10 READ
FF
XR241

OR
XR241

READ OF PROG LD TO READ (XR301, 321, 331)

(PROG LD BLOCK INT)

READ RESP.

A
FF
XR291

READ RESP LVL 0

A
KM301

TIMING T7X7

INTERRUPT LEVEL 0
A
FF
KM301

TIMING T4

A
A

NOT BLOCK LAST INT

A
XR281

NOT BUSY

END OP
A
FF
XR281

READ/PUNCH DATA REGISTER (XR341, 351, 361)

12	11	0	1	2	3	4	5	6	7	8	9

OR
XR381

X10 READ OR PROG LOAD

0	1	2	3	4	8	9	10	11	12	13	14	15

I/O INPUT BUSS ASSEMBLY GATES (XR371 & 381)

TO I/O INPUT BUSS

DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		

CARD READ/PUNCH
PROGRAM LOAD OPERATION

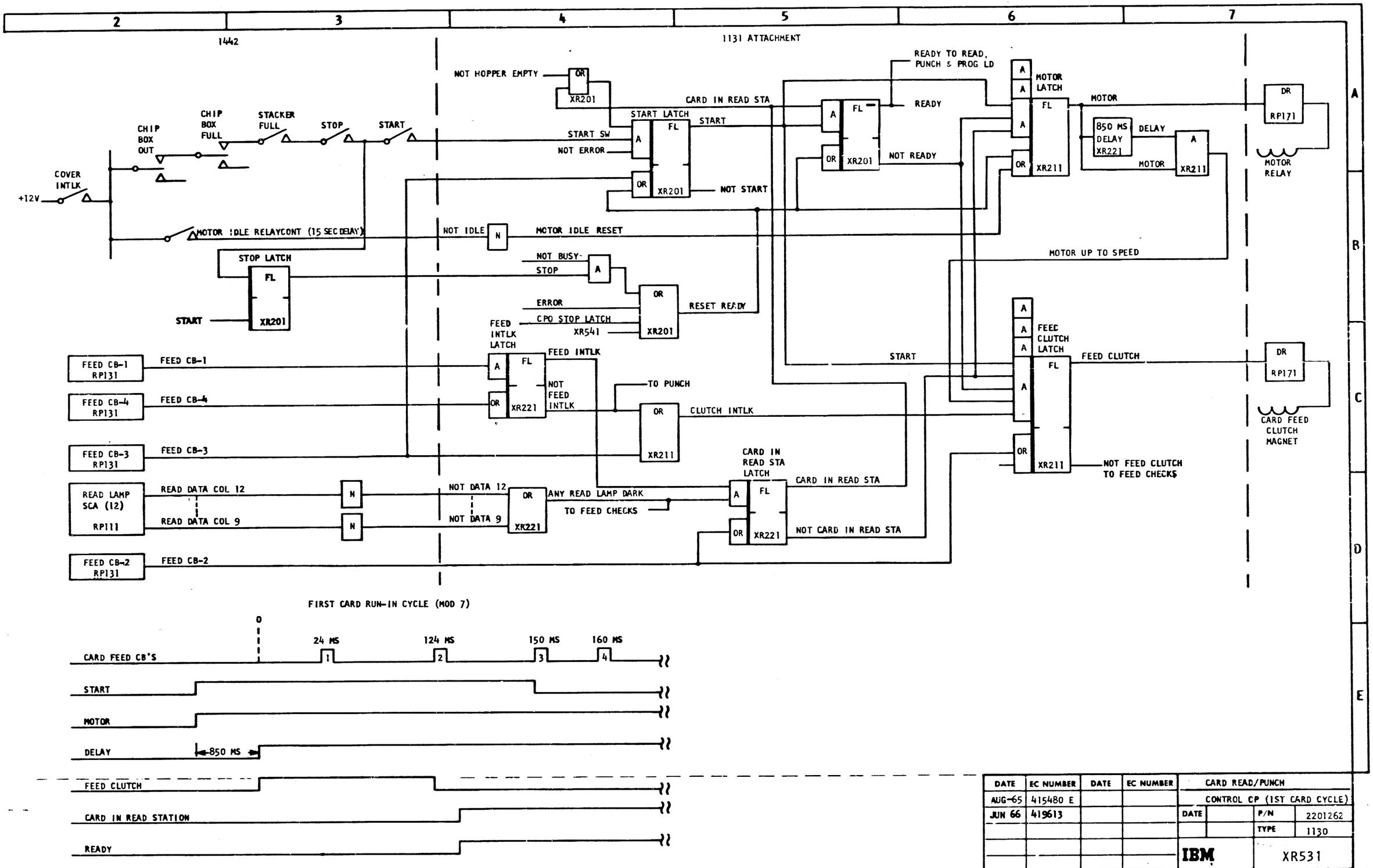
DATE	3-26-65	P N	2201261
		TYPE	1130

IBM

XR521

XR521

XR521



DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
JUN 66	419613		

CARD READ/PUNCH

CONTROL CP (1ST CARD CYCLE)

DATE		P/N	2201262
		TYPE	1130

IBM

XR531

1442

STACKER JAM SW

PUNCH LAMP SCA RP121

COVER INTLK NO

HOPPER EMPTY SW NC

STOP NC

NPRO NO

+12V

OR COVER

OPEN OR NC 1442 12V SUPPLY

1131 ATTACHMENT

XR541

PUNCH LAMP DARK

NPRO SW

NOT BUSY

NPRO

MOTOR LATCH

MOTOR

XR211

FEED CLUTCH LATCH

FEED CLUTCH

NPRO TO READ & PUNCH ERROR RESET

POWER ON RESET

NPRO/RESET TO FEED CHECKS

HOPPER EMPTY

START

FEED CB-1

LAST CARD

LAST CARD TO DSW

NOT LAST CARD

BLOCK LAST CARD INT

FEED CB-4

NOT BLOCK INT TO READ

NPRO/RESET

STACKER JAM

TO PUNCH

PUNCH STA CHECK

FEED CB-3

FEED CLUTCH MISS FEED

NOT FEED CLUTCH

DATA ERROR

HOPPER MISS FEED

NOT HOPPER EMPTY

NO CARD IN READ STA

XR201, 421 ERROR TO RUN DSW

NOT START

NOT BUSY

XR201, 501 RESET READY TO RUN-IN

XR501 ANY READ LAMP DARK

FEED CB-2

READ STA CHECK

CARD FEED CB'S

850 MS

X10 FEED

START MOTOR

DELAY

FEED CLUTCH

CARD IN READ STA

READY

BUSY (X10 FEED)

HOPPER EMPTY SW

XR541 LAST CARD TGR

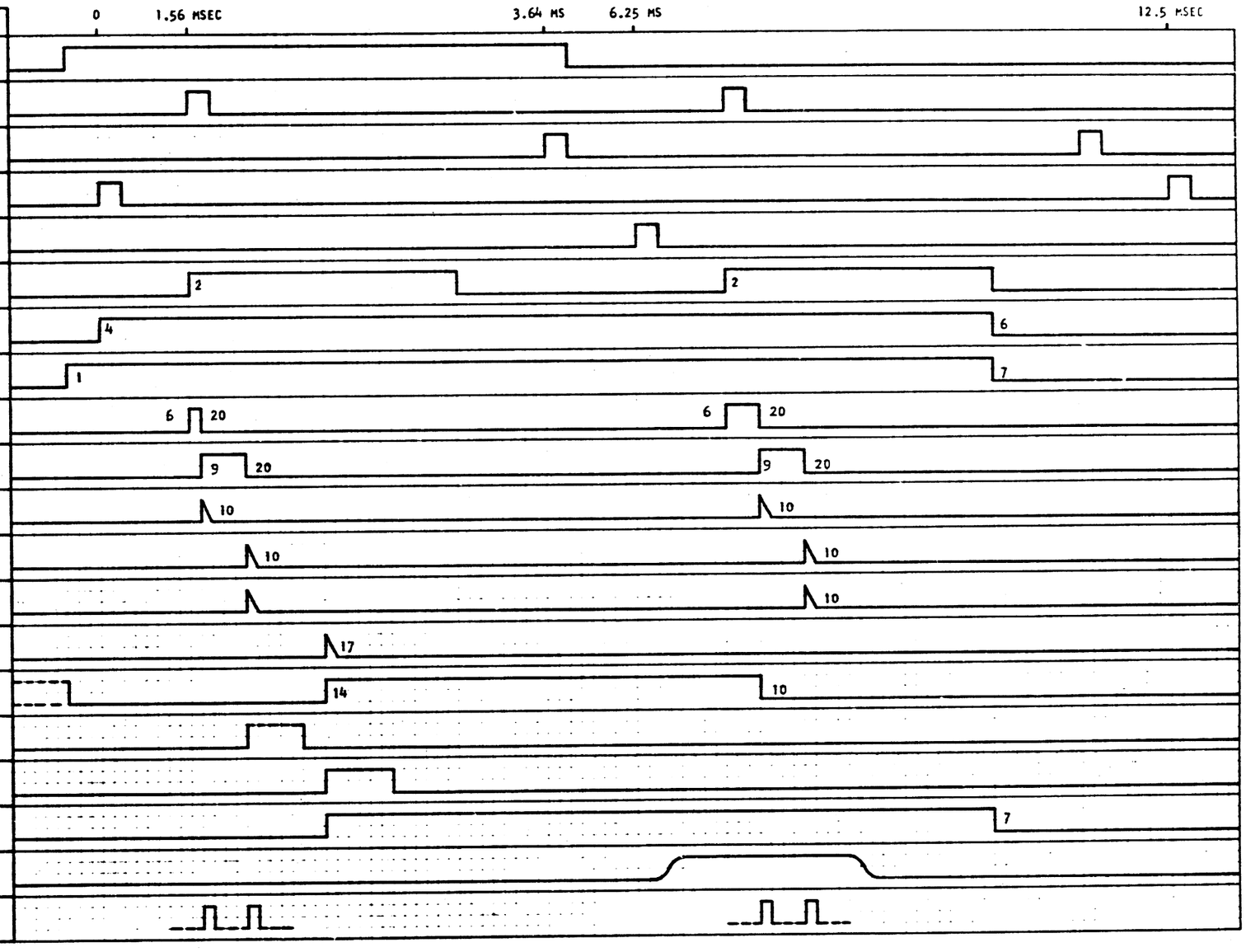
XR541 BLOCK LAST CARD INT

DATE	EC NUMBER	DATE	EC NUMBER	CARD READ/PUNCH CONTROL CP (NPRO, LAST CARD, FEED CK)
AUG-65	415480 E			DATE / P N 2201263
				TYPE 1130
				IBM XR541

XR541

2	3	4	5	6	7

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
1	+SRP X10 PUNCH	XR241BB2	A-B1F3D09
2	+PUNCH CB-1	XR121AF4	A-B1M3G04
3	-PUNCH CB-2	XR121AH1	A-B1M3G07
4	+INCR DRIVE CB-A	XR121AH5	A-B1M3G02
5	-INCR DRIVE CB-B	XR121AH9	A-B1M3J13
6	-PUNCH SS2	XR301AS4	A-B1K3B07
7	+PUNCH SRP	XR261AD4	A-B1G4D09
8	+SRP BUSY	XR261AE4	A-B1J4B02
9	+SRP RD/PCH TIMING 1	XR301AT2	A-B1M3B10
10	+SRP RD/PCH TIMING 2	XR301BB2	A-B1M3D09
11	-REG COMPLEMENT SP	XR311AP2 XR311AQ2	A-B1L3B12 A-B1L3D11
12	-REG RESET SP	XR311AR2	A-B1L3D04
13	-PUNCH INT & ERROR SP	XR311AG2	A-B1L3B03
14	-LOAD PUNCH DATA SP	XR311AS2	A-B1L3B08
15	-REGISTER NOT ZERO	XR291BD4	A-B1G2D13
16	+PUNCH RESPONSE	XR291AY2	A-B1K4B09
17	+X10 WRITE	DU101BE4	A-B1G3D11
18	+LAST PUNCH	XR251BM2	A-B1H3D09
19	+PUNCH CHECK AMP BITS	XR121	A-B1N2 A-B1N3
20	-OSC A PWR	XR301AC4	A-B1P4D13



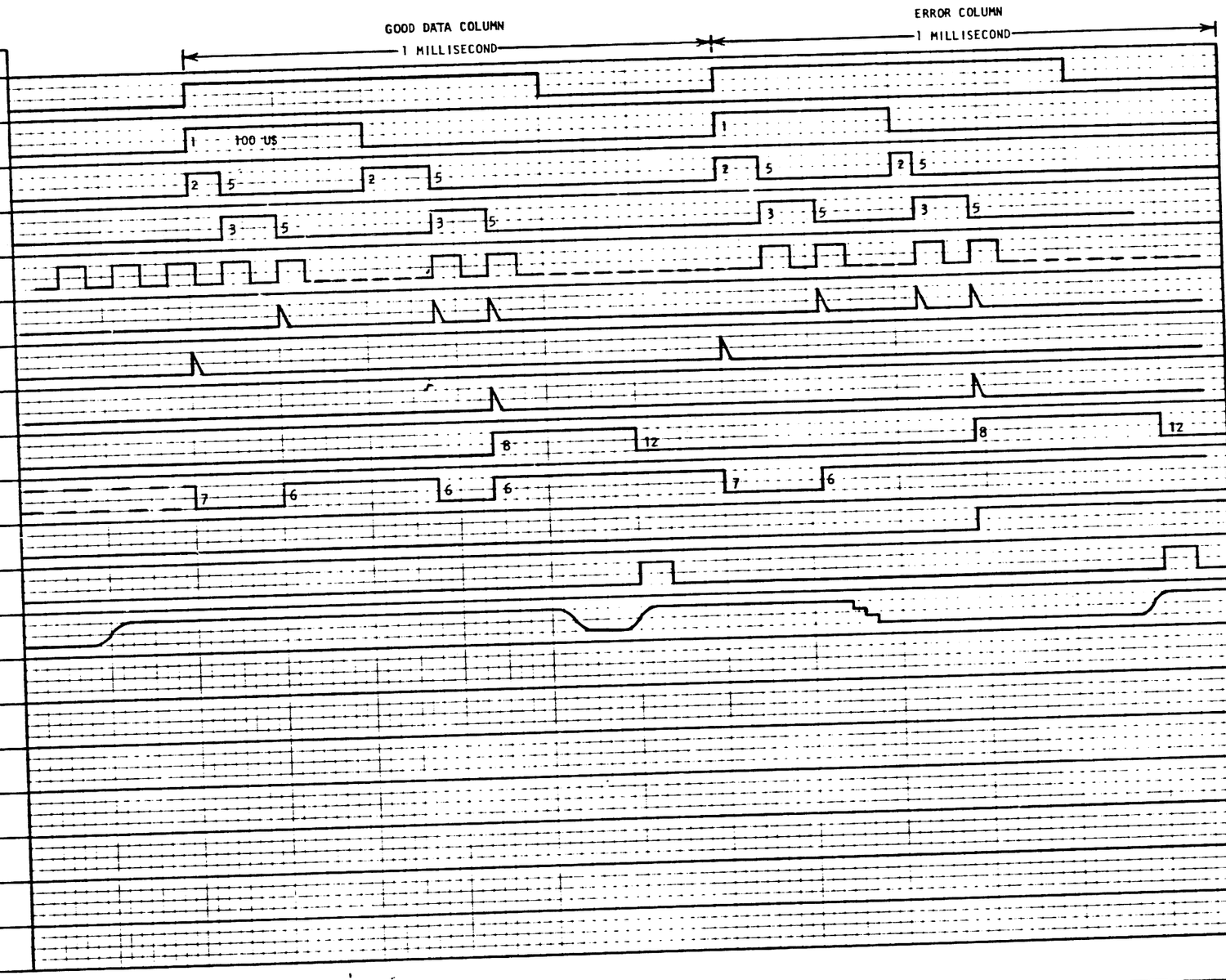
DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
22APR68	419675		

CARD READ/PUNCH
WRITE TIMING

DATE		P/N	2201264
		TYPE	1130

IBM XR701

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
1	+ READ EMITTER	XR121AD7	A-B1N3B08
2	- SRP READ SS	XR301AR4	A-B1K3B03
3	+ SRP RD/PCH TIMING 1	XR301AT2	A-B1M3B10
4	+ SRP RD/PCH TIMING 2	XR301BB2	A-B1M3D09
5	- OSC A PWR -.OSC PHASE A	XR301AC4	A-B1G4D13
6	- REG COMP SP	XR311AQ2 XR311AP2	A-B1L3D11 A-B1L3B12
7	- REG RESET SP	XR311AR2	A-B1L3D04
8	- READ INT AND ERROR SP	XR311AM2	A-B1L3D07
9	+ READ RESPONSE	XR291AX2	A-B1K4B04
10	- REGISTER NOT ZERO	XR291BD4	A-B1G2D13
11	+ READ ERROR	XR291AZ2	A-B1H4B04
12	+ X10 SENSE RESET 15	DU111AM4	A-B1B2B12
0	+ READ SCA BIT	XR111 XR121	A-B1N2



DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
22APR68	419675		

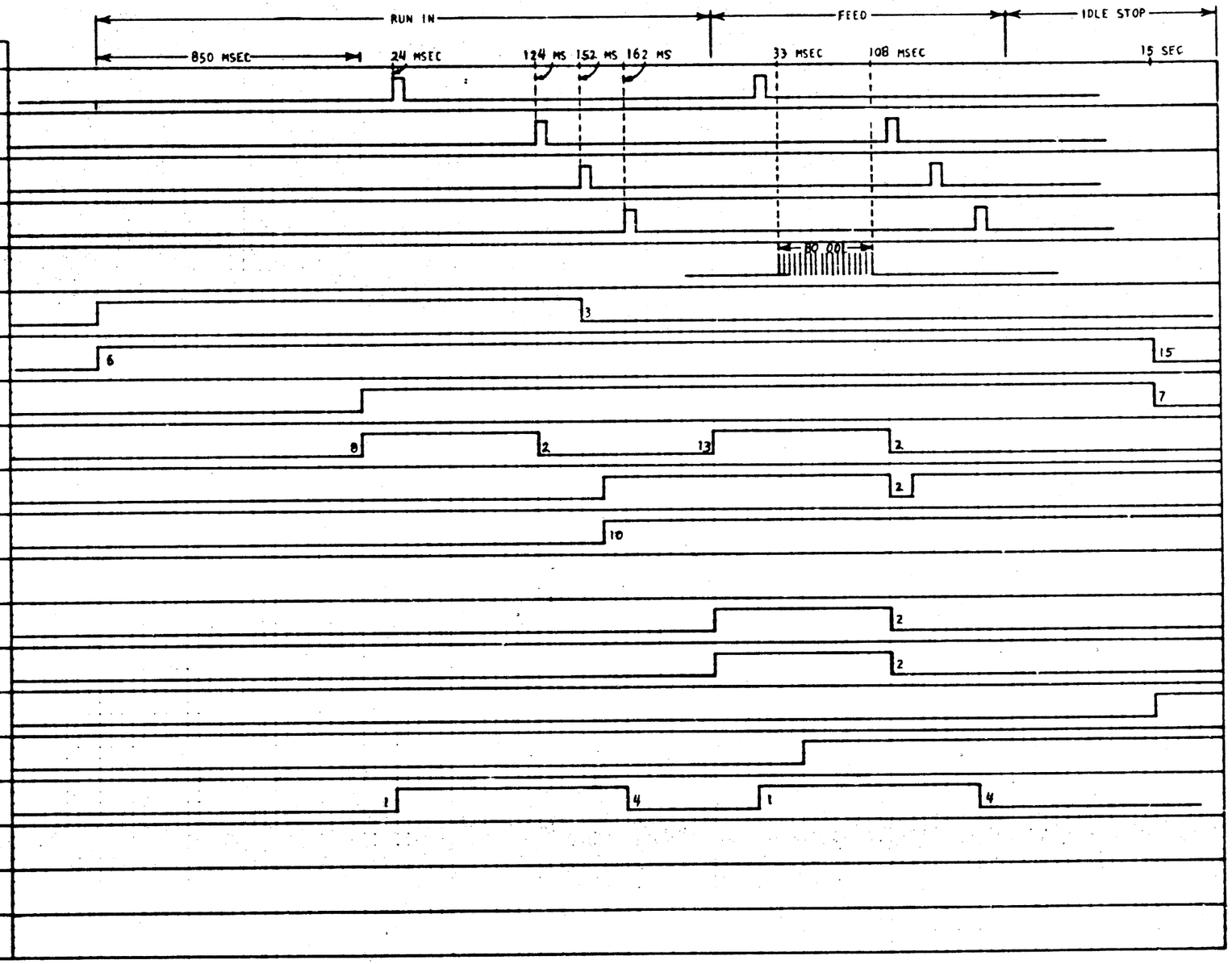
CARD READ/PUNCH READ AND PROGRAM LOAD TIMING

DATE		P/N	2201265
		TYPE	1130

IBM XR711

XR721

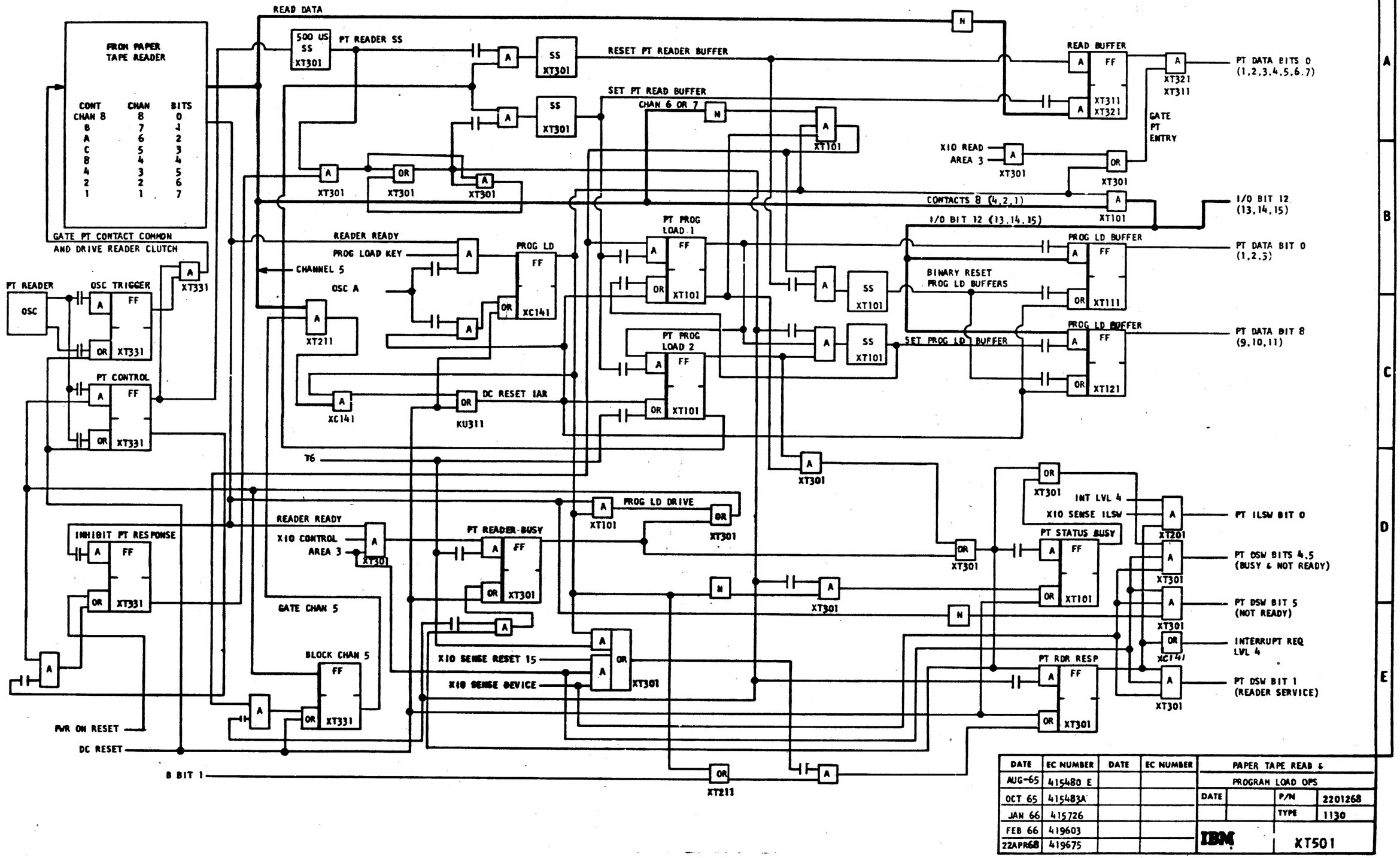
LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
1	+ FEED CB-1	XR821AF2	A-B1N3B09
2	+ FEED CB-2	XR121AF6	A-B1N3D12
3	+ FEED CB-3	XR121AH3	A-B1N3B12
4	- FEED CB-4	XR121AH7	A-B1N3B13
5	+ READ EMITTER	XR121AD7	A-B1N3B08
6	+ START SRP	XR201AS4	A-B1B3J02
7	+ SRP MOTOR	XR211AS4	A-B1B3D06
8	+ SRP MOTOR DELAY	XR211AX4	A-B1B3D10
9	+ SRP FEED CLUTCH	XR211AV4	A-B1B3B08
10	+ CARD IN READ STA	XR221AY4	A-B1C4D09
11	+ SRP READY PWR	XR201BA4	A-B1B3D13
13	+ X10 FEED	XR241BA2	A-B1F3B09
14	+ SRP BUSY	XR261AE4	A-B1J4B02
15	- IDLE RELAY CONTACT	XR111AT6	A-B1A3D10
16	+ CARD IN PCH STA	XR221AW4	A-B1C4D06
17	+SRP FEED INTLK	XR221AV4	A-B1M3G13



DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		

CARD READ/PUNCH
CONTROL TIMING
DATE 3-26-65 | P N 2201266
TYPE 1130
IBM XR721

XR721



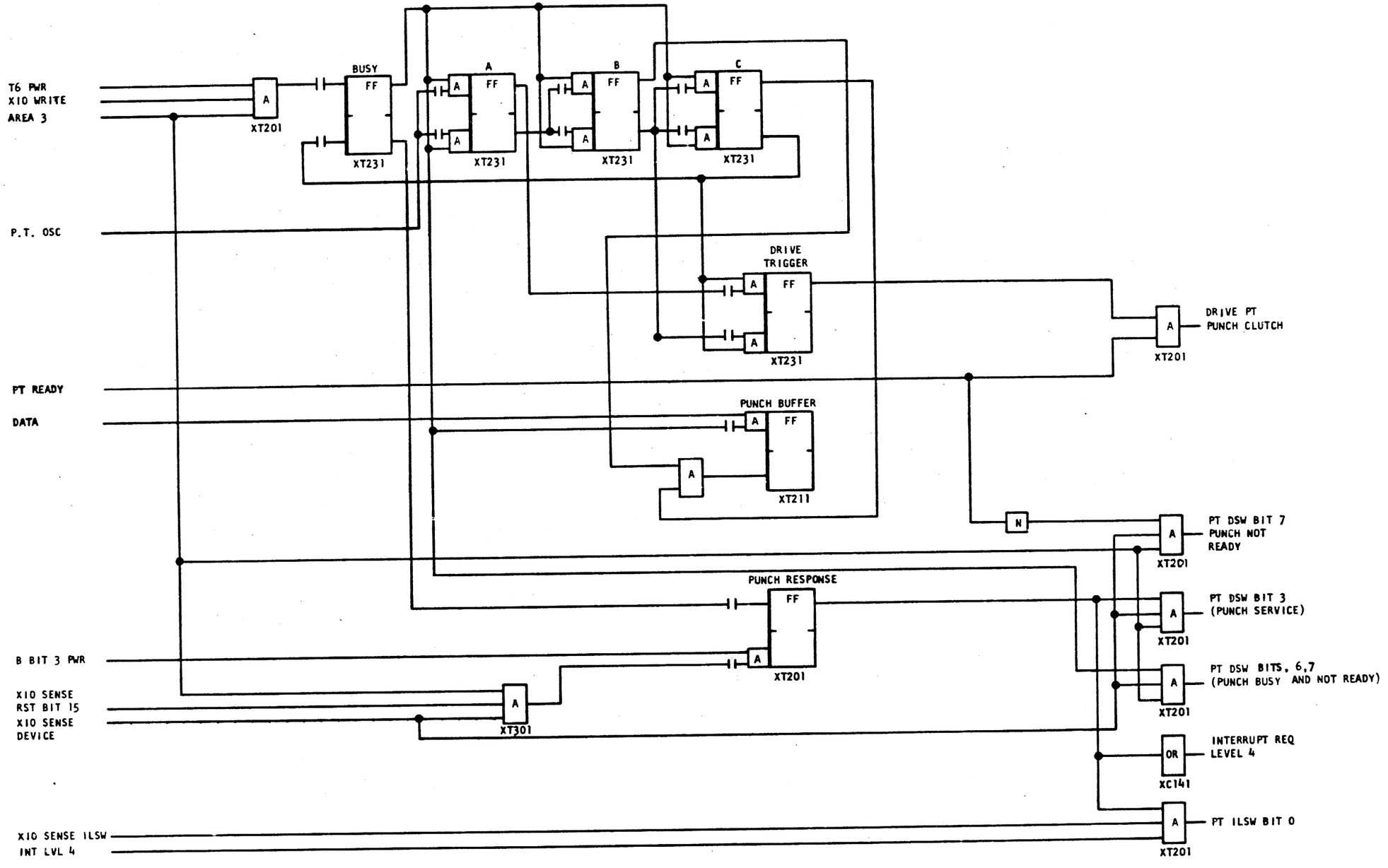
DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
OCT 65	415483A		
JAN 66	415726		
FEB 66	419603		
22APR68	419675		

PAPER TAPE READ & PROGRAM LOAD OPS

DATE | P/N 2201268

TYPE 1130

IBM XT501



NOTE: DC RESET IS ON ALL FLIP-FLOPS

DATE	EC NUMBER	DATE	EC NUMBER
AUG 65	415480E		
OCT 65	415483A		
NOV 65	415494A		
JAN 66	415726		
22APR68	419675		

PAPER TAPE
WRITE OP

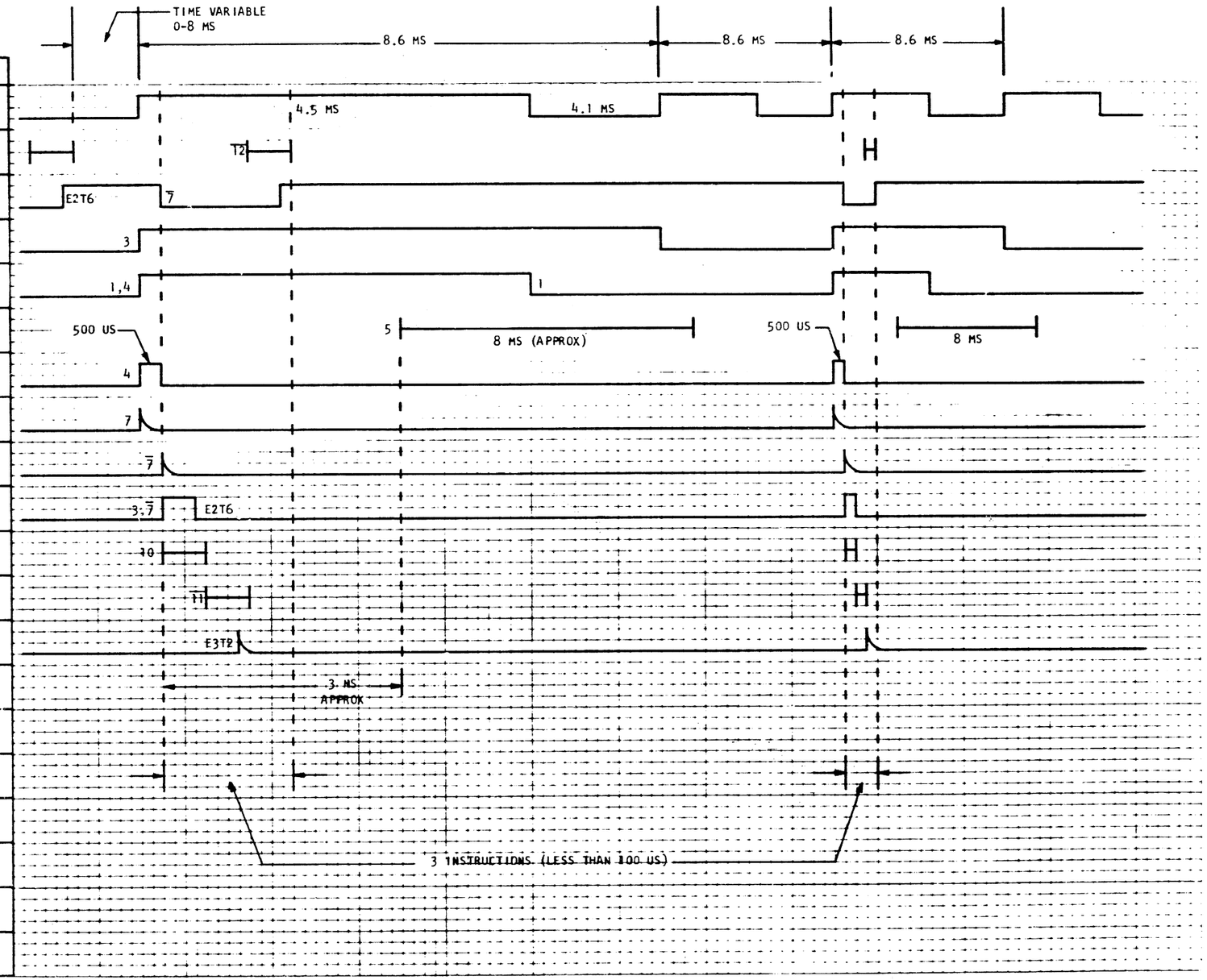
DATE		P/N	2201269
		TYPE	

IBM XT511

2	3	4	5	6	7

A-B1

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	READER OSC. TGR.	XT331AG2	H7B09	+
2	X10 CONTROL INSTRUCTION			
3	READER BUSY TGR.	XT301BD6	F6D07	-
4	CONTROL TGR.	XT331AM2	H7B04	+
5	DRIVE READER CLUTCH GATE CONTACTS	XT331		+
6	TAPE MOTION			
7	READER SS	XT301BB4	G6B07	-
8	RESET READ BUFFER	XT301BP2	H6D07	-
9	SET READ BUFFER	XT301BN2	H6B03	-
10	READ RESPONSE TGR	XT301BE2	F6B09	+
11	X10 SENSE DSW INSTRUCTION			
12	X10 READ INSTRUCTION			
13	1 COLUMN (1 WORD) TO B REGISTER			+



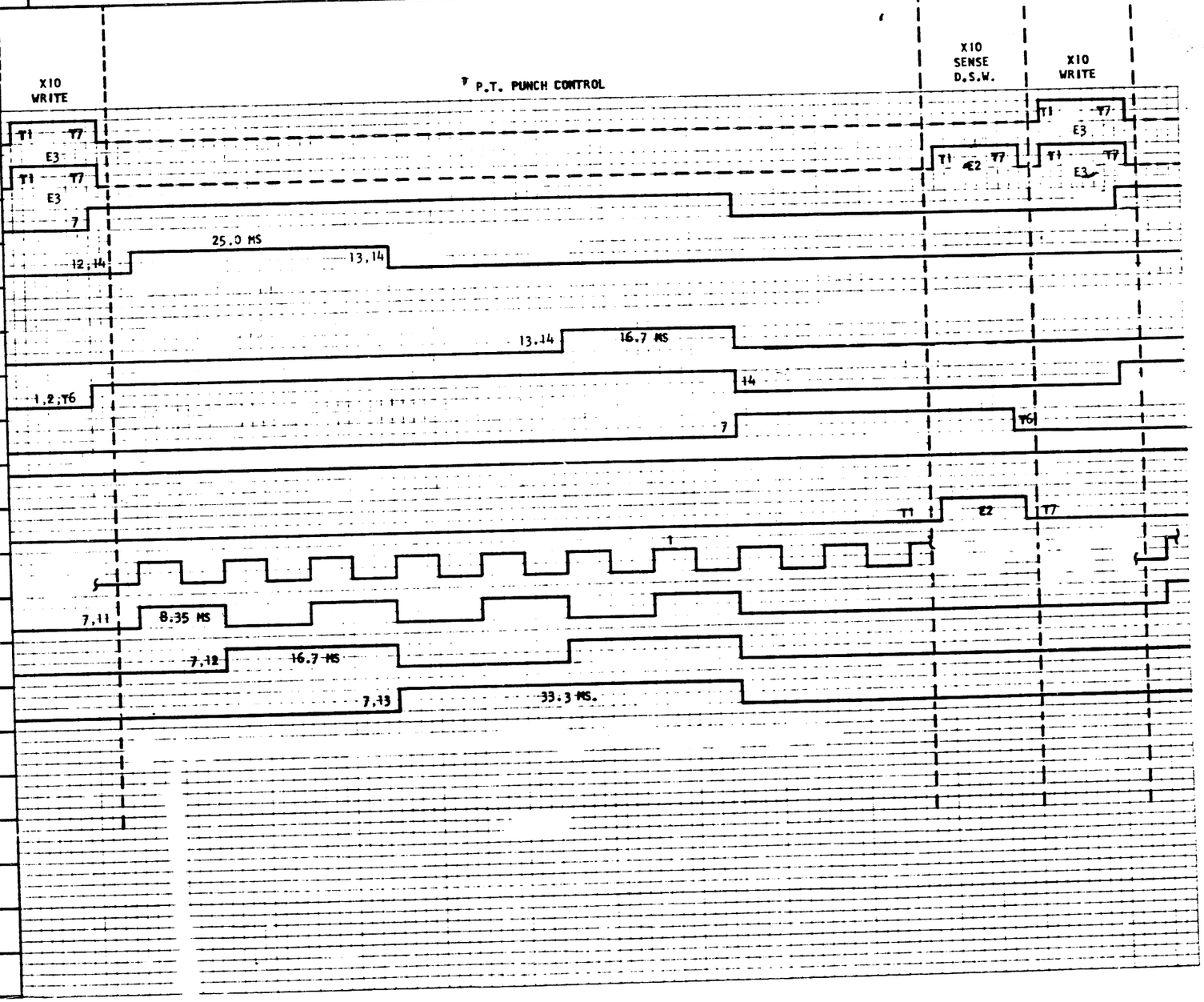
DATE	EC NUMBER	DATE	EC NUMBER
JAN 66	415726		
22APR68	419675		

PAPER TAPE
READ TIMING

DATE		P/N	2201270
		TYPE	1130

IBM XT701

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	X10 WRITE	DU101BE4	A-B1 J6B12	+
2	AREA 3	DU111AZ4	A-B1 J6D11	+
3	SET P.T. PUNCH BUFFER	XT201AR4	A-B1 L5D13	-
4	DRIVE P.T. PUNCH CLUTCH	XT201AW4	A-B1 J7D10	-
5				
6	RESET P.T. PUNCH BUFFER	XT231BD4	A-B1 L5D12	-
7	P.T. PUNCH BUSY	XT231AS2	A-B1 J5B09	+
8	P.T. PUNCH RESPONSE	XT201AY6	A-B1 F6D02	-
9	P.T. PUNCH READY	XT201BE4	A-B1 J6B03	-
10	X10 SENSE DEVICE	DU101AY4	A-B1 G5B13	+
11	P.T. READER OSC TRIGGER	XT331AG2	A-B1 H7B09	+
12	P.T. PUNCH CTRL A	XT231AT2	A-B1 F7D09	+
13	P.T. PUNCH CTRL B	XT231AU2	A-B1 F7B09	+
14	P.T. PUNCH CTRL C	XT231AV2	A-B1 F7B04	+



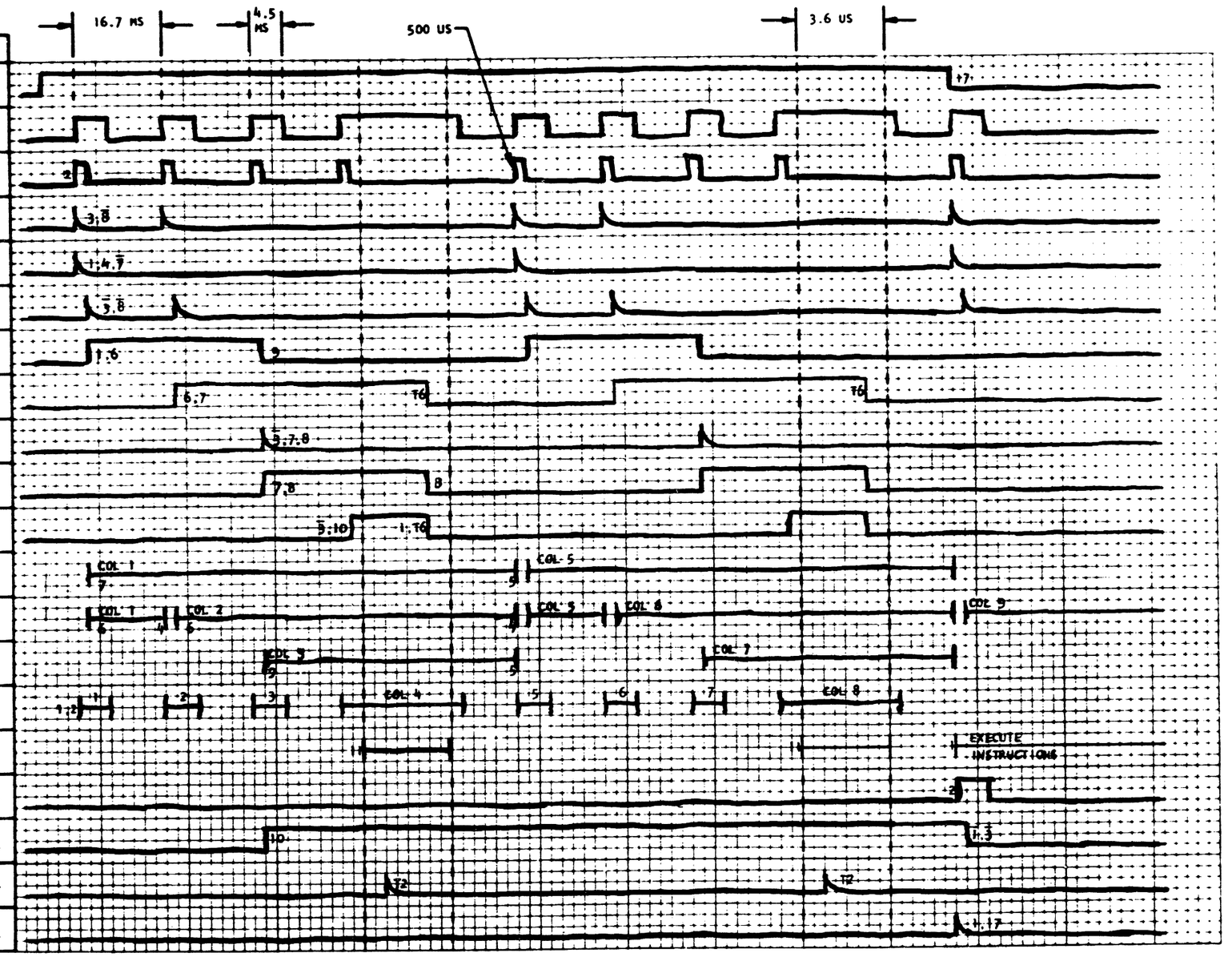
DATE	EC NUMBER	DATE	EC NUMBER
AUG 65	415480E		
OCT 65	415483A		
NOV 65	415494A		
JAN 66	415726		
22APR68	419675		

PAPER TAPE
WRITE TIMING
DATE 3-22-65 P/N 2201271
TYPE
IBM XT711

XT711

A-B1

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	PROGRAM LOAD	XT301BC4	E6D04	+
2	DRIVE READER CLUTCH GATE CONTACTS	XT331		+
3	READER SS	XT301BB4	G6B07	-
4	RESET READ BUFFER	XT301BP2	H6D07	-
5	RESET PROGRAM LOAD BUFFERS	XT101BB2	H6B12	-
6	SET READ BUFFER	XT301BN2	H6B03	-
7	PROGRAM LOAD 1 TGR	XT101AV2	H5B09	+
8	PROGRAM LOAD 2 TGR	XT101AW2	H5B04	+
9	SET P.L. BUFFER 2	XT101BC2	H6D11	-
10	GATE RESPONSE	XT101AG4	E6D06	-
11	READ RESPONSE TGR	XT301BE2	F6B09	+
12	P.L. BUFFER 1 BITS 0,1,2,3	XT111	*	
13	READ BUFFER BITS 4,5,6,7	XT311	*	
14	P.L. BUFFER 2 BITS 8,9,10,11	XT121	*	
15	I/O BUS	XT101	*	
16	STORAGE R/W CYCLE			
17	CHANNEL 5	XT321BJ4	B6B08	+
18	P.T. STATUS BUSY	XT101BP4	M7B10	+
19	4 COLUMNS (1 WORD) TO B REGISTER			+
20	DC RESET IAR	KU311AU4	H5D11	-



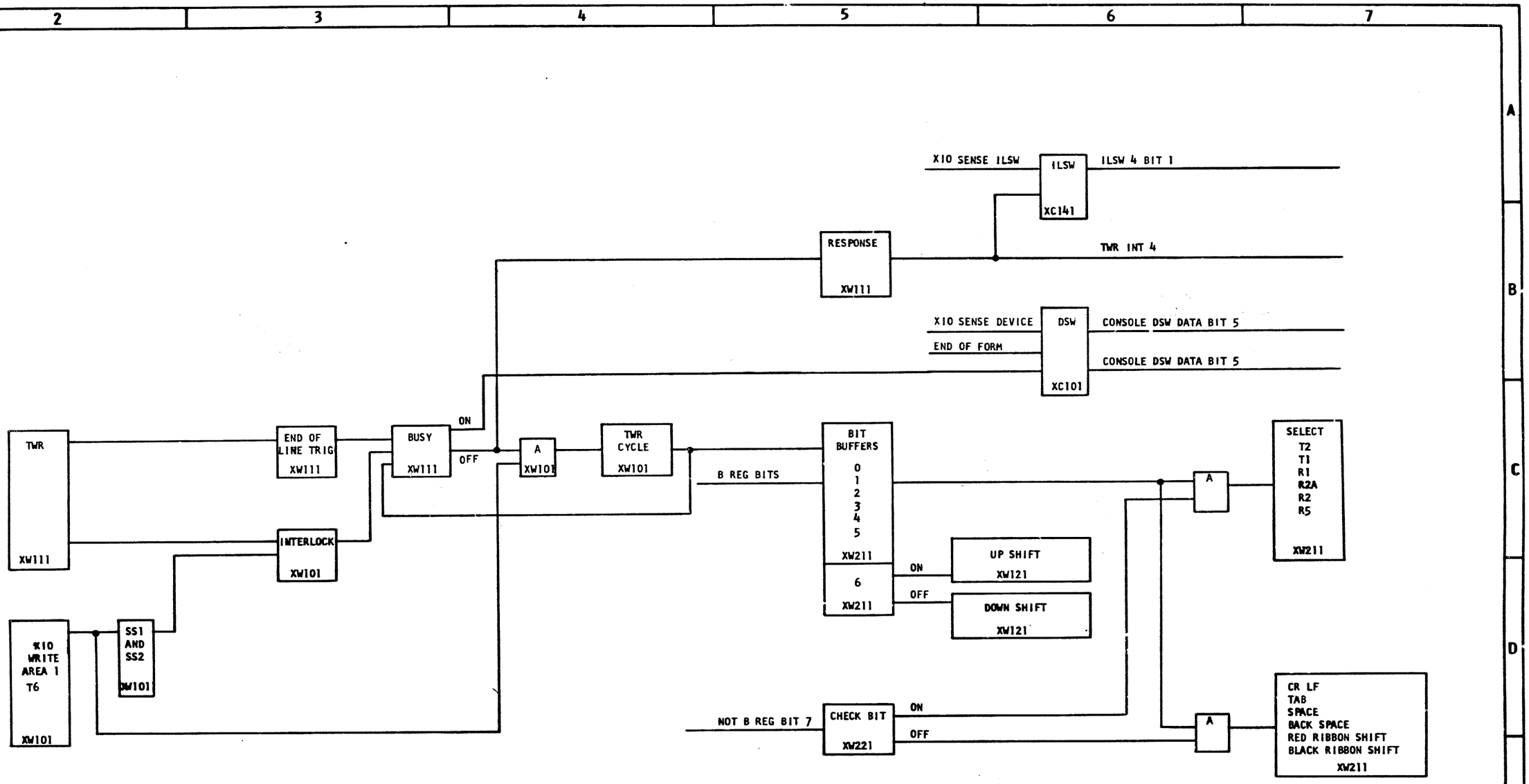
* COLUMNS 1,2,3 AND 4 CONTAIN THE 16 BITS OF THE NEXT TO LAST WORD.
COLUMNS 5,6,7 AND 8 CONTAIN THE 16 BITS OF THE LAST WORD.
COLUMN 9 CONTAINS THE CHANNEL 5 PUNCH.

DATE	EC NUMBER	DATE	EC NUMBER
JAN 66	415726		

PAPER TAPE
PROGRAM LOAD TIMING

DATE		P/N	2201272
		TYPE	1130

IBM XT721



DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
22APR68	419675		

CONSOLE PRINTER UNIT

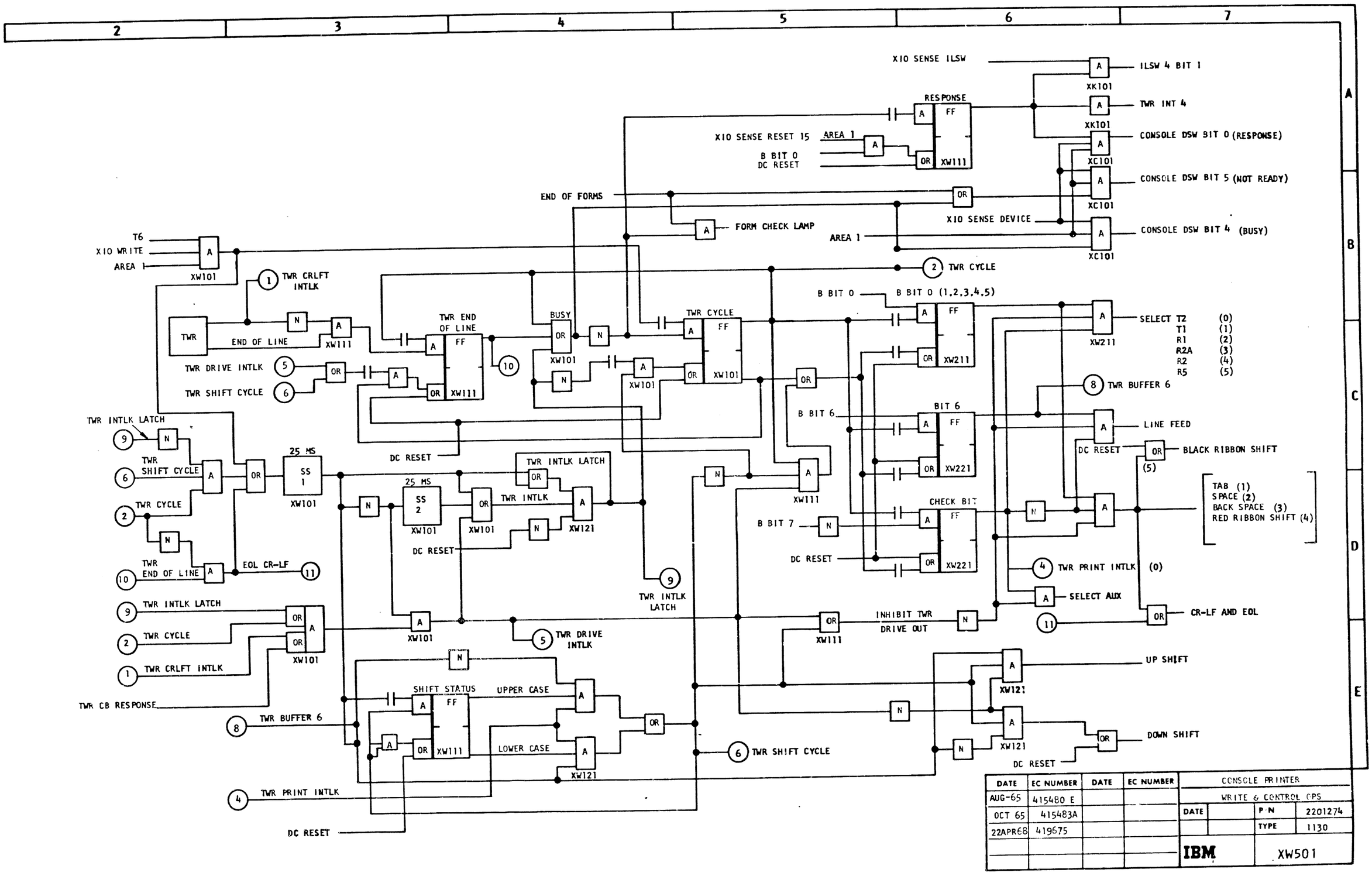
DATA AND CONTROL DIAGRAM

DATE | P/N 2201273

TYPE 1130

IBM

XW401



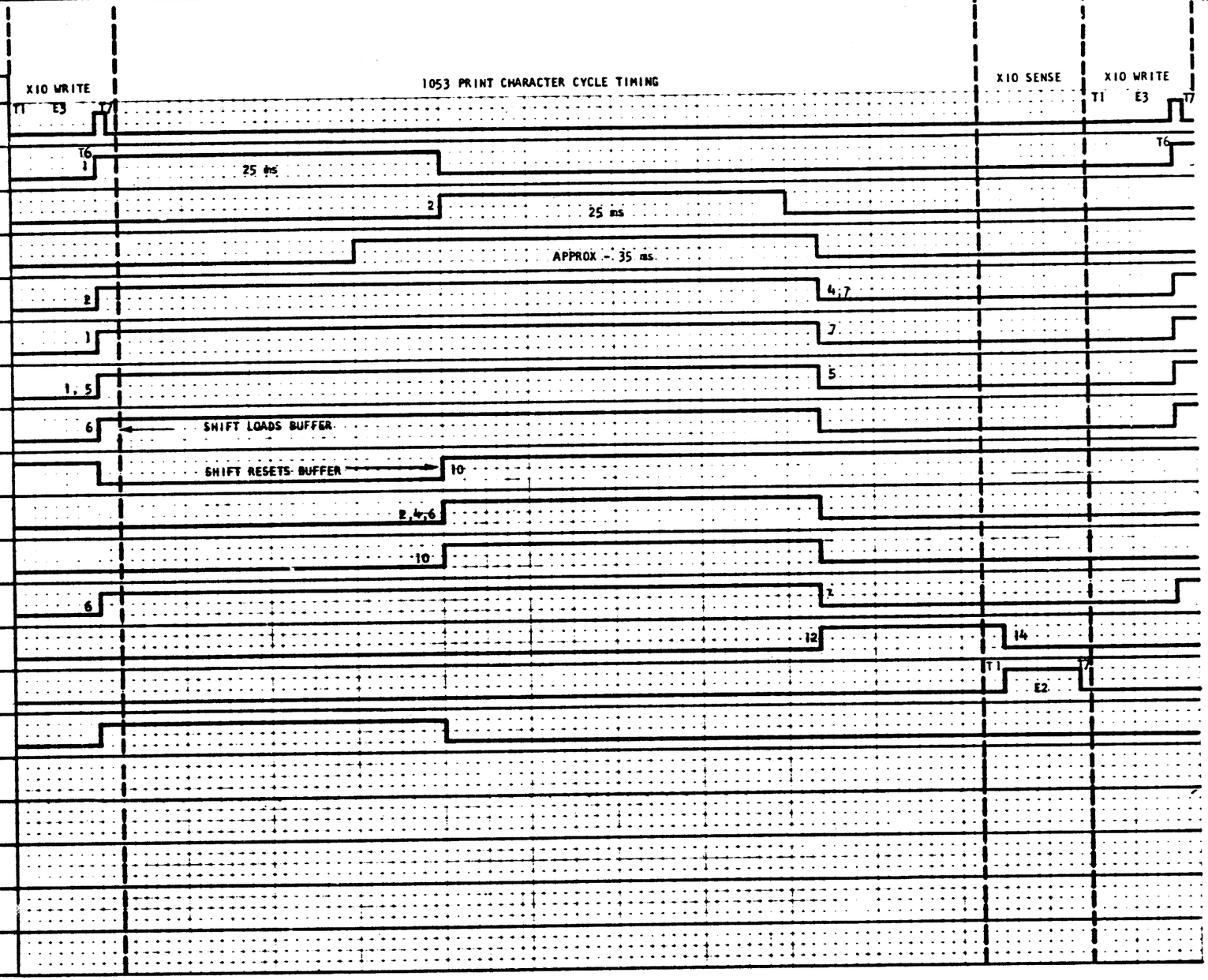
DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
OCT 65	415483A		
22APR68	419675		

CONSOLE PRINTER
WRITE & CONTROL CPS

DATE		P/N	2201274
		TYPE	1130

IBM XW501

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
1	- X10 WRITE, AREA 1, T6	XW101AA4	A-C1H7B02
2	- SINGLE SHOT 1	XW101BF4	A-C1F5B03
3	- SINGLE SHOT 2	XW101AJ4	A-C1F5B07
4	- TWR. C.B. RESPONSE	XW101AD4	A-C1E4D13
5	- TWR. INTERLOCK	XW101AH4	A-C1D4D02
6	- TWR CYCLE	XW101AS6	A-C1C4J07
7	- TWR. INTLK. LATCH	XW121BB4	A-C1F7B04
8	- TWR. BUFFER LOAD SP	XW101BD4	A-C1D4B09
9	- TWR. BUFFER RESET SP	XW111AR4	A-C1D4B13
10	- TWR. DRIVE INTLK.	XW101BG4	A-C1E4B07
11	- INH. TWR. DRIVE OUT	XW111AK4	A-C1D4B12
12	+ TWR. BUSY	XW101BE4	A-C1G5B02
13	+ TWR. RESPONSE	XW111BB2	A-C1F4D09
14	- X10 SENSE RESET IS AREA 1	XK111AX4	A-C1F4D13
15	- SELECT T1	XW211BH4	A-C1B4D06



DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		

CONSOLE PRINTER WRITE AND CONTROL TIMING

DATE | P/N 2201275

TYPE 1130

IBM XW701

XW701