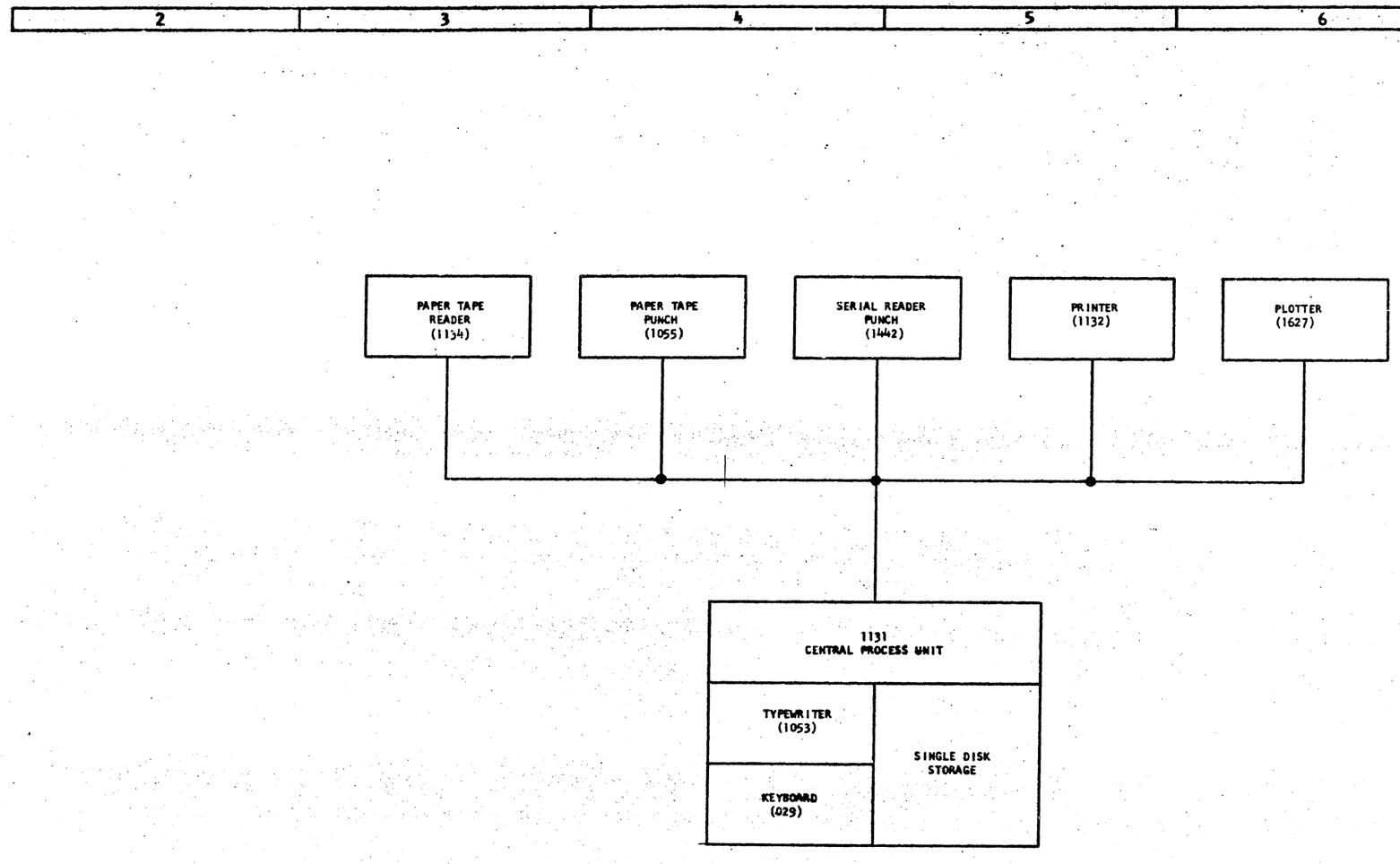
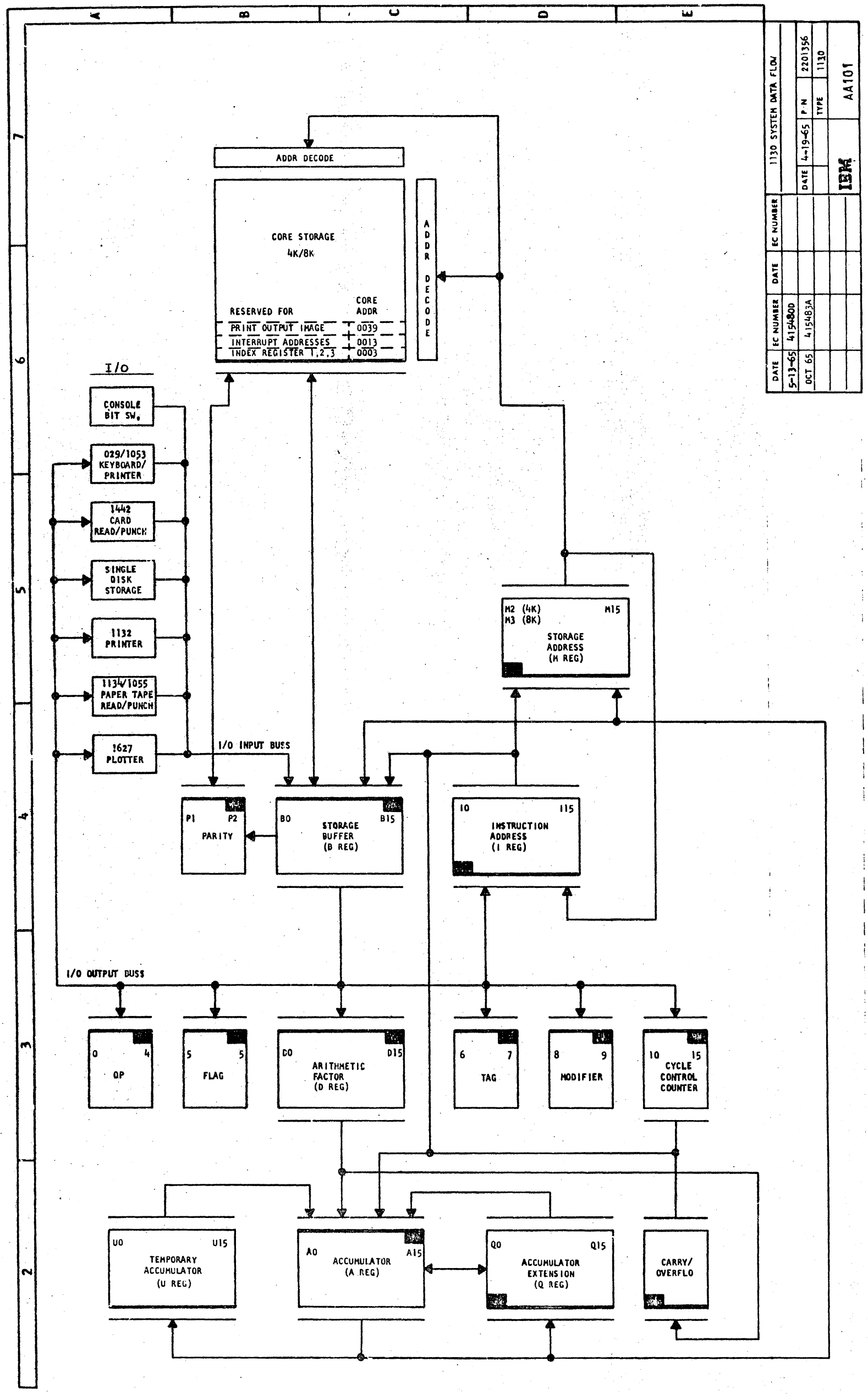


DATE	EC NUMBER	DATE	EC NUMBER	1130 SYSTEM CONFIGURATOR			
5-13-65	4154800						
OCT 65	415483A			DATE	4-19-65	P/N	2201354
						TYPE	1130 .
				IBM		AA011	



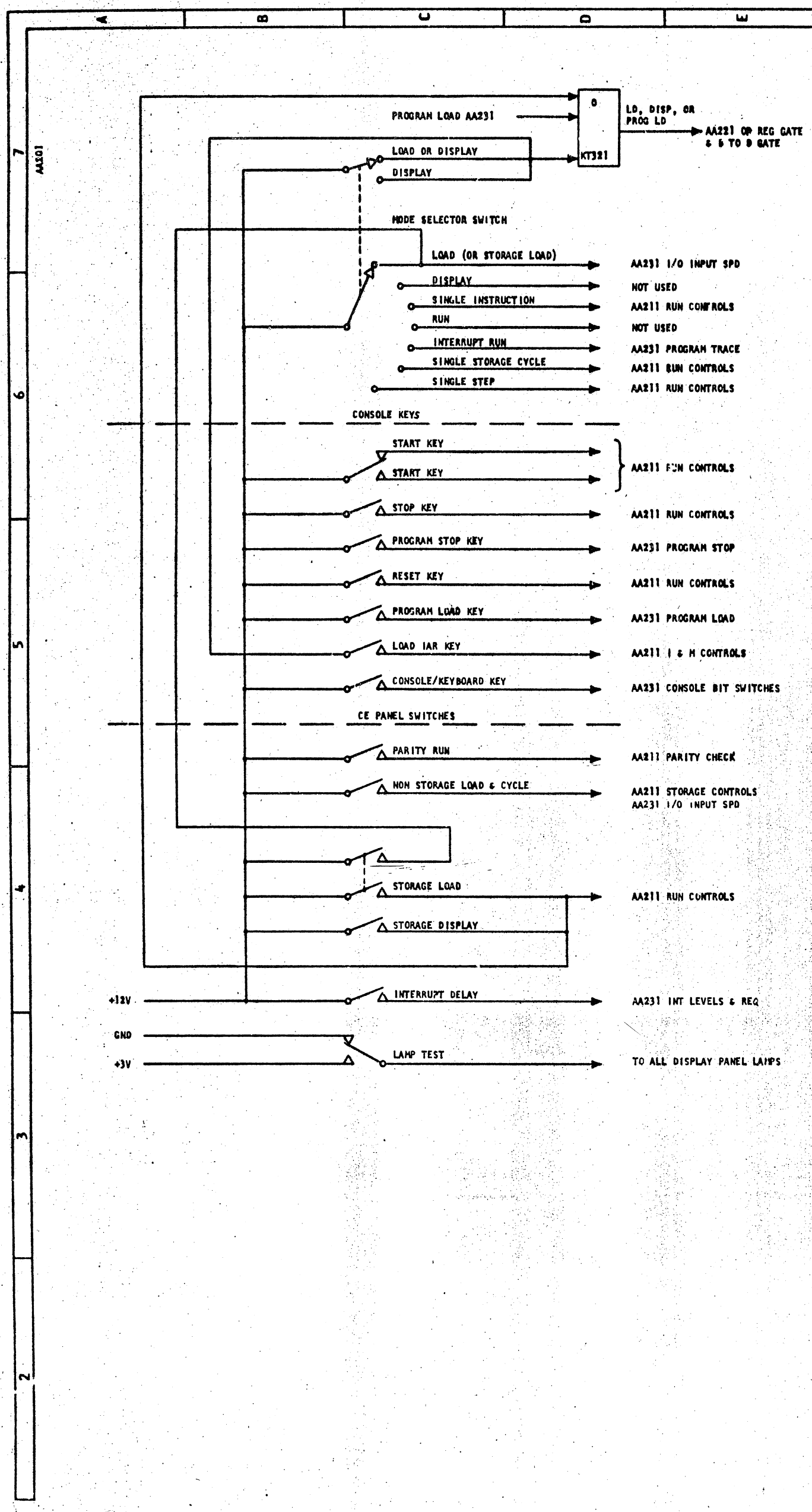
DATE	EC NUMBER	DATE	EC NUMBER
5-13-65	415480D		
OCT 65	4154834		

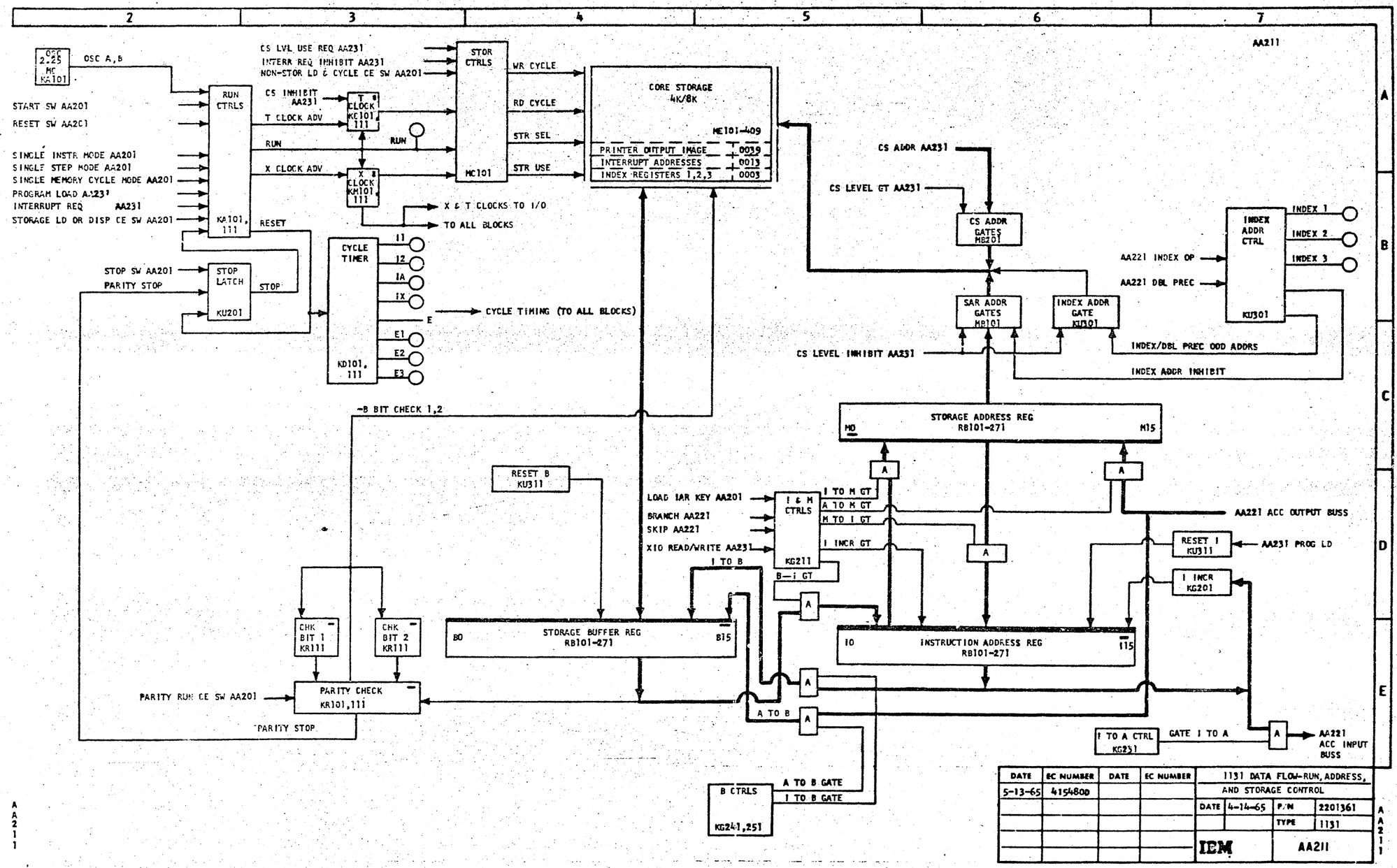
1130 SYSTEM DATA FLOW

DATE 4-19-65 P/N 2201356

TYPE 1130

IBM AA101

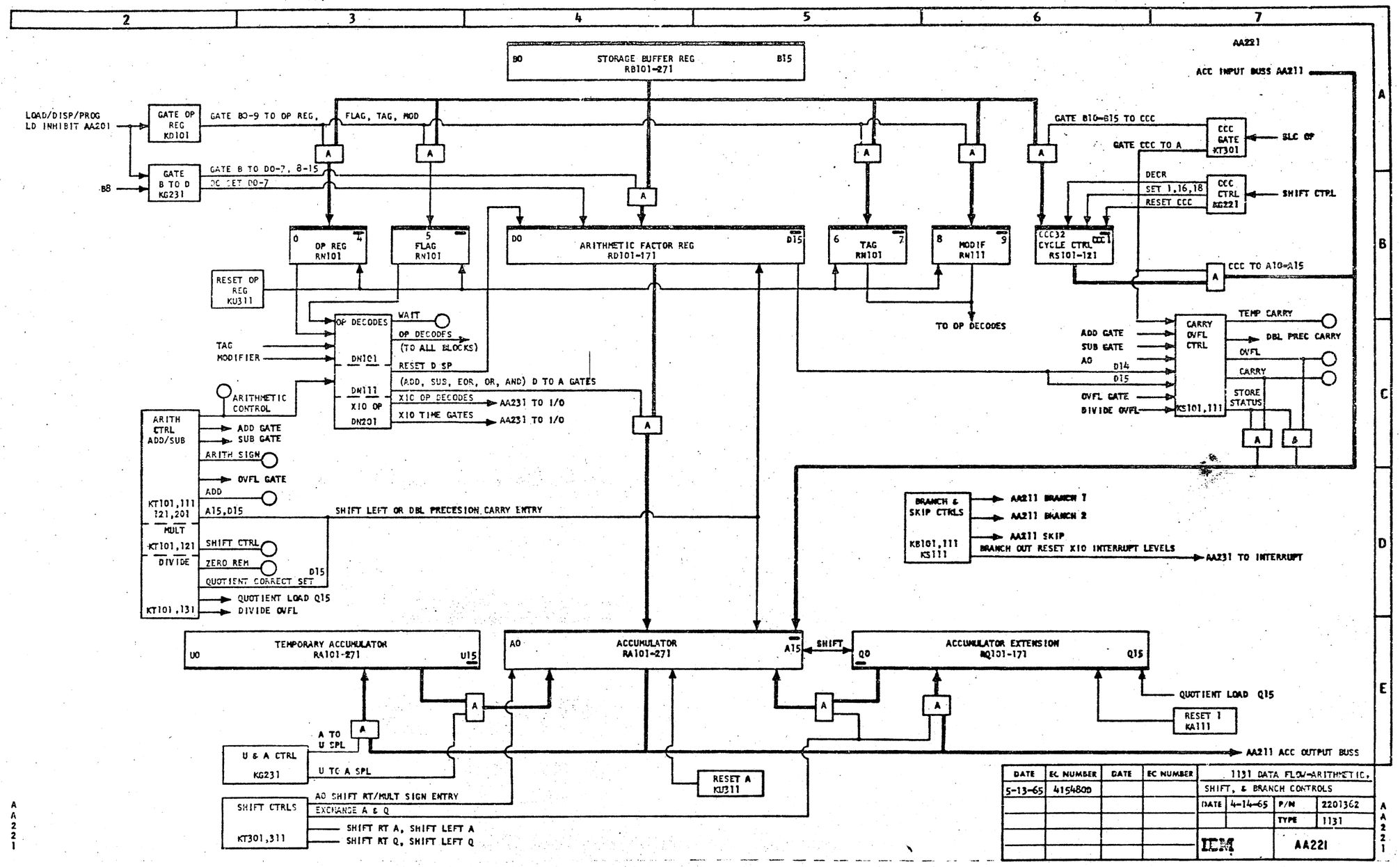

A
B
C
D
E
7
6
5
4
3
2
AA201
PROGRAM LOAD AA231
LOAD OR DISPLAY
DISPLAY
0
KT321
LD, DISP, OR PROG LD
AA221 OP REG GATE & 5 TO 8 GATE
MODE SELECTOR SWITCH
LOAD (OR STORAGE LOAD)
AA231 I/O INPUT SPD
DISPLAY
NOT USED
SINGLE INSTRUCTION
AA211 RUN CONTROLS
RUN
NOT USED
INTERRUPT RUN
AA231 PROGRAM TRACE
SINGLE STORAGE CYCLE
AA211 RUN CONTROLS
SINGLE STEP
AA211 RUN CONTROLS
CONSOLE KEYS
START KEY
START KEY
AA211 RUN CONTROLS
STOP KEY
AA211 RUN CONTROLS
PROGRAM STOP KEY
AA231 PROGRAM STOP
RESET KEY
AA211 RUN CONTROLS
PROGRAM LOAD KEY
AA231 PROGRAM LOAD
LOAD IAR KEY
AA211 I & M CONTROLS
CONSOLE/KEYBOARD KEY
AA231 CONSOLE BIT SWITCHES
CE PANEL SWITCHES
PARITY RUN
AA211 PARITY CHECK
NON STORAGE LOAD & CYCLE
AA211 STORAGE CONTROLS
AA231 I/O INPUT SPD
STORAGE LOAD
AA211 RUN CONTROLS
STORAGE DISPLAY
+12V
INTERRUPT DELAY
AA231 INT LEVELS & REQ
GND
+3V
LAMP TEST
TO ALL DISPLAY PANEL LAMPS
1131 DATA FLOW
SWITCH LOGIC
DATE 4-15-65
P/N 2201360
TYPE 1131
AA201
IBM
DATE
EC NUMBER
5-13-65
EC NUMBER 4154800
A
A2G1



DATE	EC NUMBER	DATE	EC NUMBER	1131 DATA FLOW-RUN, ADDRESS, AND STORAGE CONTROL			
5-13-65	4154800			DATE	4-14-65	P/N	2201361
						TYPE	1131
				IBM		AA211	

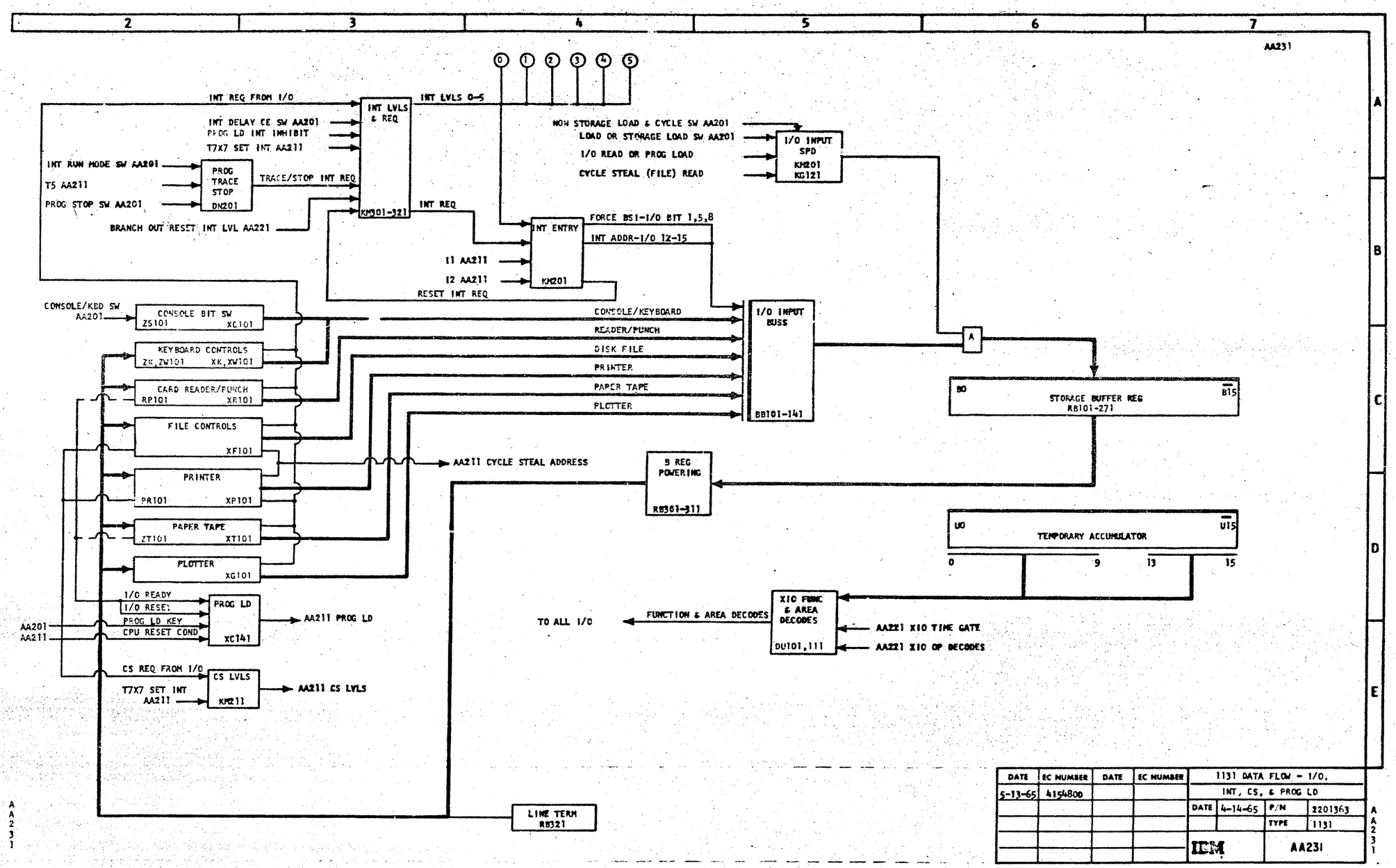
AA211

AA211



DATE	EC NUMBER	DATE	EC NUMBER	1131 DATA FLOW-ARITHMETIC, SHIFT, & BRANCH CONTROLS			
5-13-65	4154800			DATE	4-14-65	P/N	2201362
						TYPE	1131
				IBM		AA221	

AA221



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

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

DATE	4-14-65	P/N	2201363
		TYPE	1131
IBM		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 AD=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
	4154600		
OCT 65	4154834		

1131 INSTRUCTION CYCLE PATTERNS

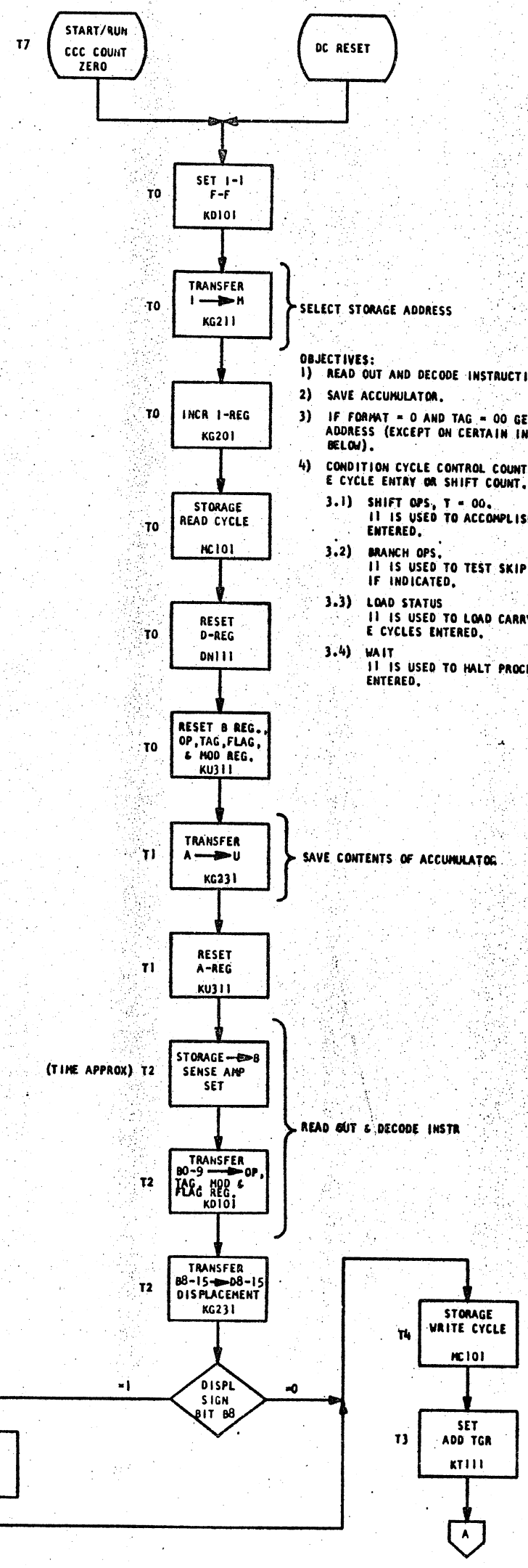
DATE 5-24-65 P/N 2201425

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
OCT 65	4154800		
	4154834		

I-1 CYCLE

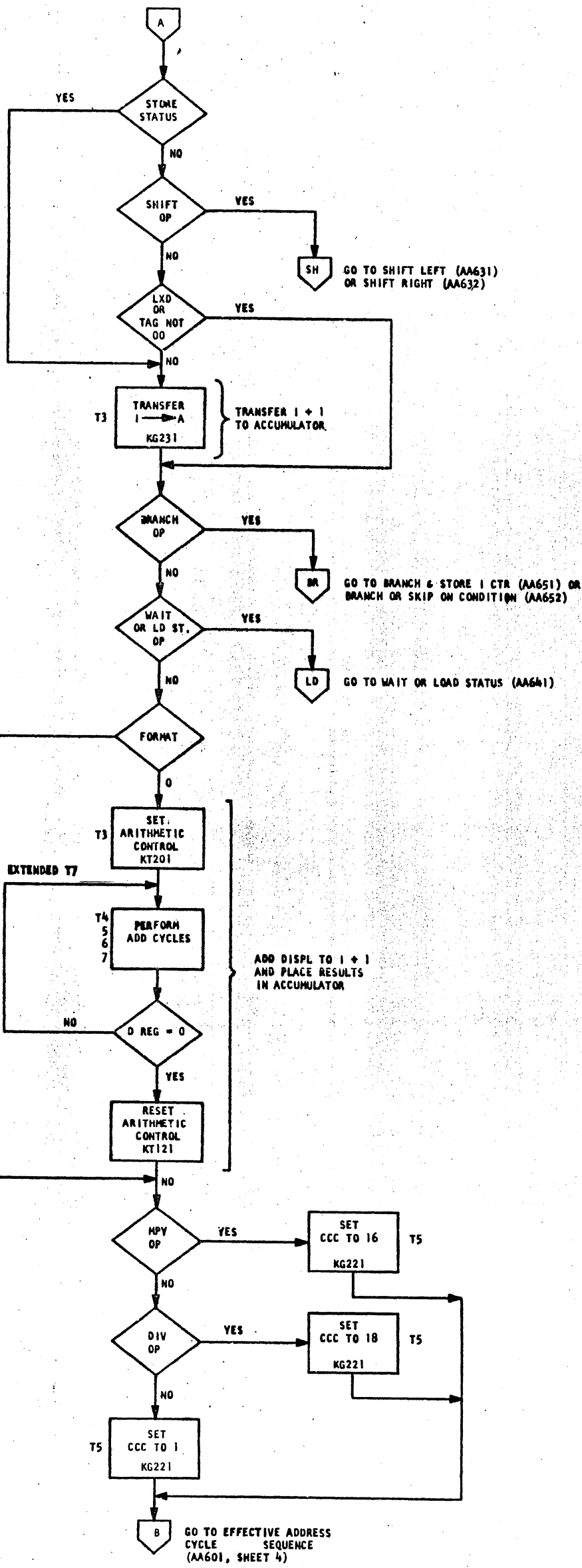
DATE 5-5-65 | P/N 2201425

TYPE 1131

IBM AA601

I-1 CYCLE

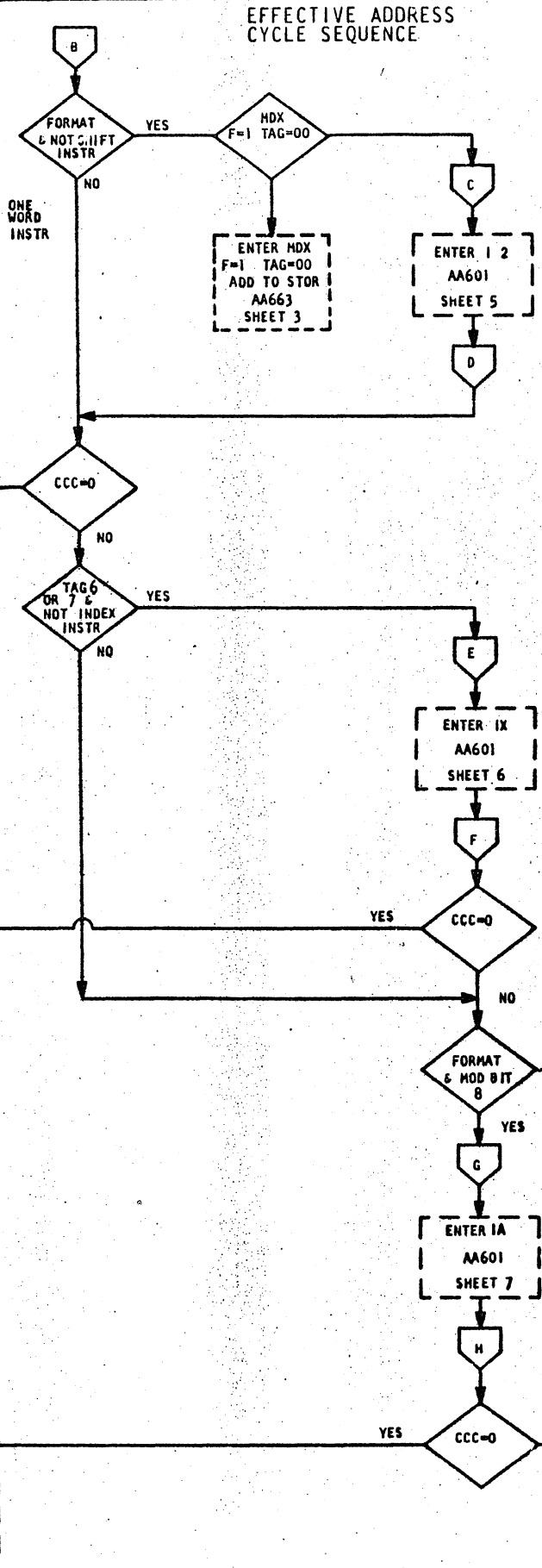
SHEET 3



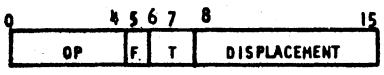
DATE	EC NUMBER	DATE	EC NUMBER	I-1 CYCLE		
OCT 65	4154800			DATE 5-5-65	P/N 2201425	AA601
	4154834				TYPE 1131	IBM

EFFECTIVE ADDRESS CYCLE SEQUENCE

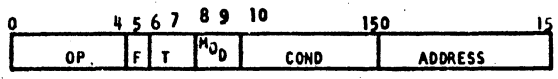
SHEET 4



ONE WORD INSTR



TWO WORD INSTR



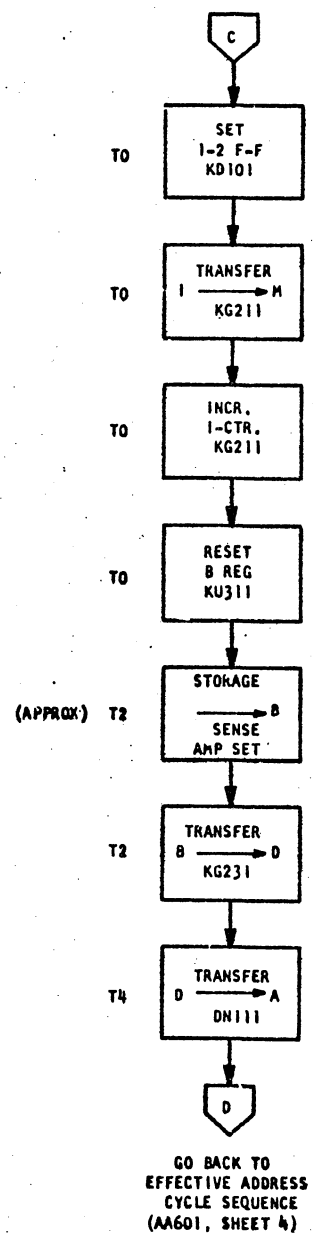
EFFECTIVE ADDRESSING SEQUENCE

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
	4154800
OCT 65	4154834

EFFECTIVE ADDRESS CYCLE SEQUENCE
DATE 5-5-65 P/N 2201425 TYPE 1131
IBM AA601



OBJECTIVES:

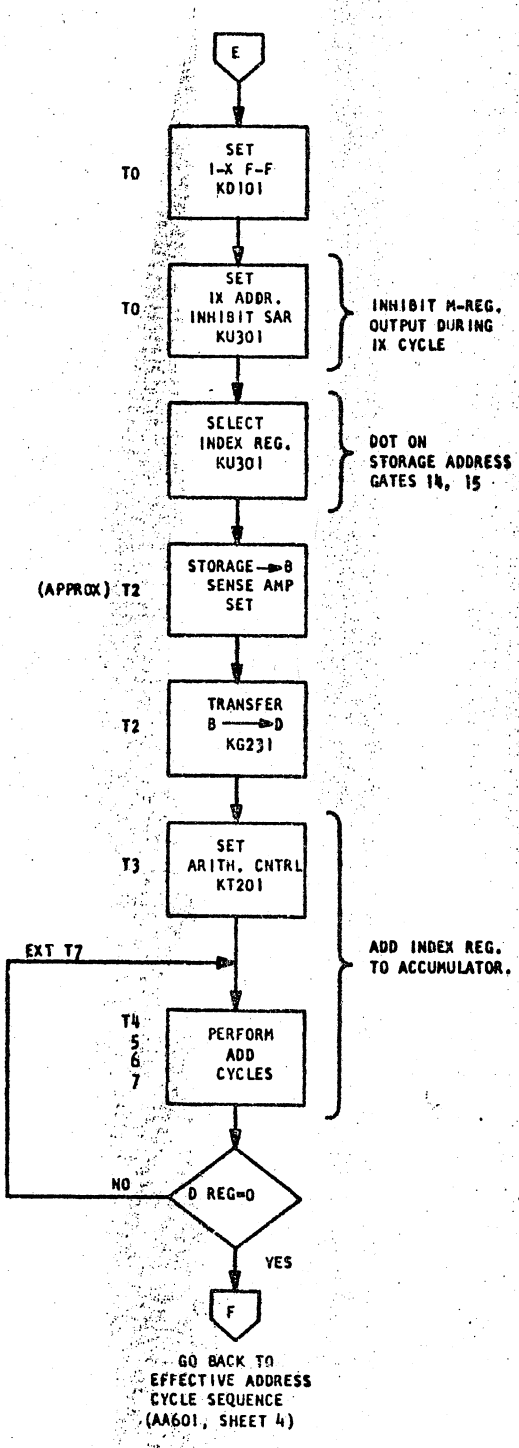
1. PLACE ADDRESS WORD OF A TWO WORD INSTRUCTION IN ACCUMULATOR.
2. SEE MDX INSTR. FOR I2 CYCLE ON MDX ADD TO STORAGE OP.

DATE	EC NUMBER	DATE	EC NUMBER	1-2 CYCLE		
	4154800			DATE 5-24-65	P/N	2201425
OCT 65	4154938				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	DATE	EC NUMBER
OCT 65	4154483A		
	4154COD		

IX CYCLE

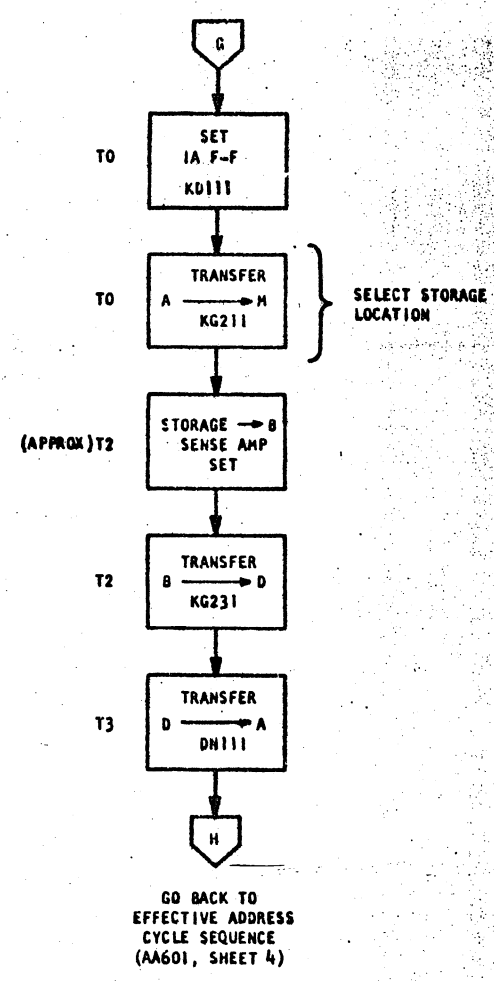
DATE	P/N
5-5-65	2201425

TYPE
1131

IBM AA601

OBJECTIVE:

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



DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154831A		4154800D

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 APPROPRIATE LEVEL. b. STORE THE I CTR TO PERMIT A RETURN TO THE MAIN LINE PROGRAM.

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

INTERRUPT REQ FROM I/O

INTR DELAY SW — ON / OFF

CCC COUNT=Ø (END OP) — NO / YES

THAT LEVEL TGGR ALREADY ON — YES / NO

SET LEVEL AND REQ TGR FOR THAT LEVEL
KM 301,11,21
T7X78

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

SET RUN TRIGGER
KU211
T7X78

ANY CYCLE STEAL LEVEL ON — YES / NO

CS
ENTER CYCLE STEAL
(AA611, SHEET 2)

BLOCK STORAGE USE
DN201

BSI I1 CYCLE
KD101

BLOCK I-COUNTER INCREMENT
KG211
TO

FORCE BSI INDIRECT OP

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

TRANSFER I/O → B
KM201
T1

CONTINUE NORMAL BSI I1 CYCLE

ENTER BSI I2 CYCLE
KD101

BLOCK I-CTR INCR
KG211
TO

GATE INT ADDRESS ON I/O BUSS
KM201
TO

TRANSFER I/O → B
KM201
T1

CONTINUE NORMAL BSI I2 CYCLE

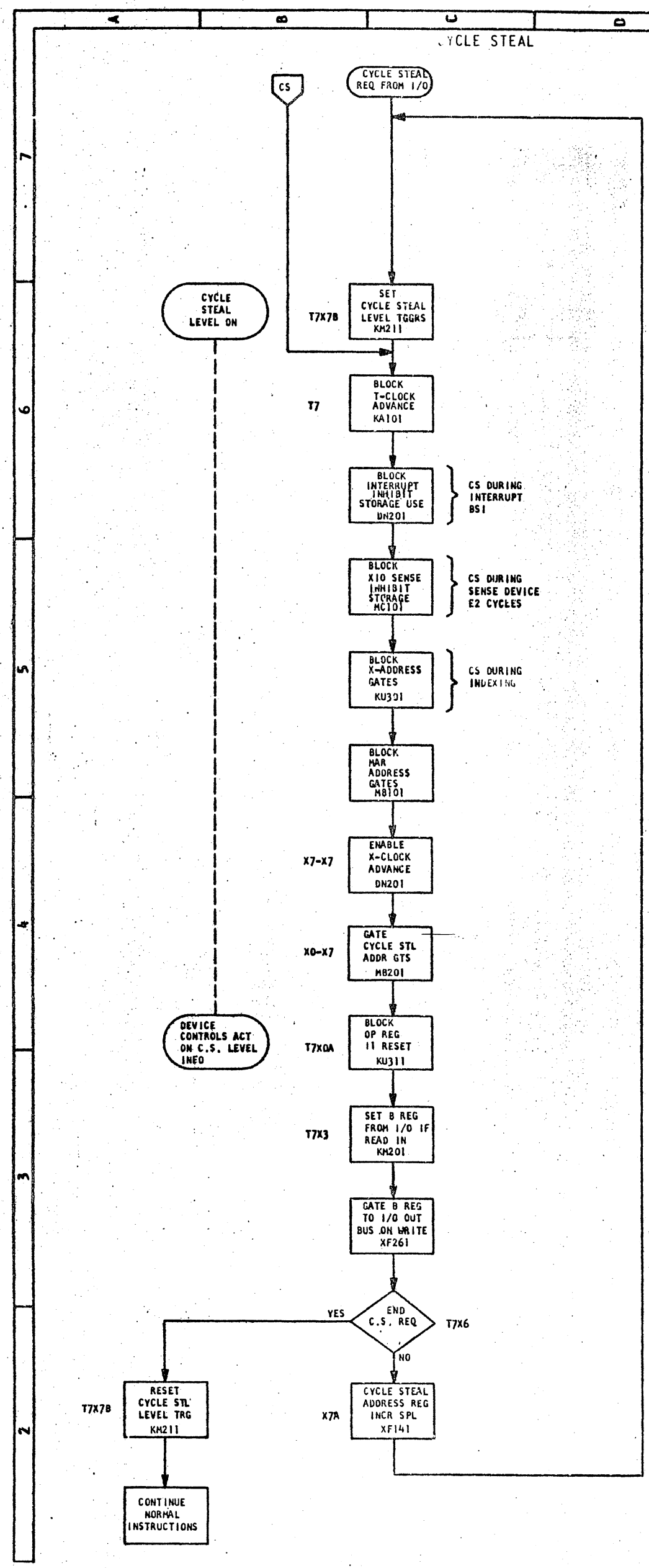
RESET HIGHEST PRI REQUEST TRG
KM201
T7

STORAGE USE UNBLOCKED
T7

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

FORCE BSI INDIRECT ADDRESS TO INTERRUPT SUBROUTINE

DATE	EC NUMBER	DATE	EC NUMBER	INTERRUPT FORCED BRANCH AND STORE I CTR INDIRECT		
OCT 65	4154800			DATE 3-24-65	P/N 2201432	IBM AA611
	4154834				TYPE 1131	



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	CYCLE STEAL		
	4154600			DATE 3-25-65	P/N 2201432	AA611
OCT 65	4154831A			IBM	TYPE 1131	

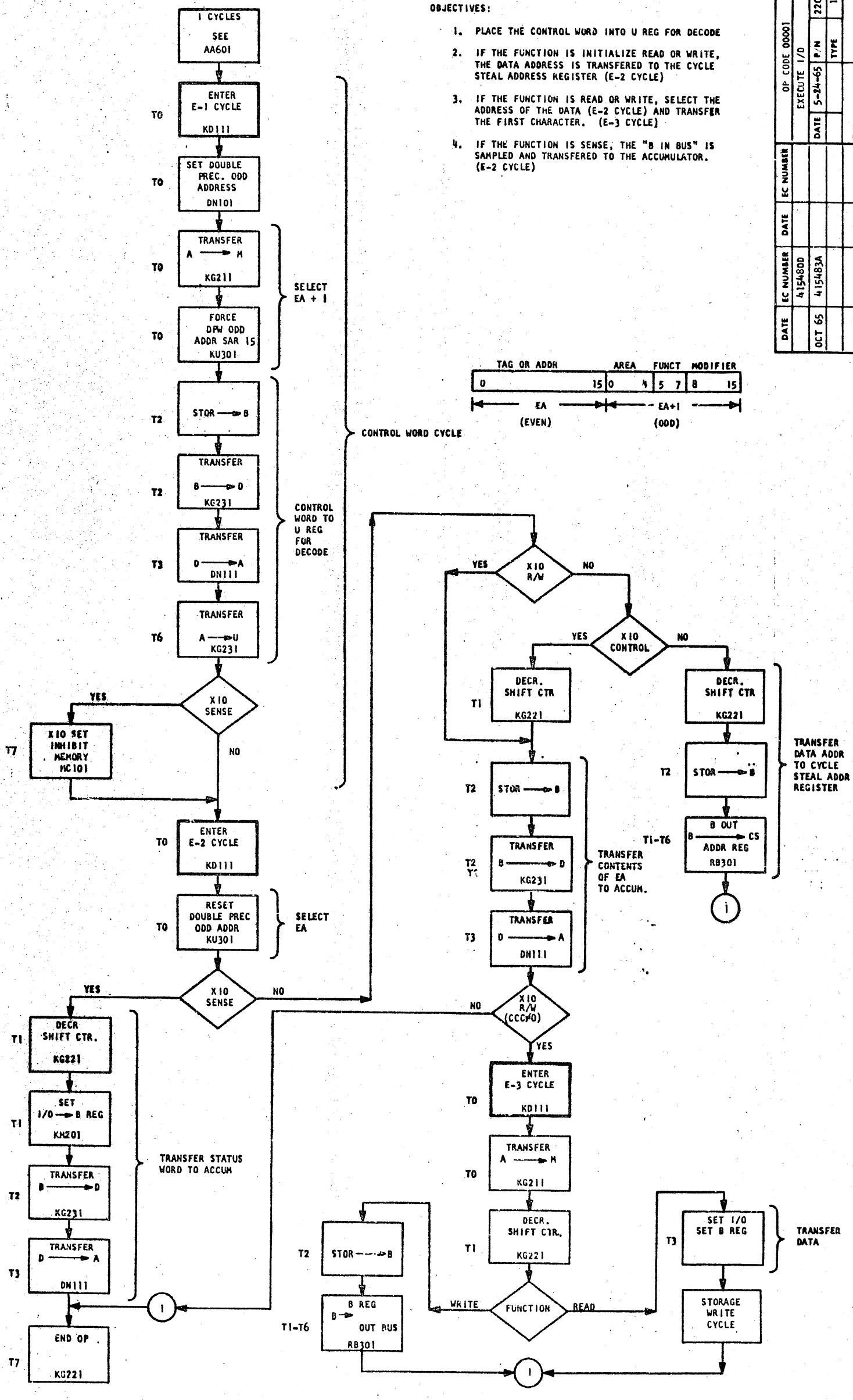
OP CODE 00001
EXECUTE I/O

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)

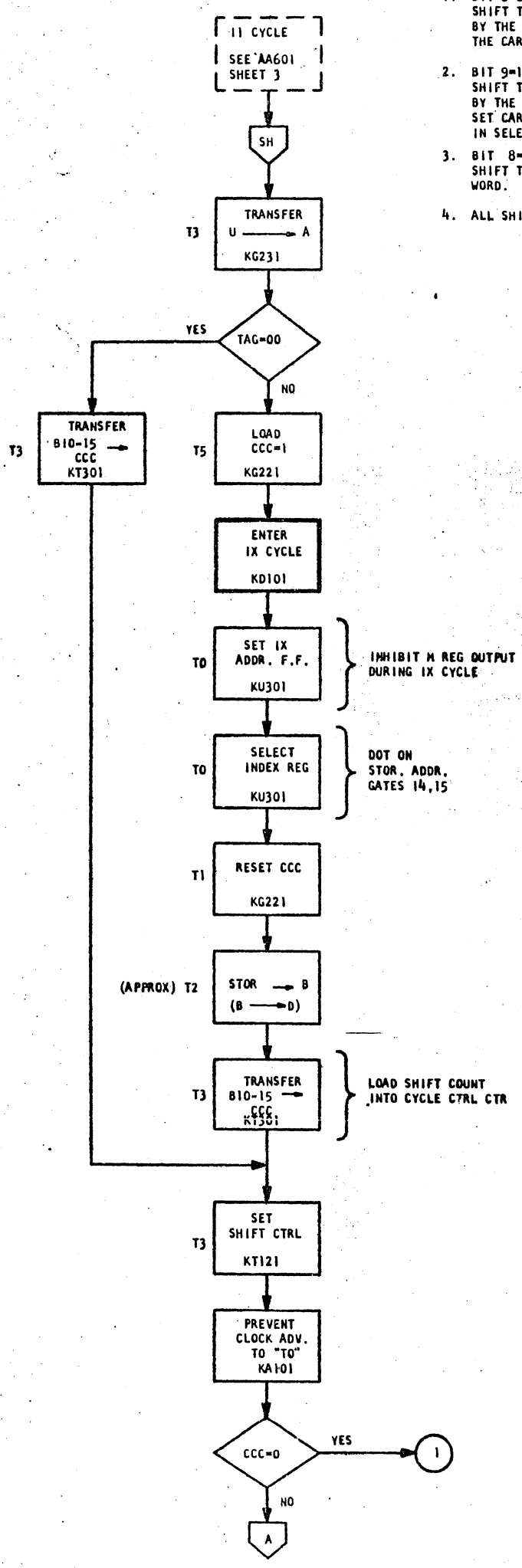
DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154800		
	4154834		

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.

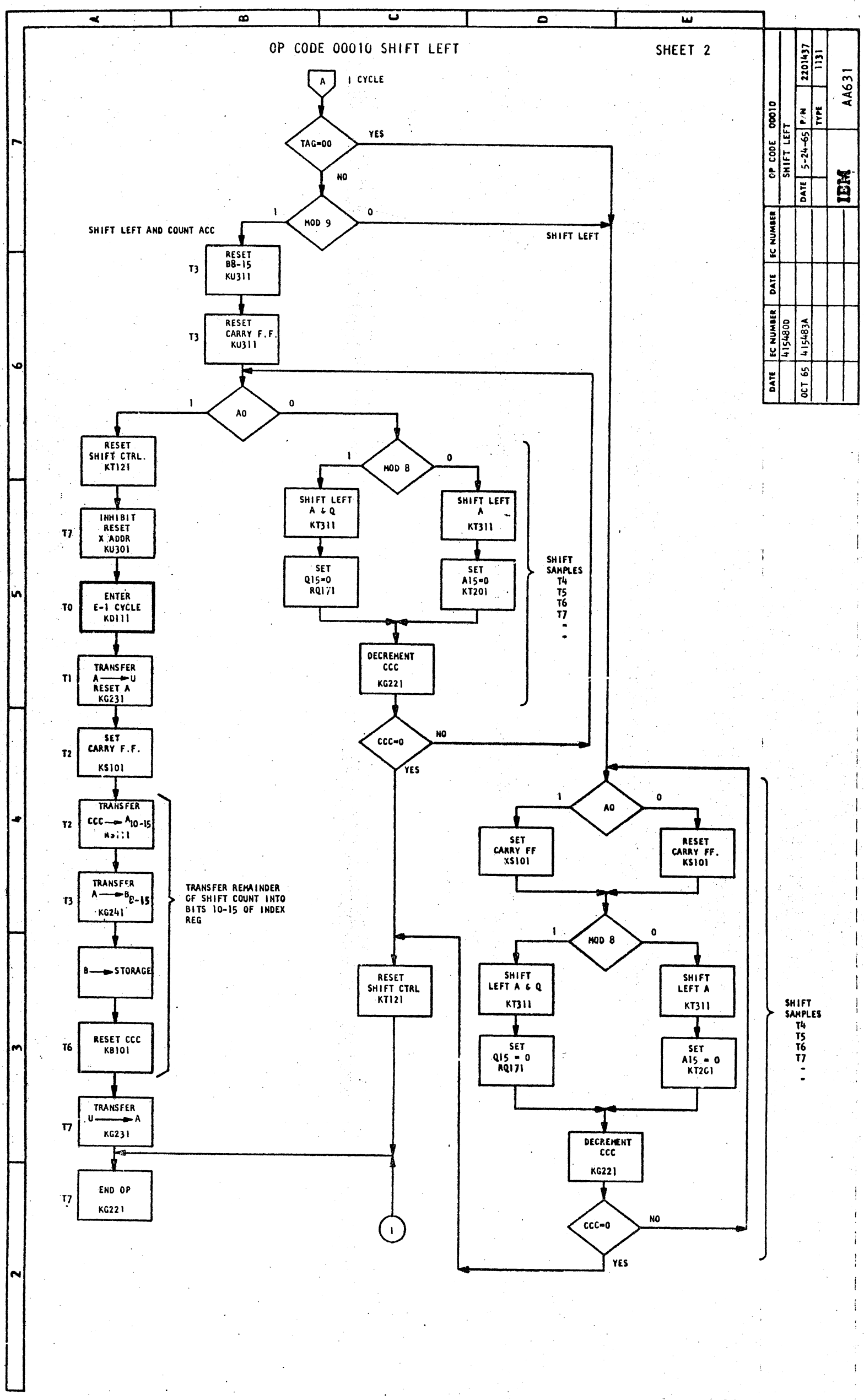
TAG	CCC SHIFT CNT
00	DISPLACEMENT
01	INDEX 1
10	INDEX 2
11	INDEX 3

DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154800		
	4154830		

OP CODE 00010
SHIFT LEFT
DATE 5-14-65
P/N 2201437
TYPE 1131
IBM
AA631

OP CODE 00010 SHIFT LEFT

SHEET 2



DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	415480D		
	415483A		

OP CODE 00010
SHIFT LEFT

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

IBM AA631

OP CODE 00011 SHIFT RIGHT

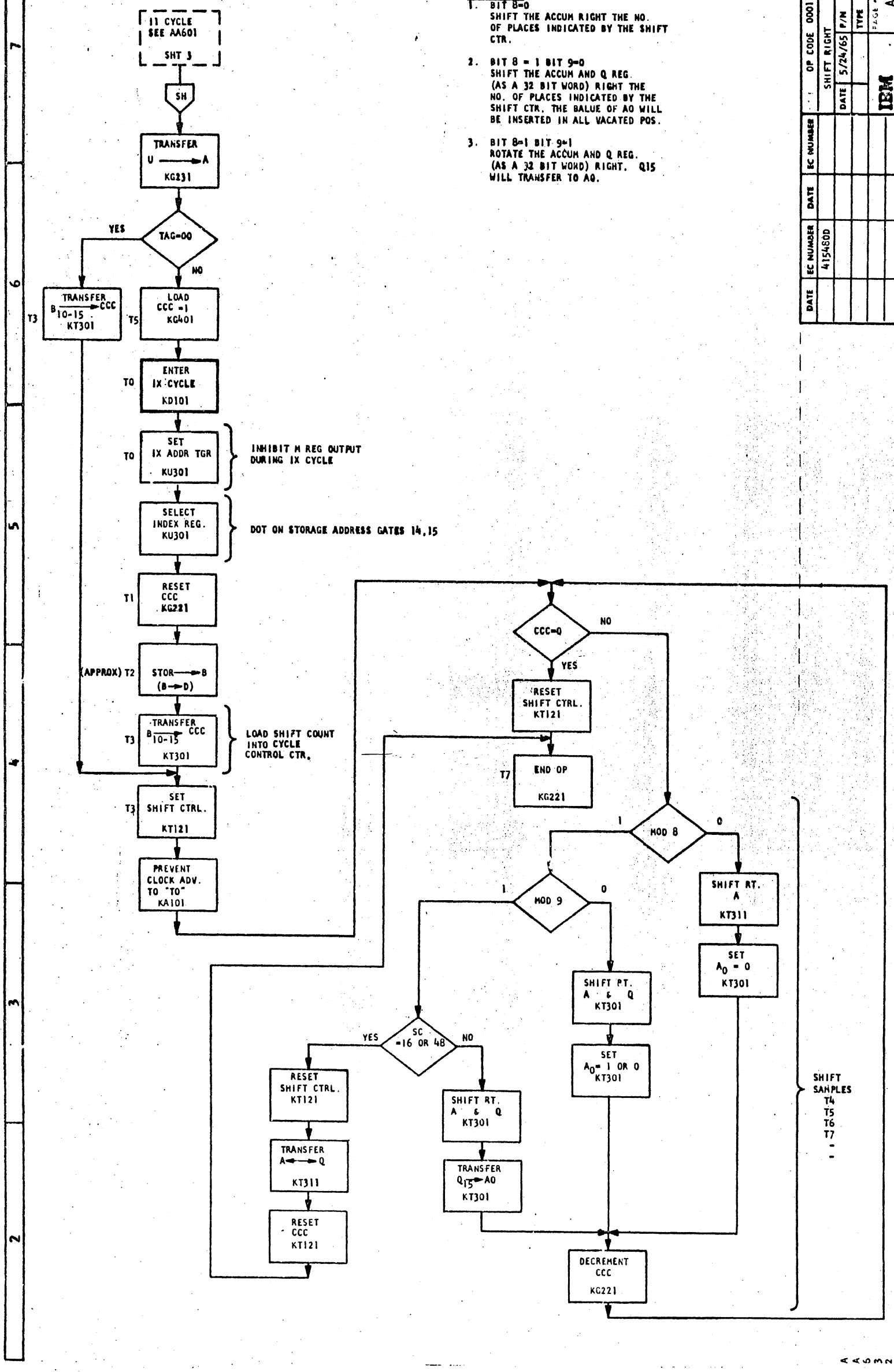
AA632

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 A0.



DATE	EC NUMBER	DATE	EC NUMBER
	4154600		

OP CODE 00011
SHIFT RIGHT

DATE	P/N	TYPE
5/24/65	2201438	1131

IBM

AA632

A
A
6
3
2

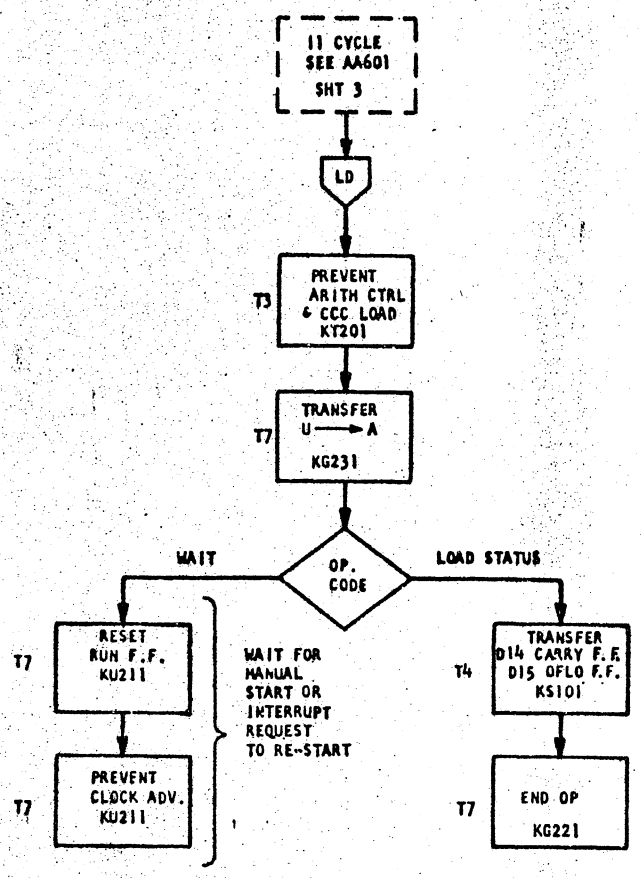
OP CODE 00100 LOAD STATUS

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	OP CODE 00100 LOAD STATUS
	4154600			OP CODE ----WAIT
				DATE 5-24-65
				P/N 2201440
				TYPE 1131
				IBM AA641

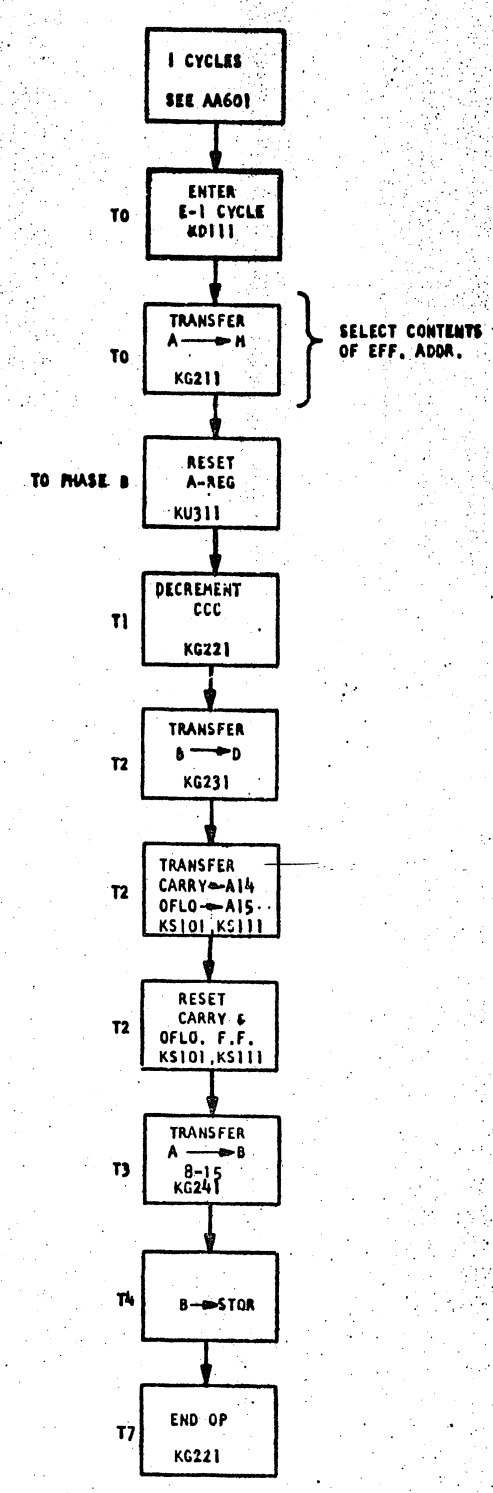
A A 6 4 1 - 1

OP CODE 00101 STORE STATUS

AA642

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.

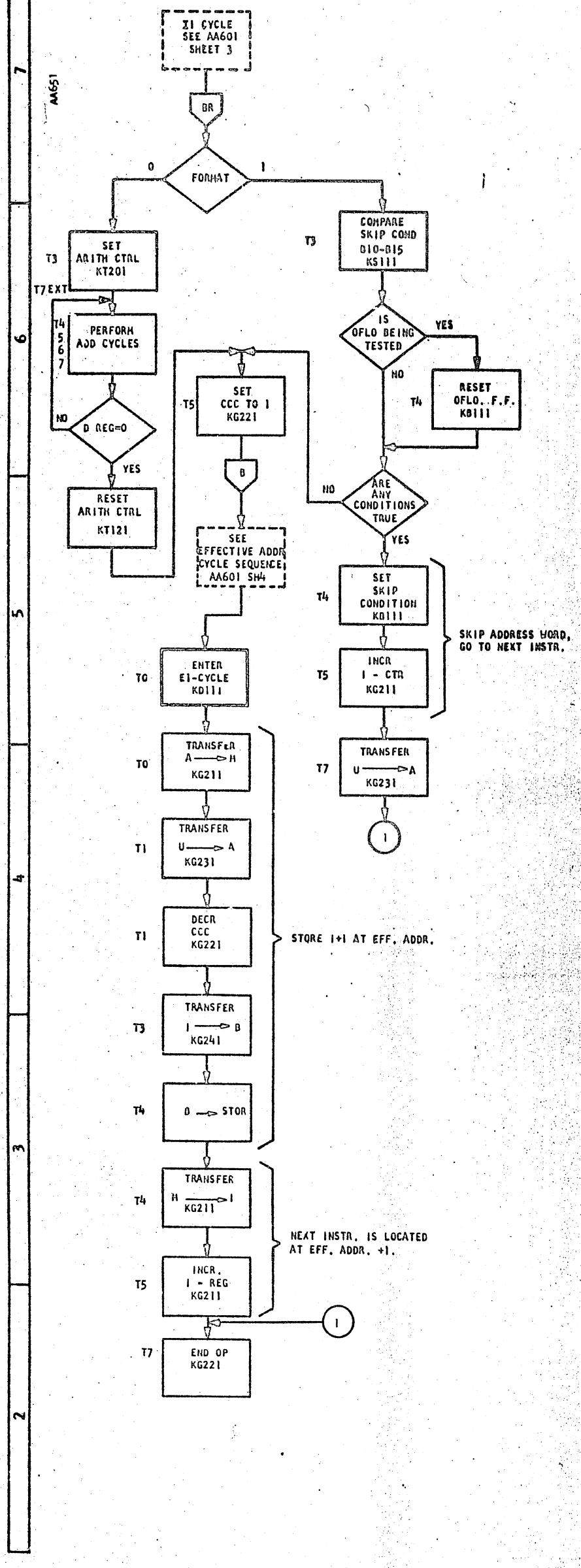


DATE	EC NUMBER	DATE	EC NUMBER
	4154800		

OP CODE 00101
STORE STATUS
DATE 5-24-65 P/N 2201441
TYPE 1131
IBM
AA642
A 6 4 2

A 6 4 2

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

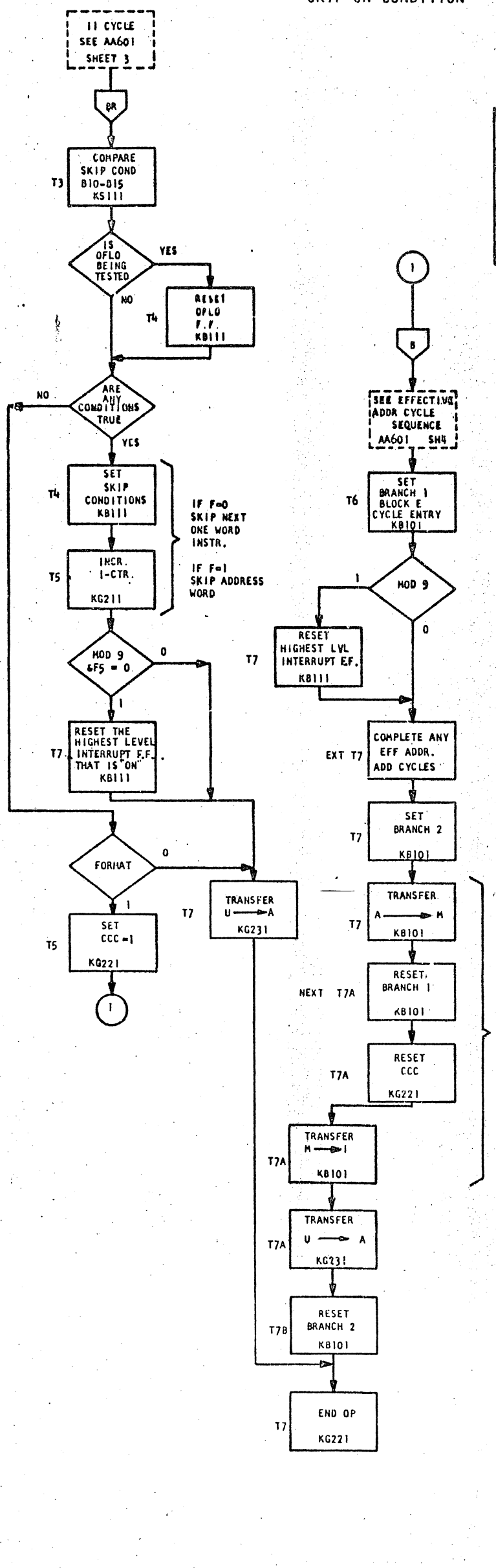
OBJECTIVES:

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			
	4154600			DATE 5-24-65	P/N 2201443	A	
					TYPE 1131	A	
				IBM	AA651	S	
						5	
						1	

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.

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

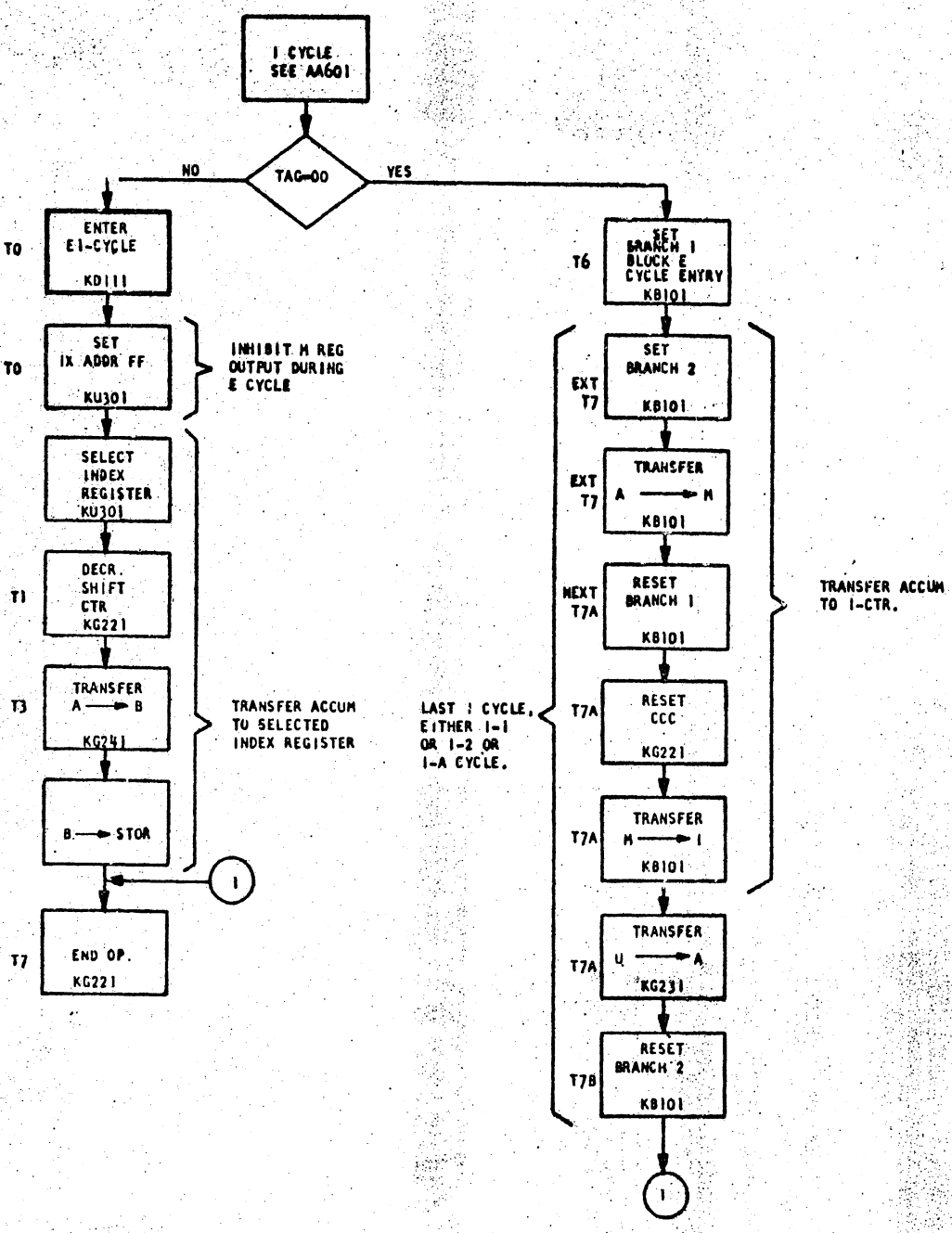
OP CODE 01100 LOAD INDEX

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



DATE	EC NUMBER	DATE	EC SYMBOL
	4154808		

OP CODE 01100
LOAD INDEX
DATE 5-24-65
P/N 2201446
TYPE 1131
IBM
AA661

A-1661

OP CODE 01101 STORE INDEX

AA662

I CYCLES
SEE AA601

OBJECTIVE:
1. STORE THE I CTR OR AN INDEX REGISTER AT THE EFF. ADDR.

TO ENTER E-1 CYCLE KD111

TO TRANSFER A → M KG211

TRANSFER EFF. ADDR. TO M REG.

YES — TAG=00 — NO

TO SET XADDR. F.F. KU301

TO SELECT INDEX REG KU301

INHIBIT M REG. OUTPUT DURING NEXT E CYCLE

T1 DECR CCC KG221

T3 TRANSFER I → B KG241

T4 B → STOR

STORE I-CTR. AT LOCATION SPECIFIED BY EFF. ADDR.

(1)

APPROX T2 STOR → B

T2 TRANSFER B → D KG231

T4 TRANSFER D → A DN111

TRANSFER C (INDEX REG) TO ACCUM.

TO ENTER E-2 CYCLE KD111

T1 DECR. CCC KG221

T3 TRANSFER A → B KG241

T4 B → STOR

STORE ACCUM IN LOCATION SPECIFIED BY EFF. ADDR.

(1)

T7 TRANSFER U → A KG231

T7 END OP KG221

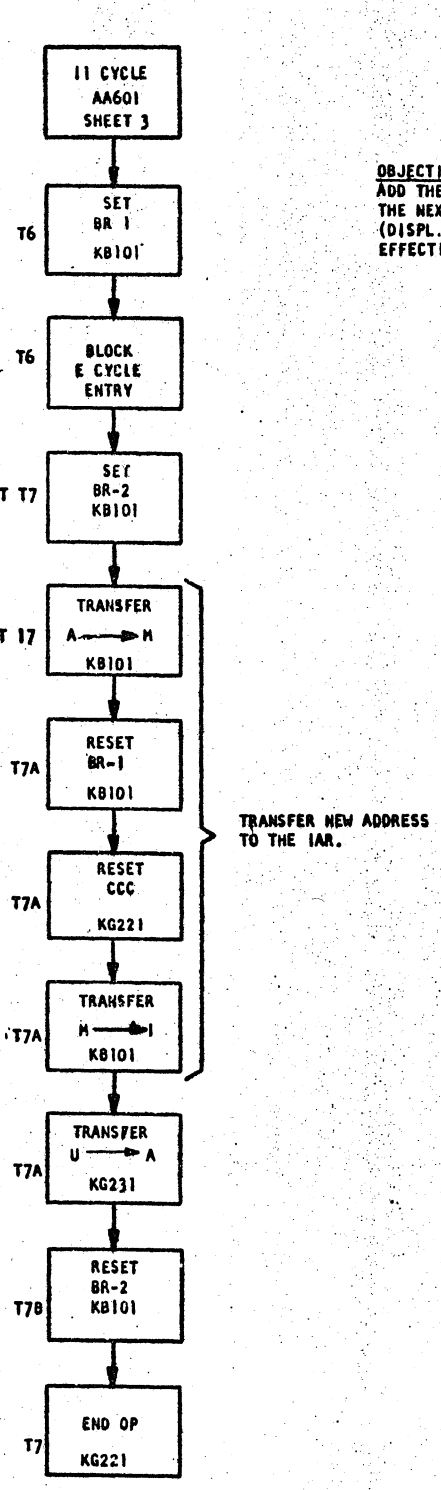
DATE	EC NUMBER	DATE	EC NUMBER	OP CODE 01101
	4154800			STORE INDEX

DATE 5-24-65 | P/N 2201447 | TYPE 1131 | IBM | AA662 | A

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	415483A		
JAN 66	415726		

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

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

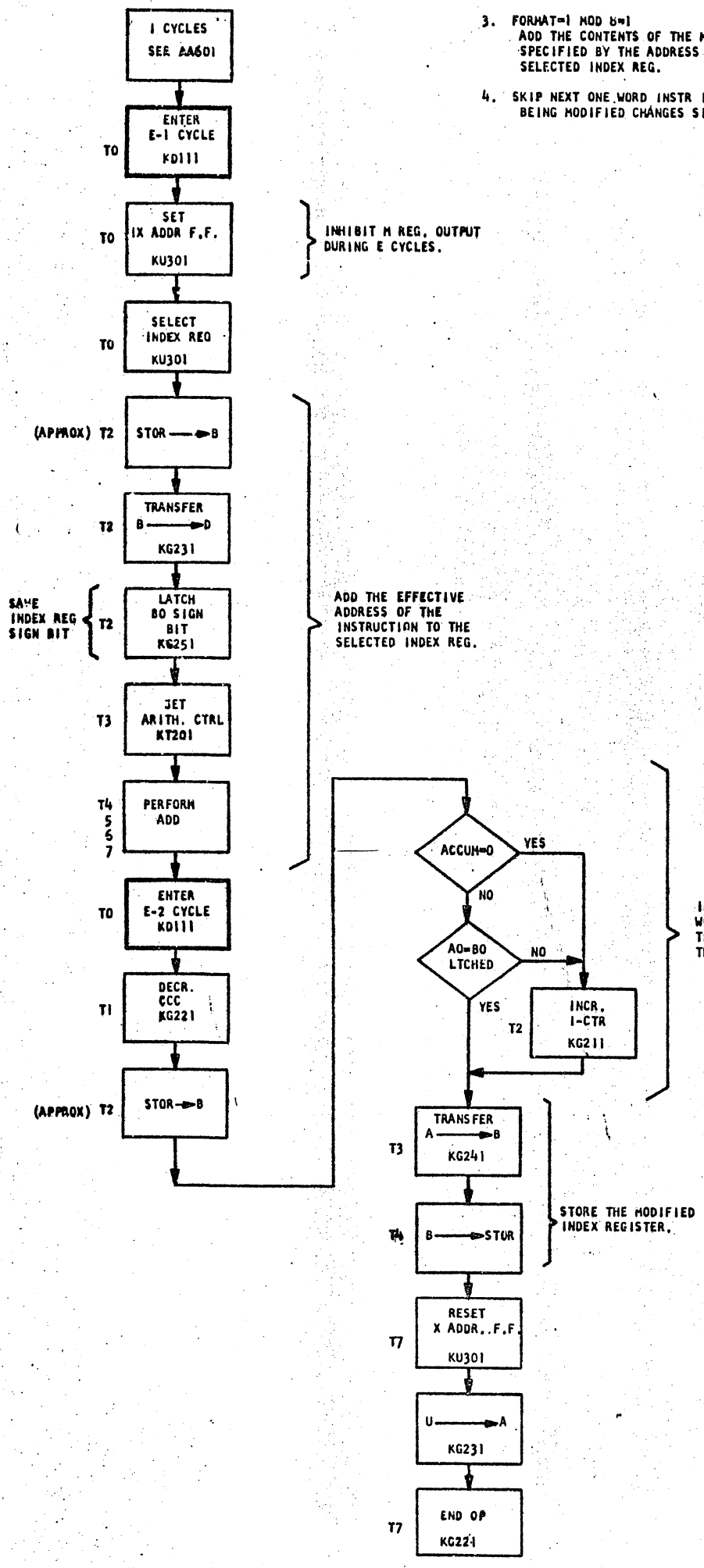
IBM AA663

OP CODE 01110 MODIFY
INDEX AND SKIP TAG ≠ 00

SHEET 2

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
	4154800		
OCT 65	4154834		
JAN 66	4157261		

OP CODE 01110 MODIFY
INDEX & SKIP TAG≠00

DATE 5-24-65 P/N 2201446
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
OCT 65	415480D		
JAN 66	415483A		
	415726		

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

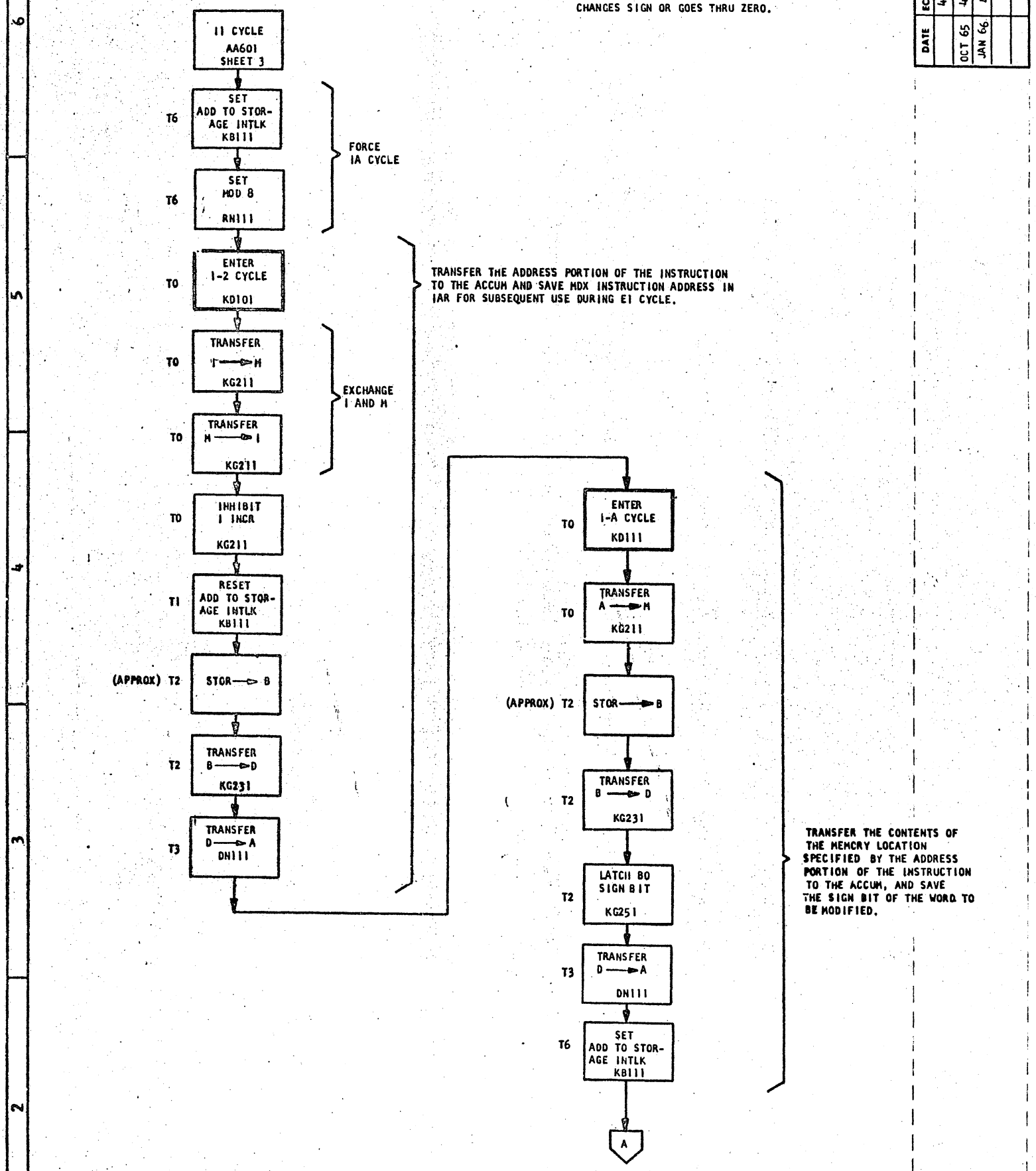
DATE 5-24-65 P/N 2201448 TYPE 1131

IBM AAE63

OBJECTIVE:

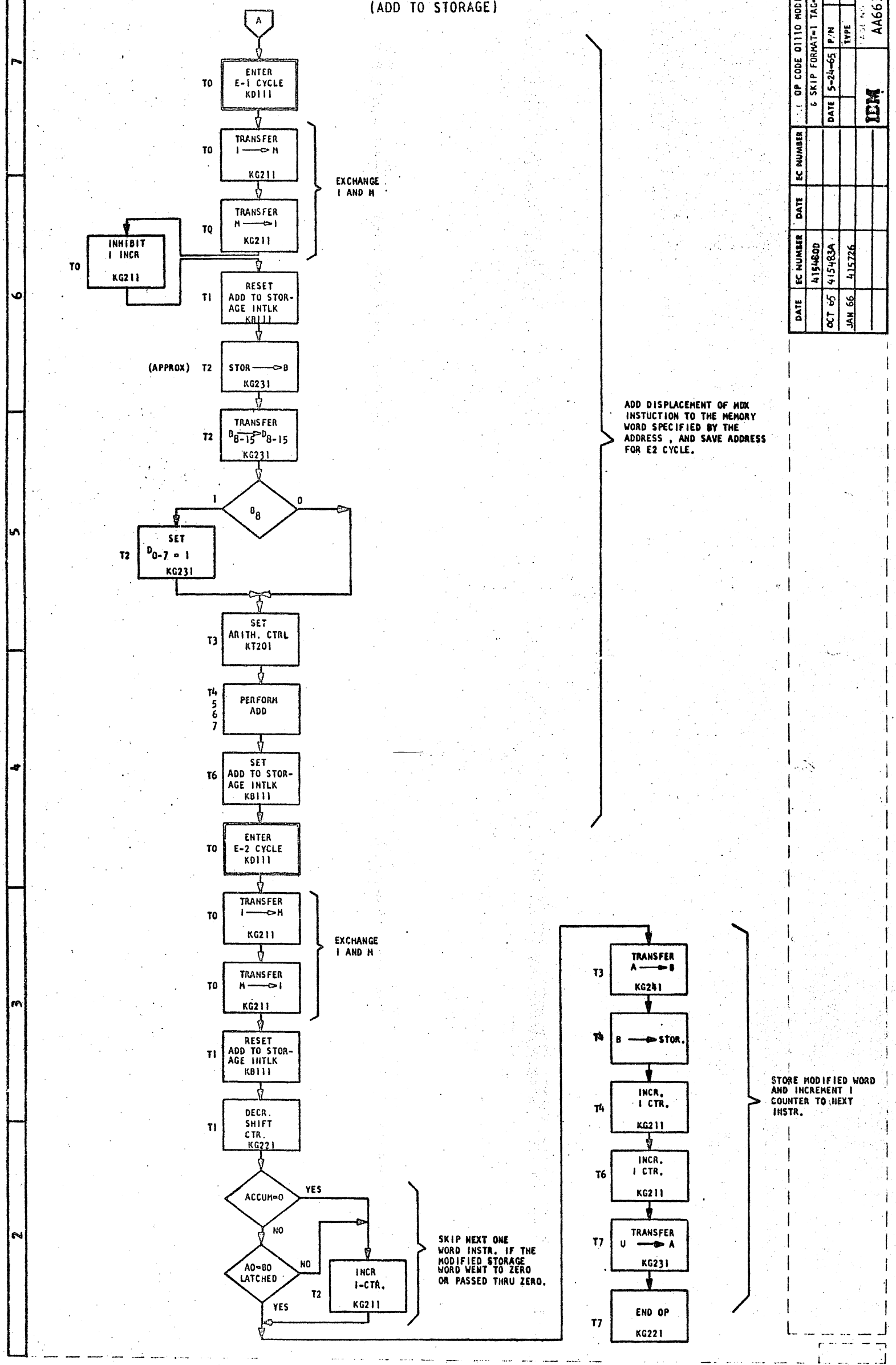
1. ADD THE DISPLACEMENT TO THE CONTENTS OF THE MEMORY LOCATION SPECIFIED BY THE ADDRESS PORTION OF THE INSTRUCTION.

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		

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

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

IBM

DRG NO. AA663

OP CODE 10000 ADD/
OP CODE 10010 SUBT

AA671

I CYCLES
AA601

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 A0.

T0 ENTER E1-CYCLE KD111

T0 TRANSFER A ⟶ M KG211

T1 DECR. SHIFT CTR KG221

T1 TRANSFER Q ⟶ A KG231

(APPROX) T2 STOR ⟶ B

T2 TRANSFER B ⟶ D KG231

T3 SET ARITH. CTRL. KT201

LIKE SIGNS KT101 — NO → T3 SET UNLIKE ARITH. SIGN KT111

YES

T7 EXT

T3 T4 5 6 7 PERFORM ADD/SUBT. SEE LOGIC AA671

CARRY OR BORROW FROM A0 — YES → SET TEMP CARRY KS101

NO

D REG =0 — NO → T3 T4 5 6 7 PERFORM ADD/SUBT. SEE LOGIC AA671

YES

RESET ARITH. CTRL. KT121

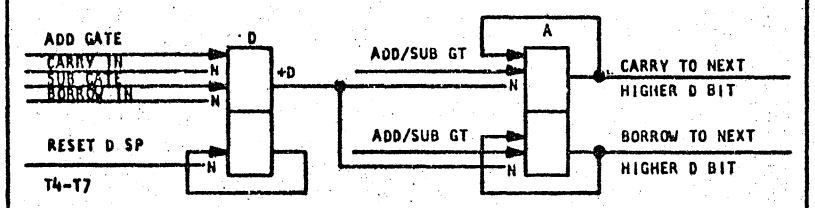
TEST FOR OVERFLO SEE CHART AA671 — OFLO → T7 SET OVERFLOW KS111

OK

T7 END OP KG221

ADD/SUBTRACT LOGIC

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



ADD/SUB OVERFLO

ACCUM RESULT NEG(A0=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	EC NUMBER
	415400

DATE 5-24-65 P/N 2201450 TYPE 1131 AA671

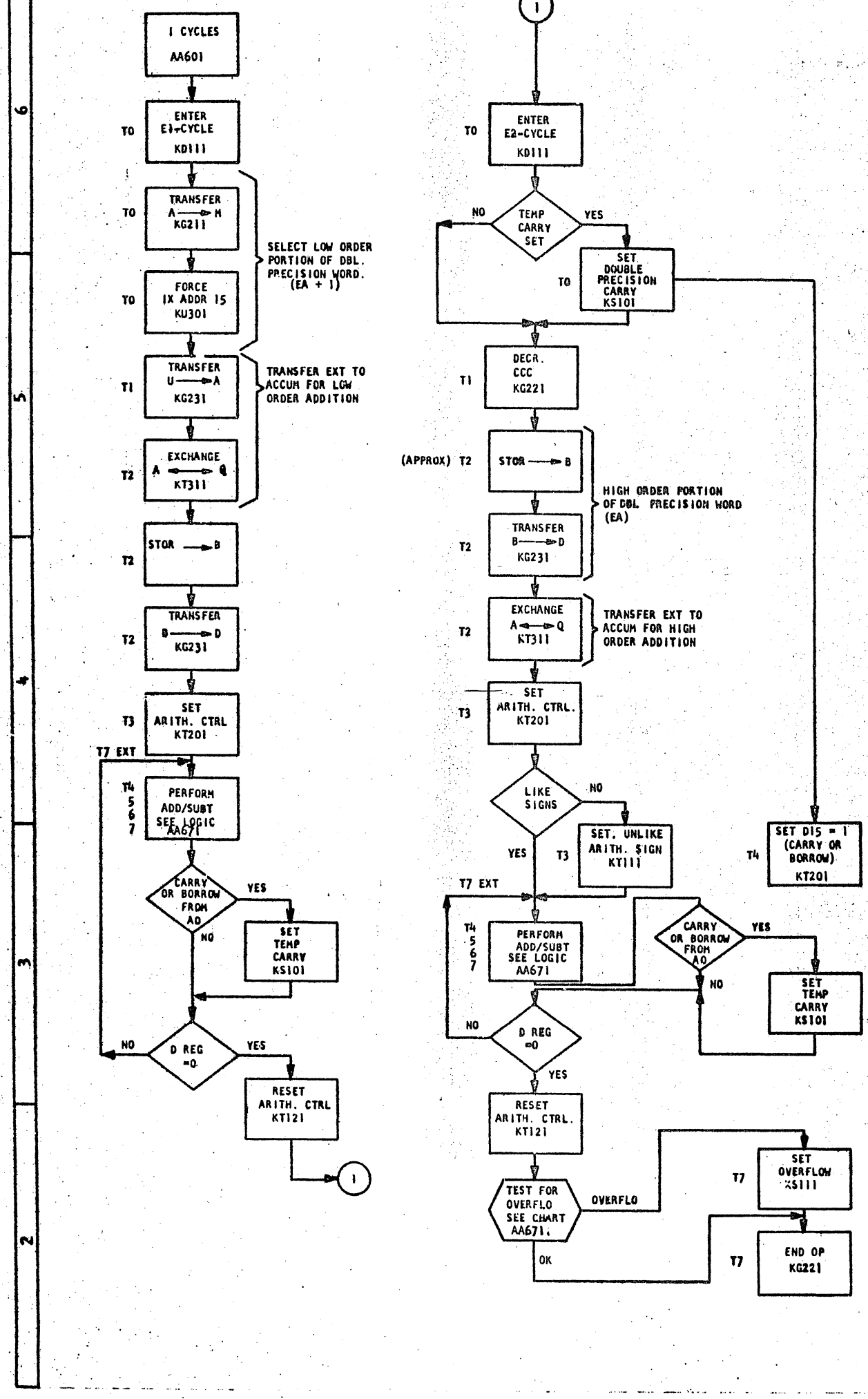
IBM

A 6 7 1

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.



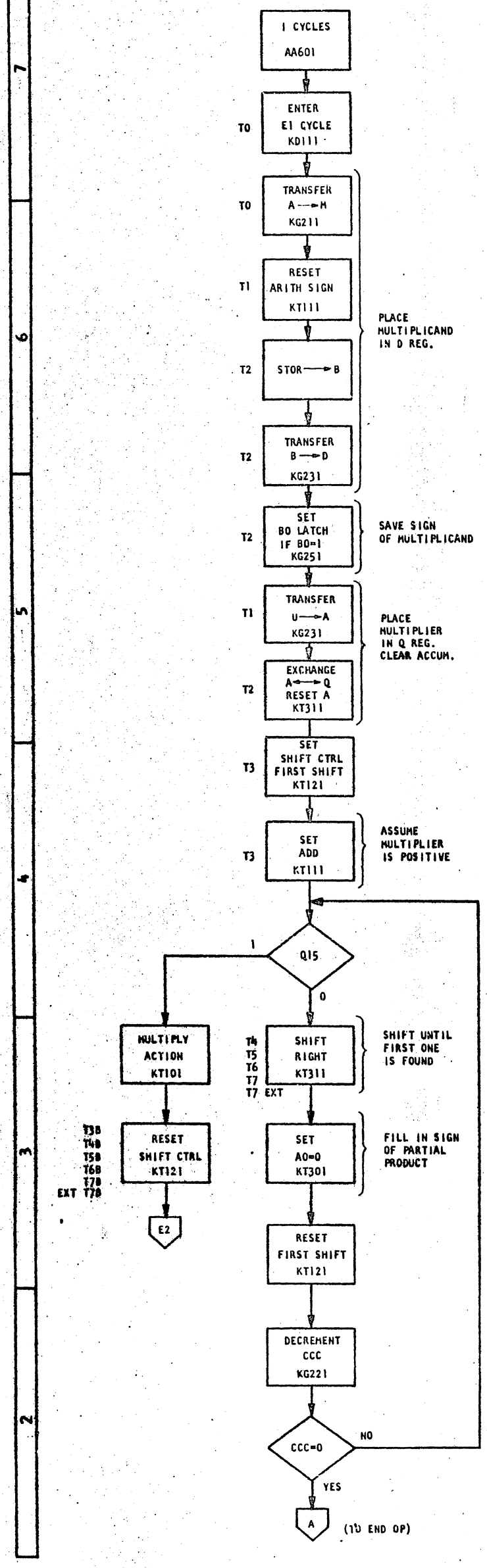
DATE	EC NUMBER	DATE	EC NUMBER	DATE
	4154800			
OCT 65	4154834			
JAN 66	4157260			

OP CDE 10001 DBL PRECISION
ADD 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.

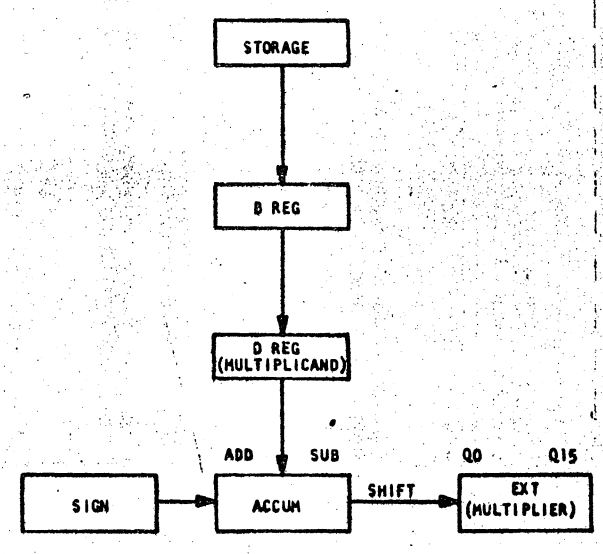
PWR OF 2	8 7 6 5 4 3 2 1 0	RAPID EQUIV	LONG EQUIVALENT
BINARY	0 0 1 1 1 1 0 1 0	$2^7-2^3+2^1$	$2^6+2^5+2^4+2^3+2^1$
BINARY	0 0 1 1 1 0 1 1 1	$2^7-2^3-2^0$	$2^6+2^5+2^4+2^2+2^1+2^0$

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 OPERATION	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 DIVISION.

4. DATA FLOW.



DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154834		

OP CODE 10100 MULTIPLY

DATE MAY 65 P/N 2201452 TYPE 1130

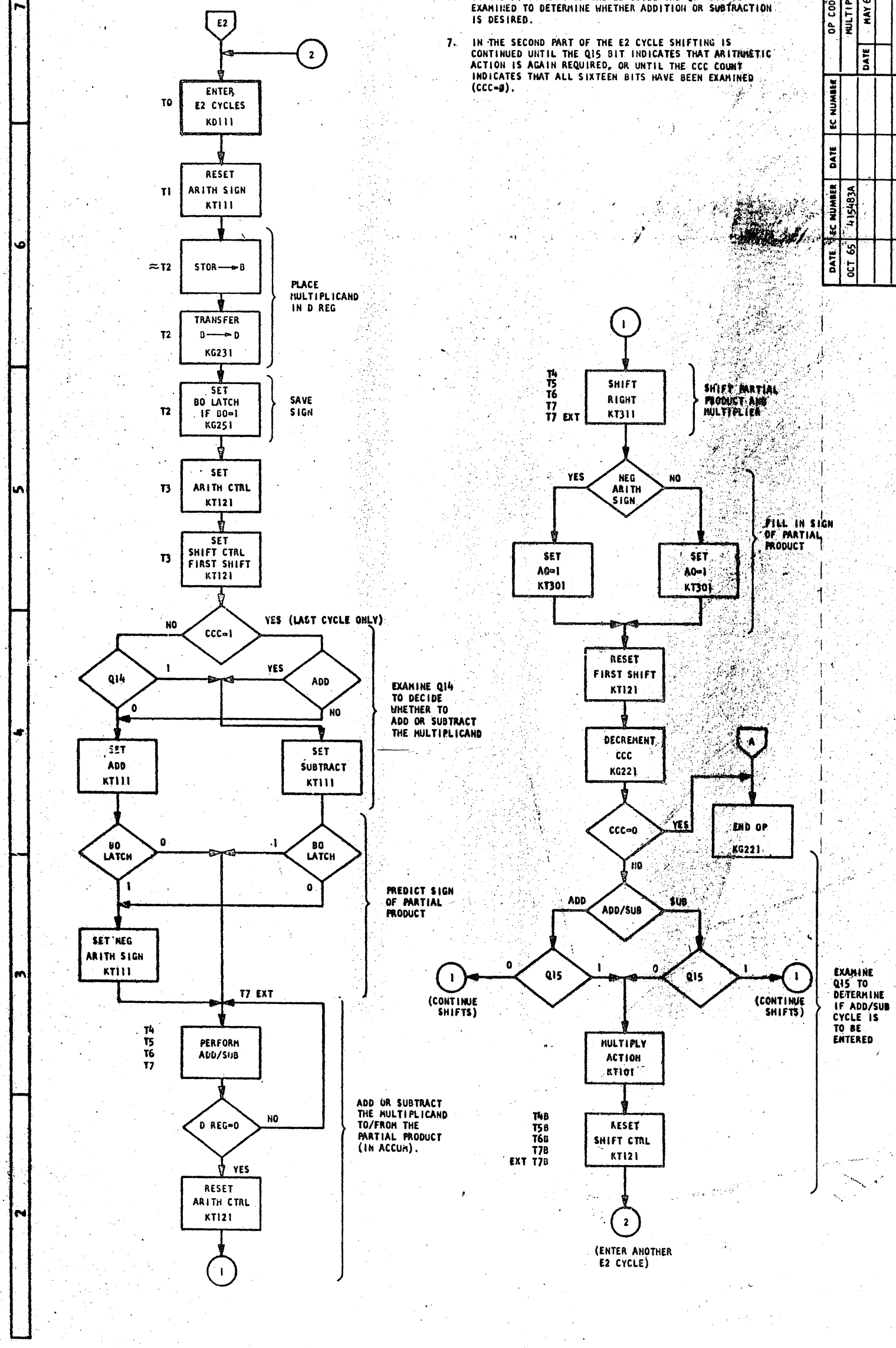
IBM AA673

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=0).



DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154834		

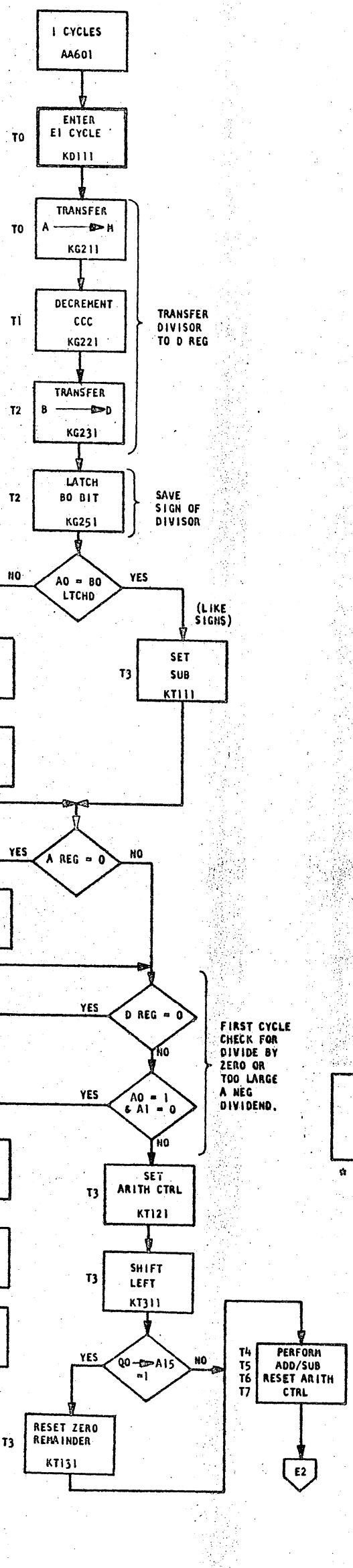
OP CODE 10100 MULTIPLY

DATE MAY 65 P/N 2201452 TYPE 1130

IBM AA673

OP CODE 10101 DIVIDE
FIRST CYCLE

SHEET 1



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:

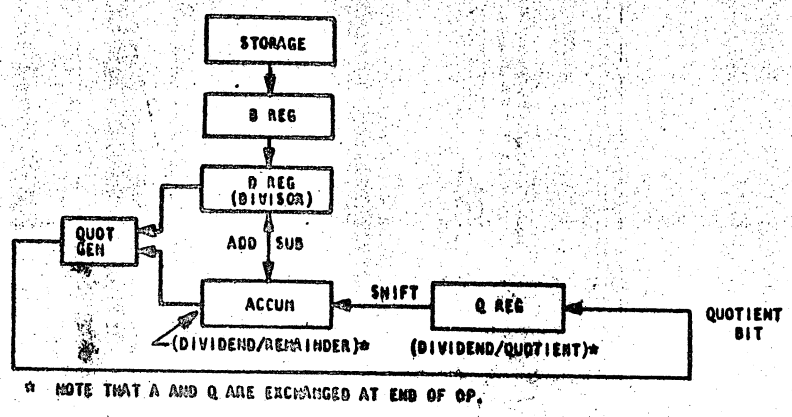
1) THE QUOTIENT OF TWO BINARY NUMBERS MAY BE GENERATED BY SUCCESSIVELY SHIFTING AND SUBTRACTING THE DIVISOR FROM APPROPRIATE ORDERS OF THE DIVIDEND. IF THE SUBTRACTION WAS SUCCESSFUL (REMAINDER SIGN BIT SAME AS DIVISOR SIGN BIT) A QUOTIENT ONE BIT IS GENERATED AND ANOTHER REDUCTION CYCLE IS TRIED. IF 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
OCT 65	415483A		

OP CODE 10101 DIVIDE

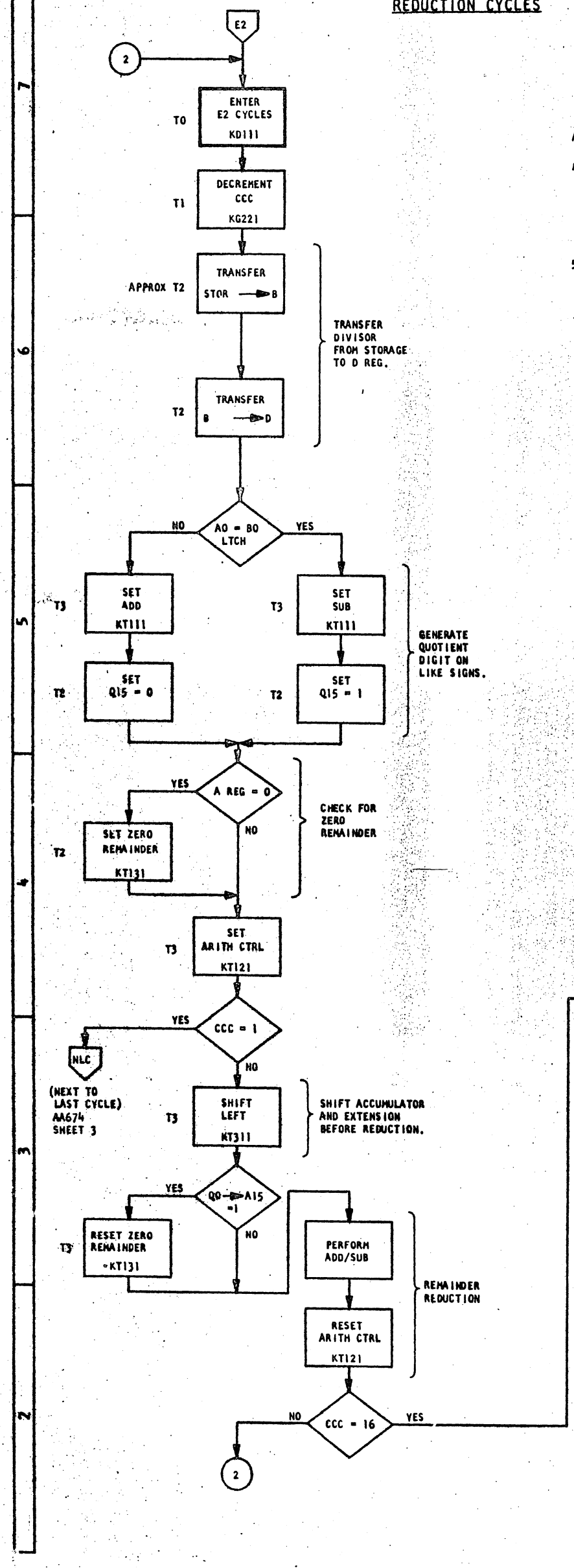
DATE AUG 65 P N 2201453 TYPE 1130

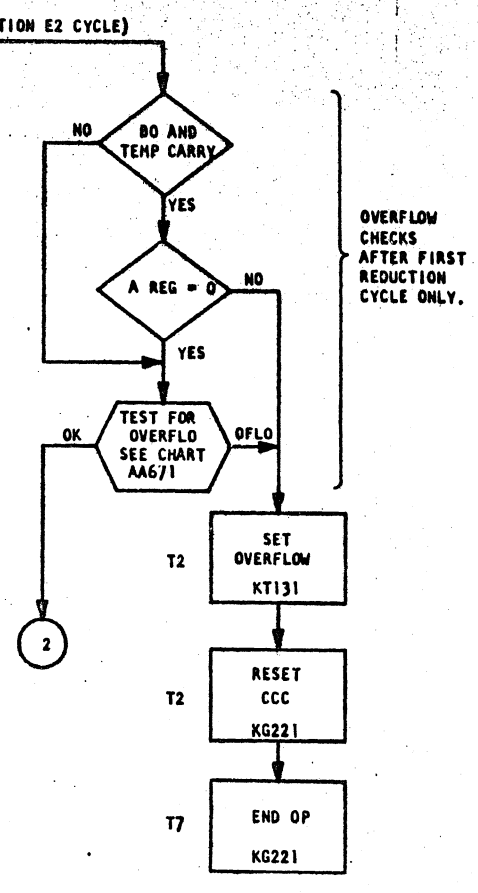
IBM AA674

OP CODE 10101 DIVIDE

SHEET 2

REDUCTION CYCLES





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 I 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.

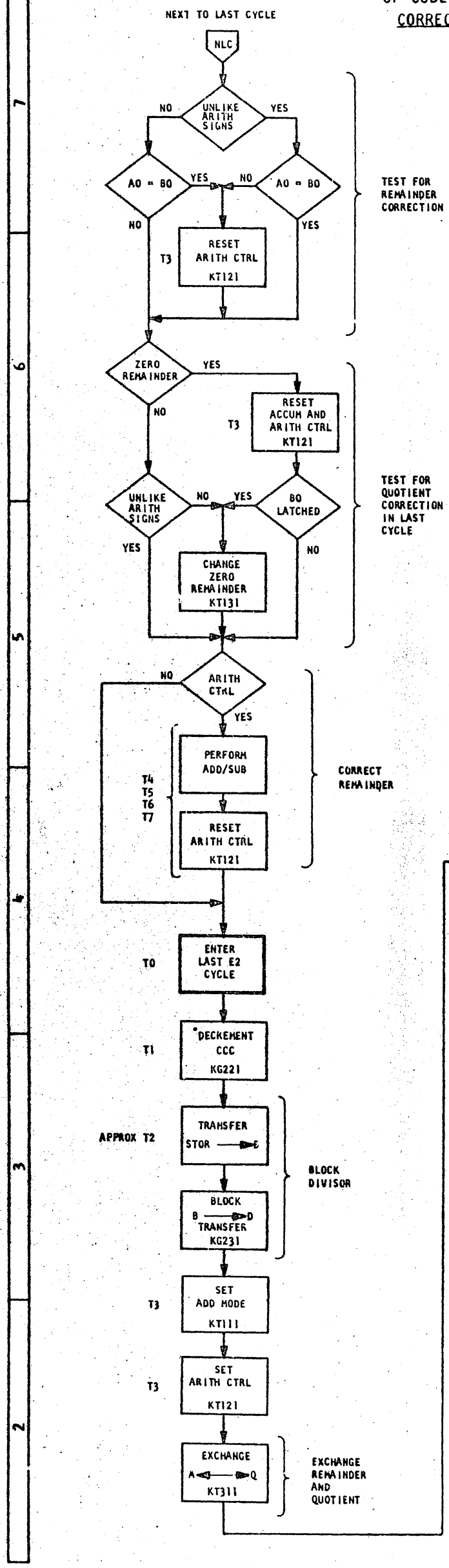
5.3 LAST CYCLE CHECK -

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		
OCT 65	4154834			DATE AUG 65	P.N 2201453	AA674
					TYPE 1130	IBM

OP CODE 10101 DIVIDE

CORRECTION CYCLES



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

OP CODE 10101 DIVIDE			
DATE	AUG 65	P/N	2201453
		TYPE	1130
IBM	AA674		

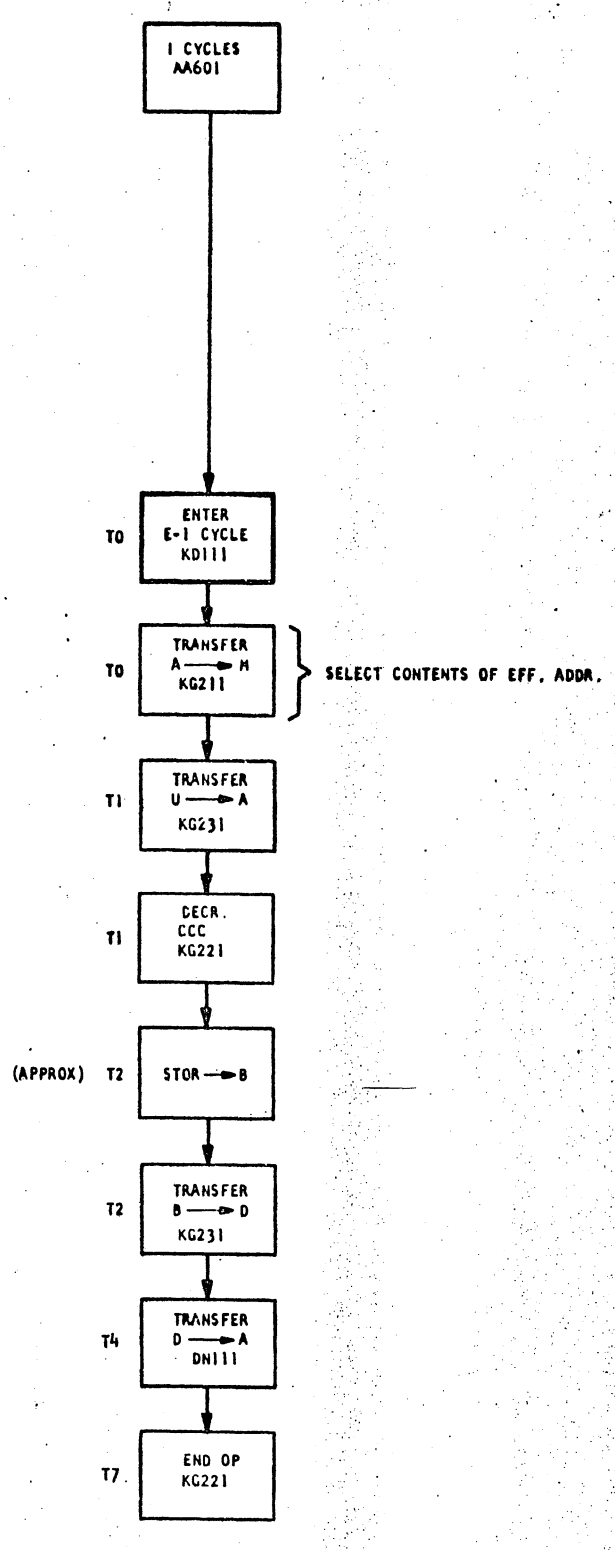
DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	415483A		

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

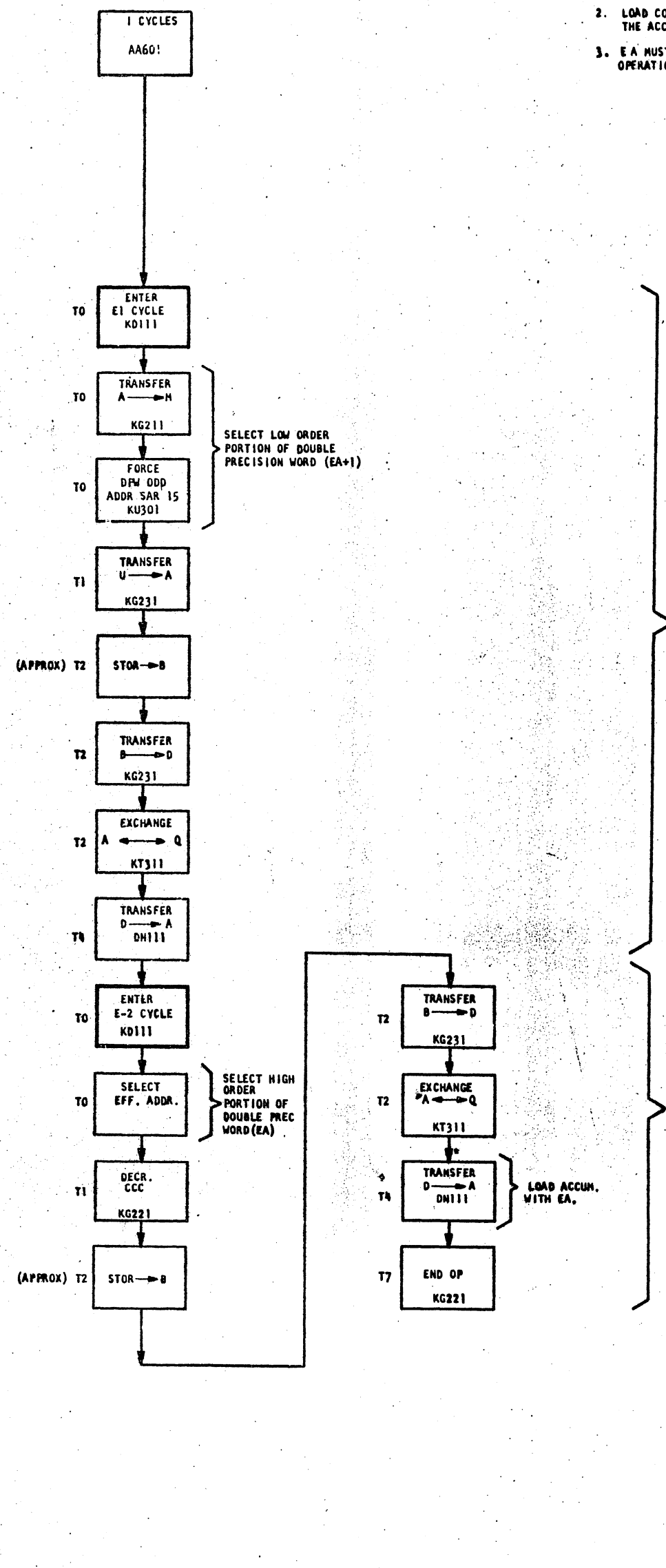
DATE	P/N	
5-24-65	2201455	A
	TYPE	6
	1131	8
IBM	AA681	1

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.

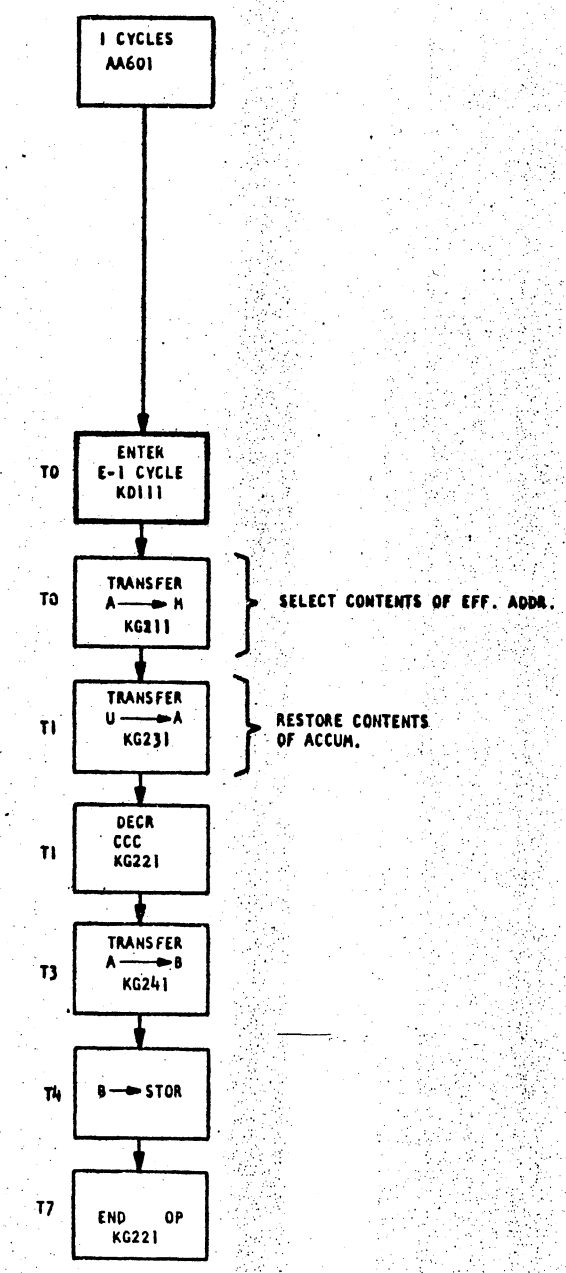


DATE	EC NUMBER	DATE	EC NUMBER	OP CODE 11001
OCT 65	4154800			DOUBLE PREC LOAD
	4154834			DATE 5-24-65 P/N 2201456
				TYPE 1131
				IBM AA682

OP CODE 11010 STORE ACCUM

AA683

OBJECTIVE:
STORE THE ACCUM INTO THE EFF. ADDR.



DATE	EC NUMBER	DATE	EC NUMBER
	4154800		

OP CODE 11010
STORE ACCUMULATOR

DATE	P/N	
5-24-65	2201457	A
	TYPE	1131
	AA683	

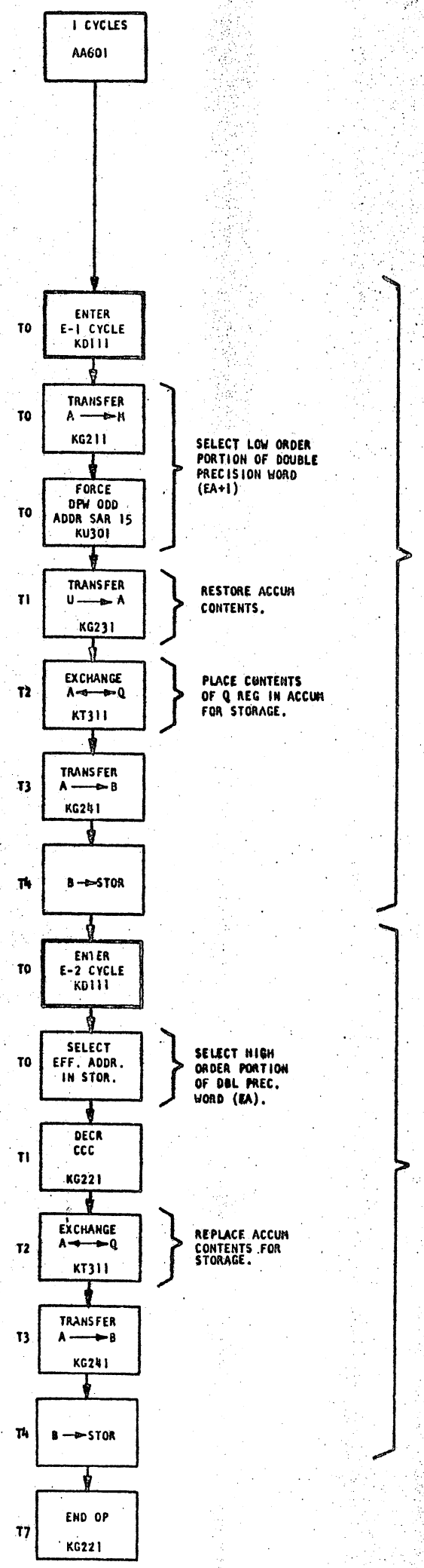
IBM

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.

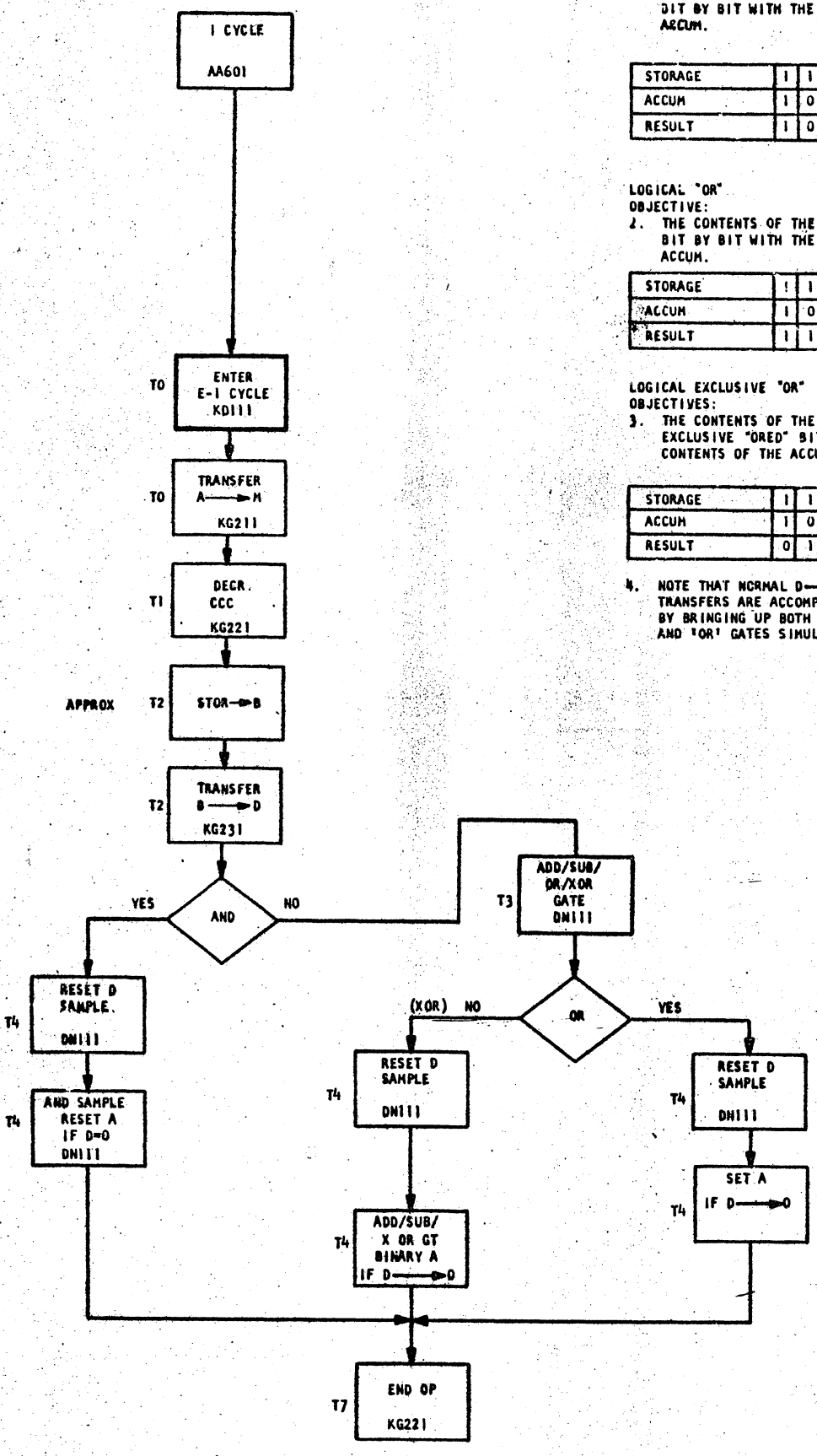


DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154800		
	4154834		

OP 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

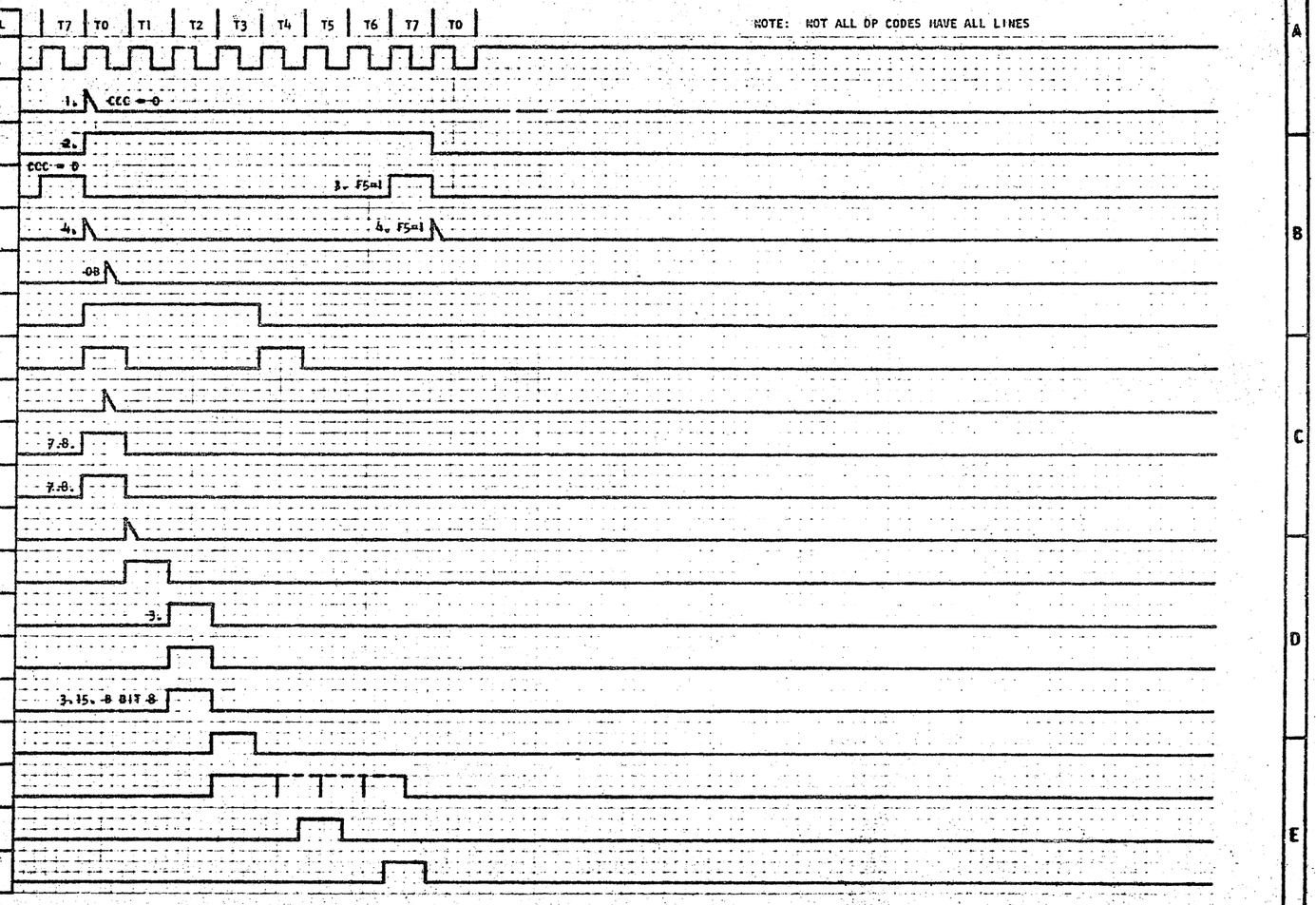
4. NOTE THAT NORMAL D ⟶ A TRANSFERS ARE ACCOMPLISHED BY BRINGING UP BOTH 'AND' AND 'OR' GATES SIMULTANEOUSLY.

DATE	EC NUMBER	DATE	EC NUMBER
MAY '65	4154800		
AUG '65	4154801		
OCT 65	4154813		

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 AR4	BA1J2B13	+
8	STORAGE SELECT	MC101 AQ4	BA1J2B10	+
9	RESET D REG SP	KG151 AS2	BA1H2D02	-
10	B 0-7 DC RESET B 8-15	KU311 AR4	BA1H2D10	-
11	DC RESET OP REG AND OP FLAGS	KU311 AS4	BA1H2B07	-
12	A TO U SP 0-7 8-15	KU131 AL4	BB1F4B08	-
13	DC RESET A REG	KT311 AT4	BA1H2D04	-
14	GATE B BITS 0-9 TO OP REG	KD101 AZ4	BA1G2J05	+
15	GATE B TO D 8-15	KG231 AL4	BA1M4D02	+
16	DC SET D 0-7	KG231 AM4	BA1M4B10	-
17	GATE I TO A 0-7 8-15	KG231 BA4	BA1M4B02	+
18	ARITH CONTROL	KT121 AZ2	BA1M4J06	+
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		

I1 CYCLE TIMING CHART

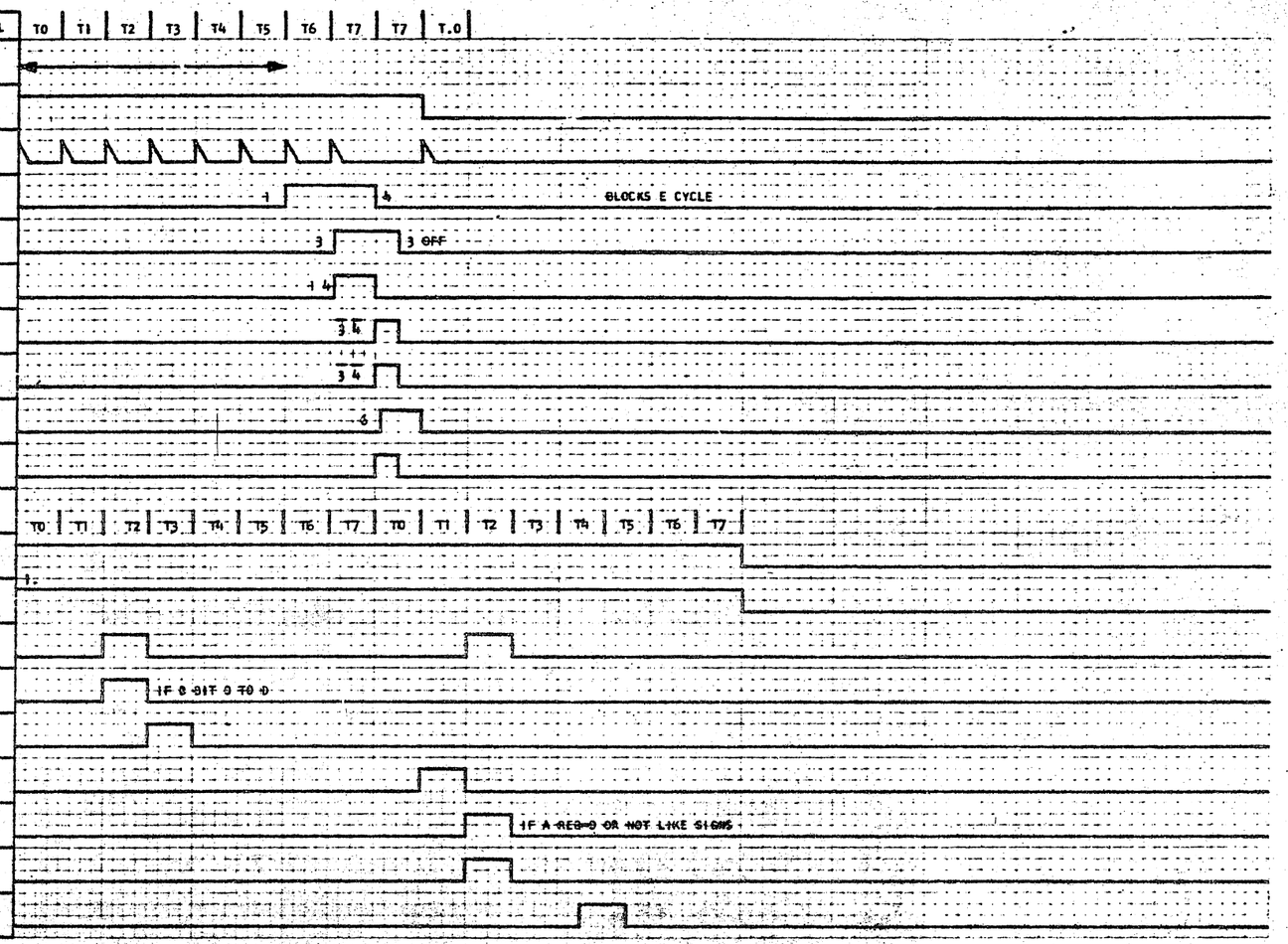
DATE | P/N 2201299

TYPE 1130

IBM AA701

OP CODE 01110 MDX TIMING CHART

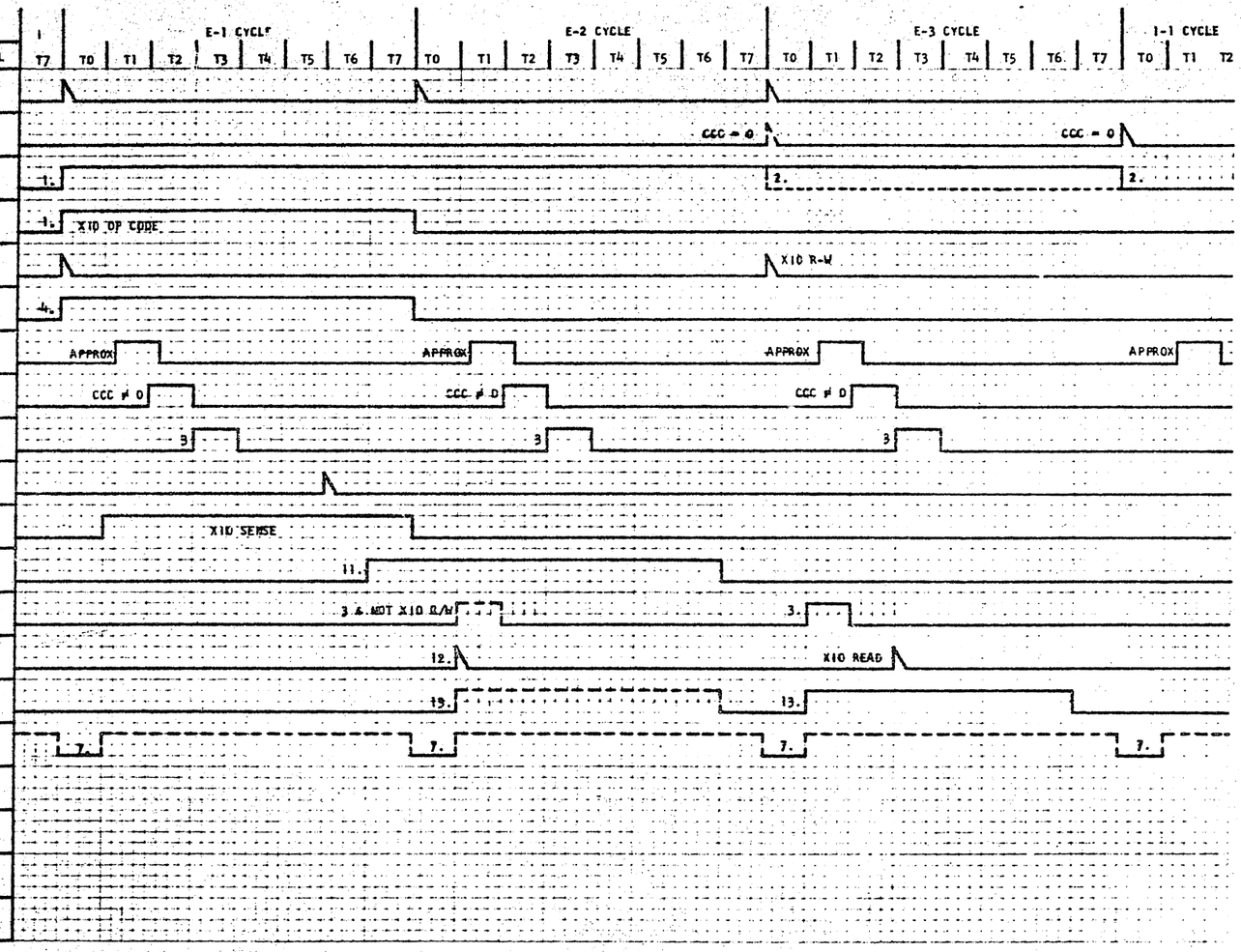
	NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
F=0 TAG=00	0	NORMAL 1-1 STEPS	-	-	+
	1	MDX	KG241 AF4	BA1L2G13	-
	2	T CLOCK ADV SAMPLE	KA101 BC4	BA1C4D02	+
	3	BRANCH 1	KB101 AY2	BA1K2D13	+
	4	BRANCH 2	KB101 AZ2	BA1K2G03	-
	5	A TO M SPD SAMPLE	KB101 BA4	BA1K2B09	-
	6	DC RESET CCC	KG221 AK4	BA1E2B02	-
	7	M TO I SPD SAMPLE	KB101 BB4	BA1K2D06	-
	8	T7 END OP	KG221 AH4	BA1E2J13	+
	9	U TO A SPD SAMPLE	KG231 AZ4	BA1K4G07	-
F=0 TAG 01		E-1 & E2 CYCLES			
	1	IX INHIBIT SAR	KUB01 AT2	BA1H2J12	+
	2	IX ADDR SAR 15	KU301 AV4	BA1H2J06	-
	3	GATE B TO D	KG231 AK4	BA1H4B13	+
	4	B BIT 0 LATCHED	KG251 AX2	BA1L2J12	+
	5	SET ARITH CONTROL	KT201 AF4	BA1A4B04	-
	6	CCC DECREM SAMPLE	KG221 AW4	BA1E2B13	-
	7	INC IAR SAMPLE	KG211 BD4	BA1H2G13	-
	8	A TO B SPD GATE	KG121 AM2	BA1L2B07	-
	9	B TO STOR	-	-	



DATE	EC NUMBER	DATE	EC NUMBER	OP CODE 01110 MDX TIMING CHART			
OCT 65	615483A						
				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 8-15	KG101 AJ7	BB1F3D04	-
6	DPW ODD ADDR SAR 15	KU301 AW4	BA1H2J06	-
7	STORAGE TO B			
8	GATE B TO D 0-7 8-15	KG231 AK4	BA1H4B13	+
9	ADD, SUB OR EOR GATE (D TO A)	DN111 AY4	BA1D2G02	-
10	A TO U SP 0-7 8-15	KG131 AL2	BB1F4B08	-
11	GATE SENSE INHIBIT STORAGE USE	DN201 AS4	BA1H4B10	-
12	NOT STORAGE USE	DN201 AB4	BA1J7B02	+
13	CCC DECREM SAMPLE	KG221 AW4	BA1E2B13	-
14	I/O TO B SP	KG121 AL4	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		

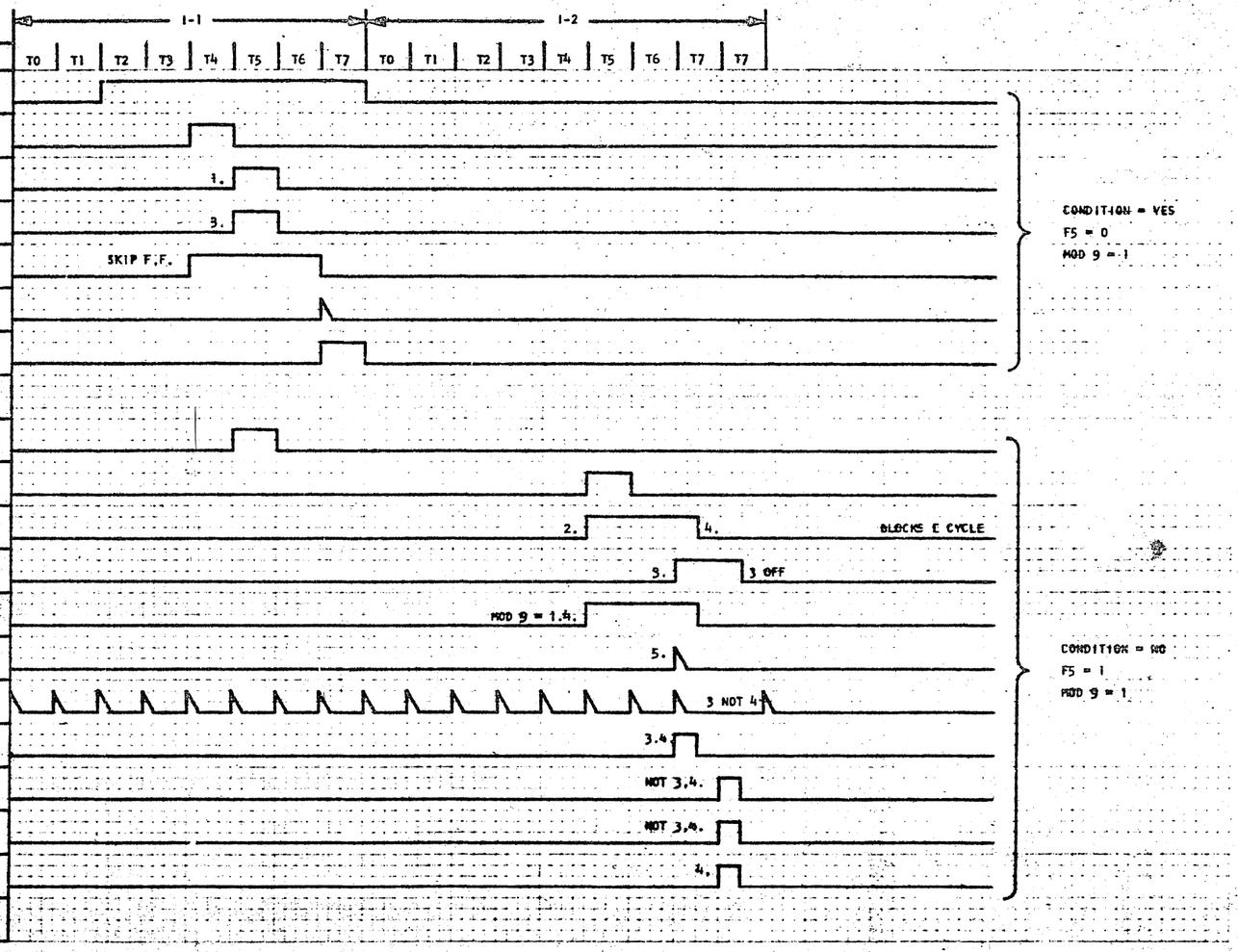
OP CODE 00001 - X10
TIMING CHART

DATE | P/N 2201297
TYPE 1130

IBM AA721

OP CODE 01001 BSC TIMING CHART

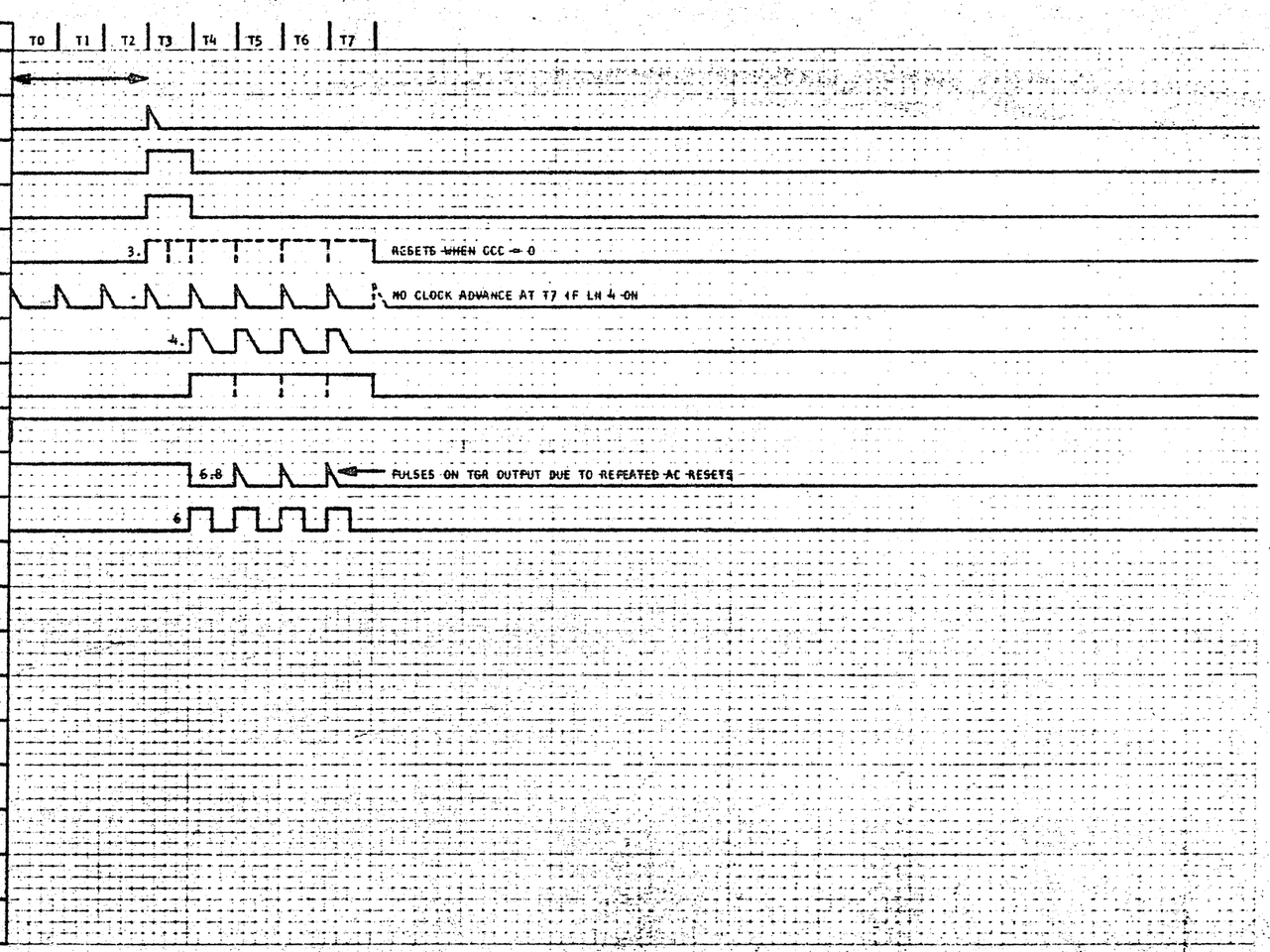
NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	SKIP CONDITION	KS111 AX4	BA1J4B08	-
2	BSI OR BSC RESET OVERFLOW	KB111 AX4	BA1K2B12	-
3	SKIP SAMPLE	KB111 AW4	BA1K2D04	-
4	INC IAR SAMPLE	KG211 BD4	BA1H2G13	-
5	BRANCH OUT	KB111 AY4	BA1K2J09	-
6	RESET INT LVLS SP	KT331 AM2	BA1B4B02	-
7	U TO A SPD SAMPLE	KG231 AZ4	BA1H4G07	-
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	BA1K2G03	+
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 TO A SPD SAMPLE	KG231 AZ4	BA1H4G07	-



DATE	EC NUMBER	DATE	EC NUMBER	OP CODE 01001 BSC
OCT 65	415483A			TIMING CHART
				DATE P/N 2201340
				TYPE 1130
				IBM AA731

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 8-15	KG131 AM2	BB1F5B08	-
2	GT B10-15 TO CCC	KT301 BE4	BA1K4D06	+
3	SHIFT UP 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	BA1J4D02	+
8	ACC BIT 15 SHIFT LT ENTRY	KT201 AZ4	BA1FAG07	+
9	A BIT 15	RA271 AU2	BB1L4J05	+
10	CCC DECREM SAMPLE	KG221 AW4	BA1F2G07	-



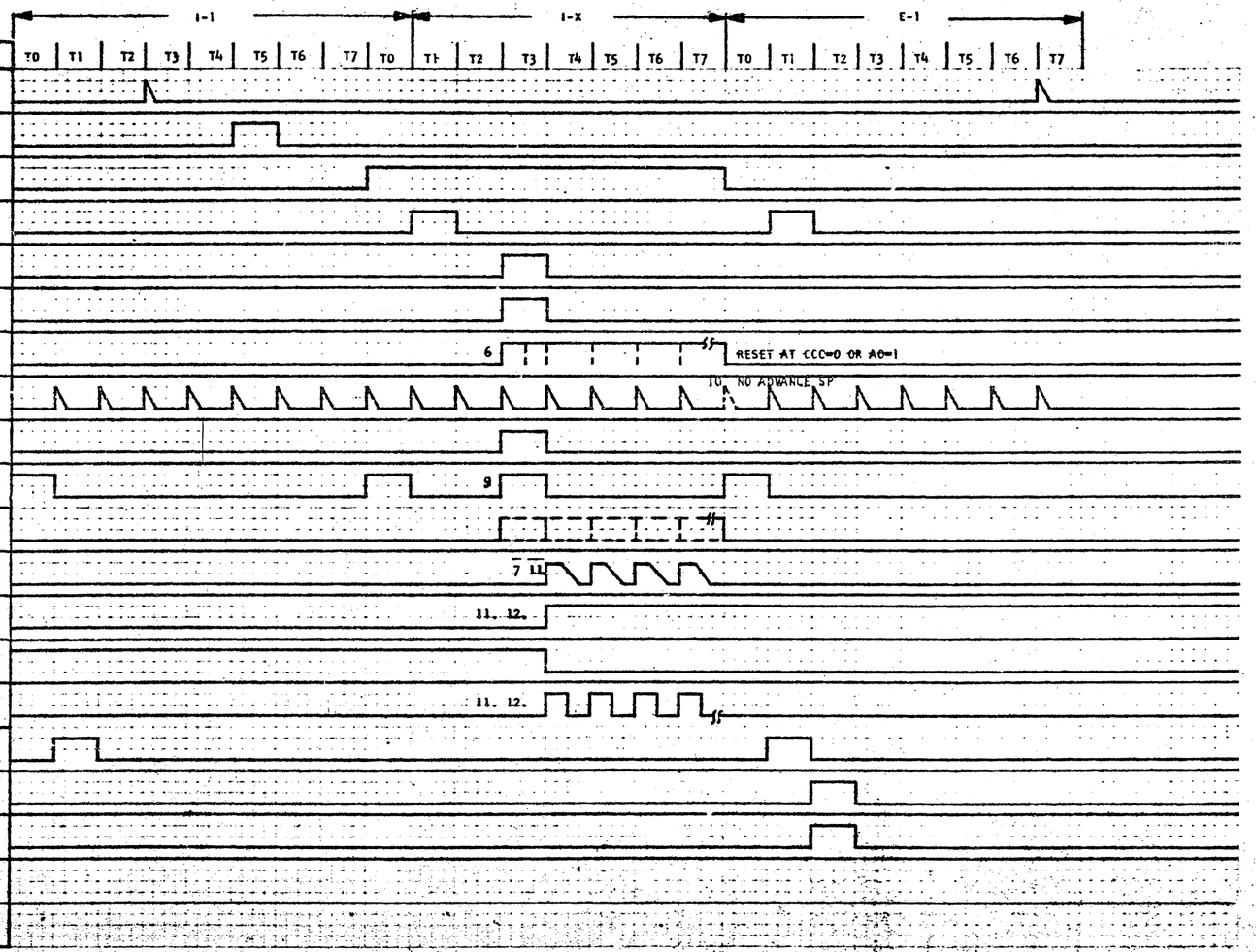
DATE	EC NUMBER	DATE	EC NUMBER
OCT 65	4154834		

OP CODE 00010 SLA
TIMING CHART
DATE
P/N 2201341
TYPE 1130
IBM
AA741

OP CODE 00010 SLCA TIMING CHART

F=0 TAG=00 MOD 9=1

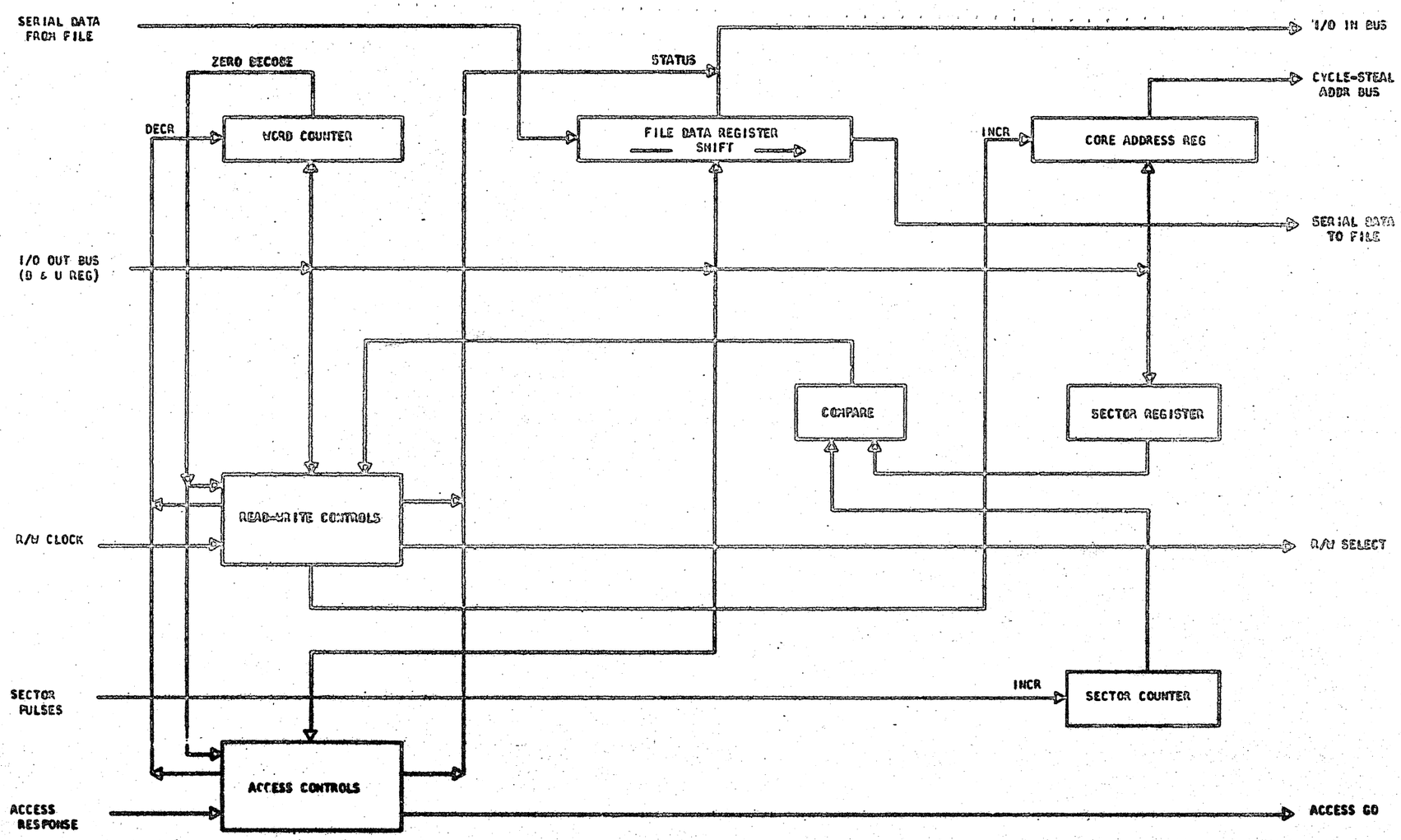
NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	U TO A SP	KG131 AM2	BB1F5B08	-
2	SET CCC 1	KG221 AF4	BA1E2G12	-
3	IX ADDR INHIBIT SAR	KU301 AT6	BA1H2J12	-
4	DC RESET CCC	KG221 AK4	BA1E2B02	-
5	GATE B10-15 TO CCC	KT301 BE4	BA1K4D06	+
6	SHIFT OP GATE	KT301 BB4	BA1K4B08	-
7	SHIFT CONTROL	KT121 AY6	BA1H4G07	-
8	T CLOCK ADVANCE SP	KA101 BH2	BA1C4D02	-
9	SLC RESET CARRY	KU301 AH4	BA1H2D12	-
10	DC RESET B 8-15	JU311 AQ4	BA1H2D11	-
11	A BIT 0	RA101 AU2	BB1B4D11	+
12	SHIFT LEFT SAMPLE	KT311 AE4	BA1L4G12	-
13	CARRY	KS101 BD4	BA1J4D04	+
14	BIT 15	RA271 AU2	BB1L4J05	+
15	CCC DECREM SAMPLE	KG221 AW4	BA1E2B13	-
16	A TO U SPD SAMPLE	KG231 AY4	BA1H4G12	-
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	446483A		

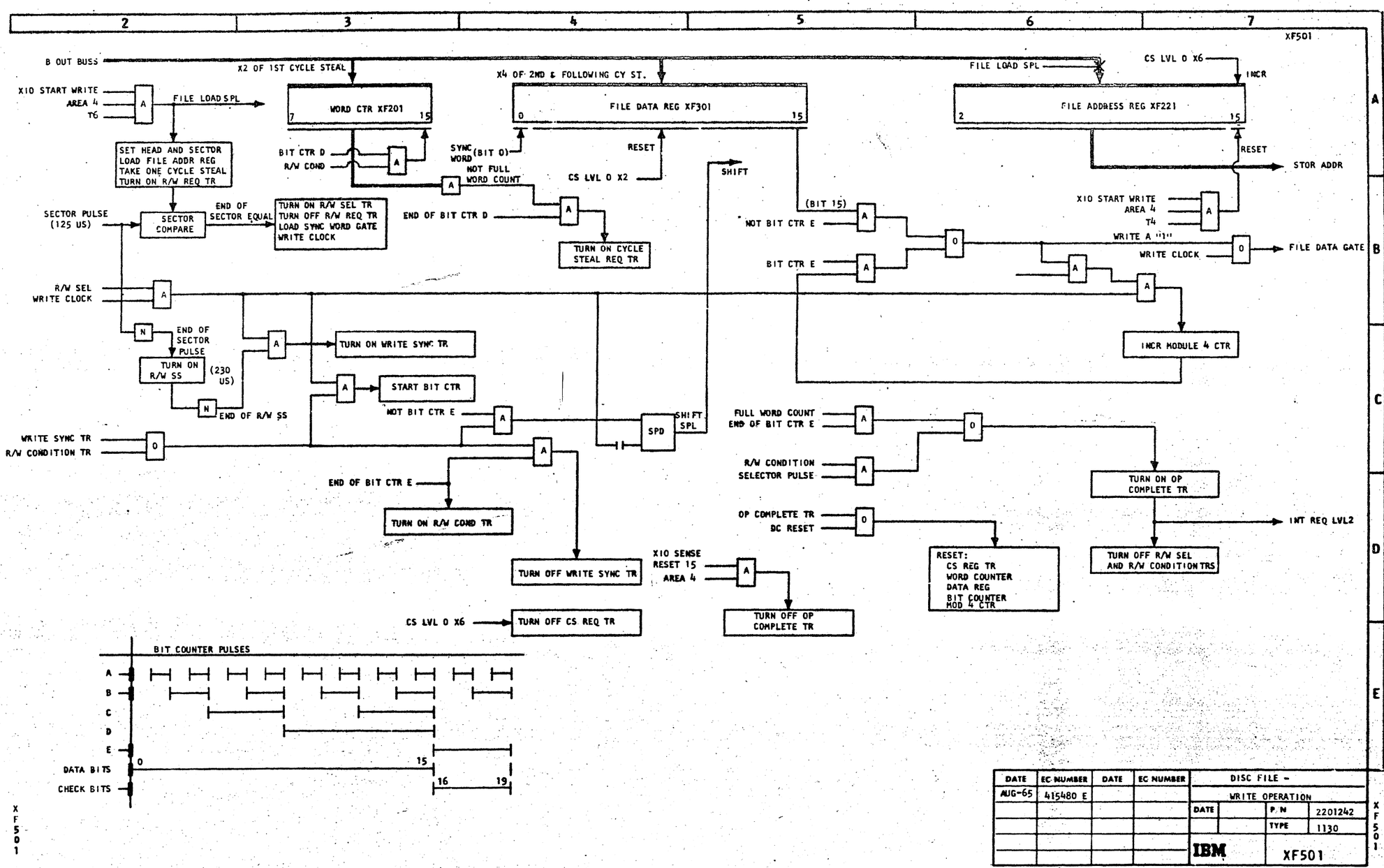
OP CODE 00010 SLCA
TIMING CHART
DATE
P/N 2201339
TYPE 1130
IBM
AA751

XF401



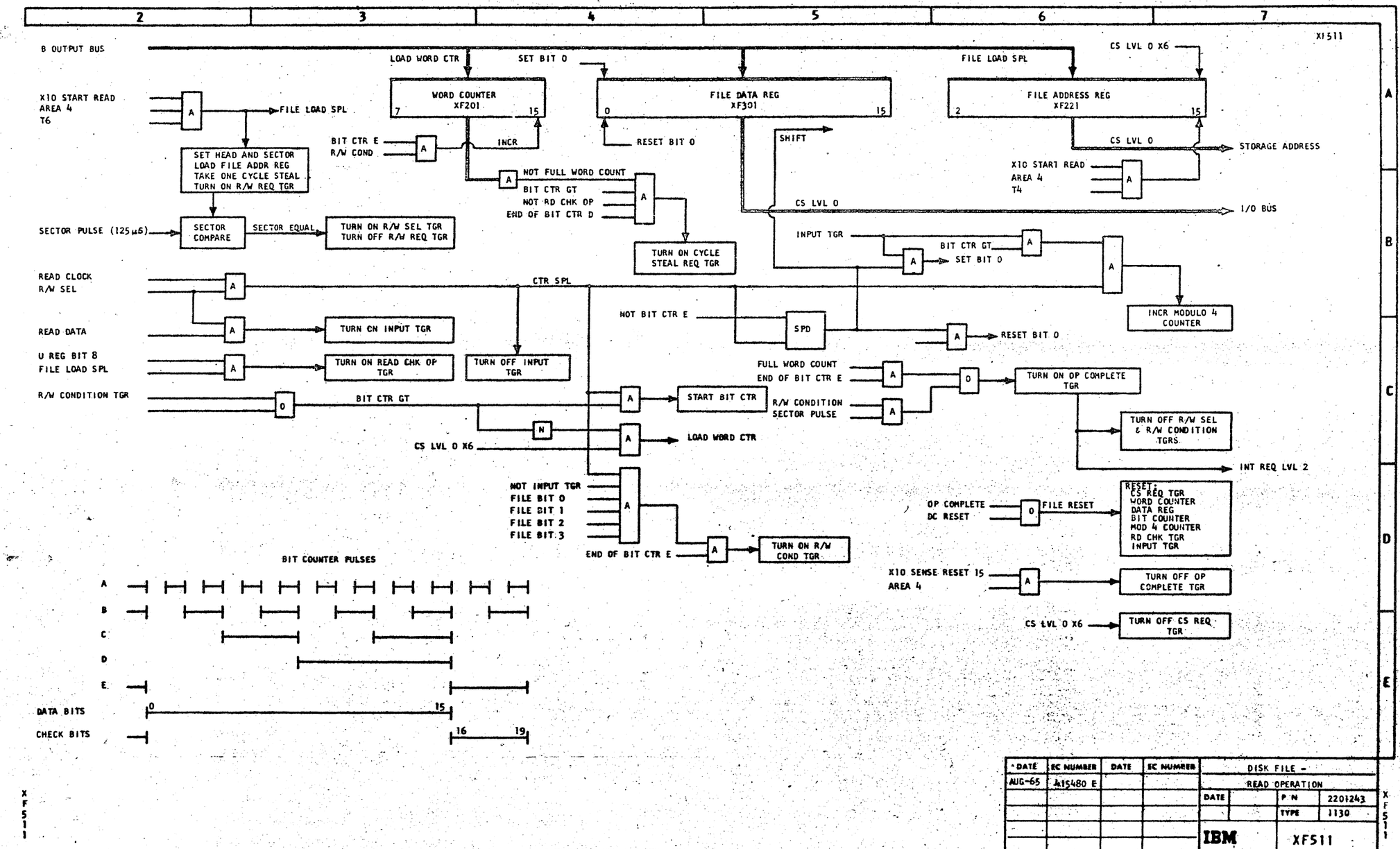
DATE	EC NUMBER	DATE	EC NUMBER	DISK FILE UNIT DATA AND CONTROL DIAGRAM			
AUG-65	415480 E			DATE		P/N	2201241
						TYPE	1130
				IBM		XF401	

XF401



DATE	EC NUMBER	DATE	EC NUMBER	DISC FILE – WRITE OPERATION			
AUG-65	415480 E			DATE		P/N	2201242
						TYPE	1130
				IBM		XF501	

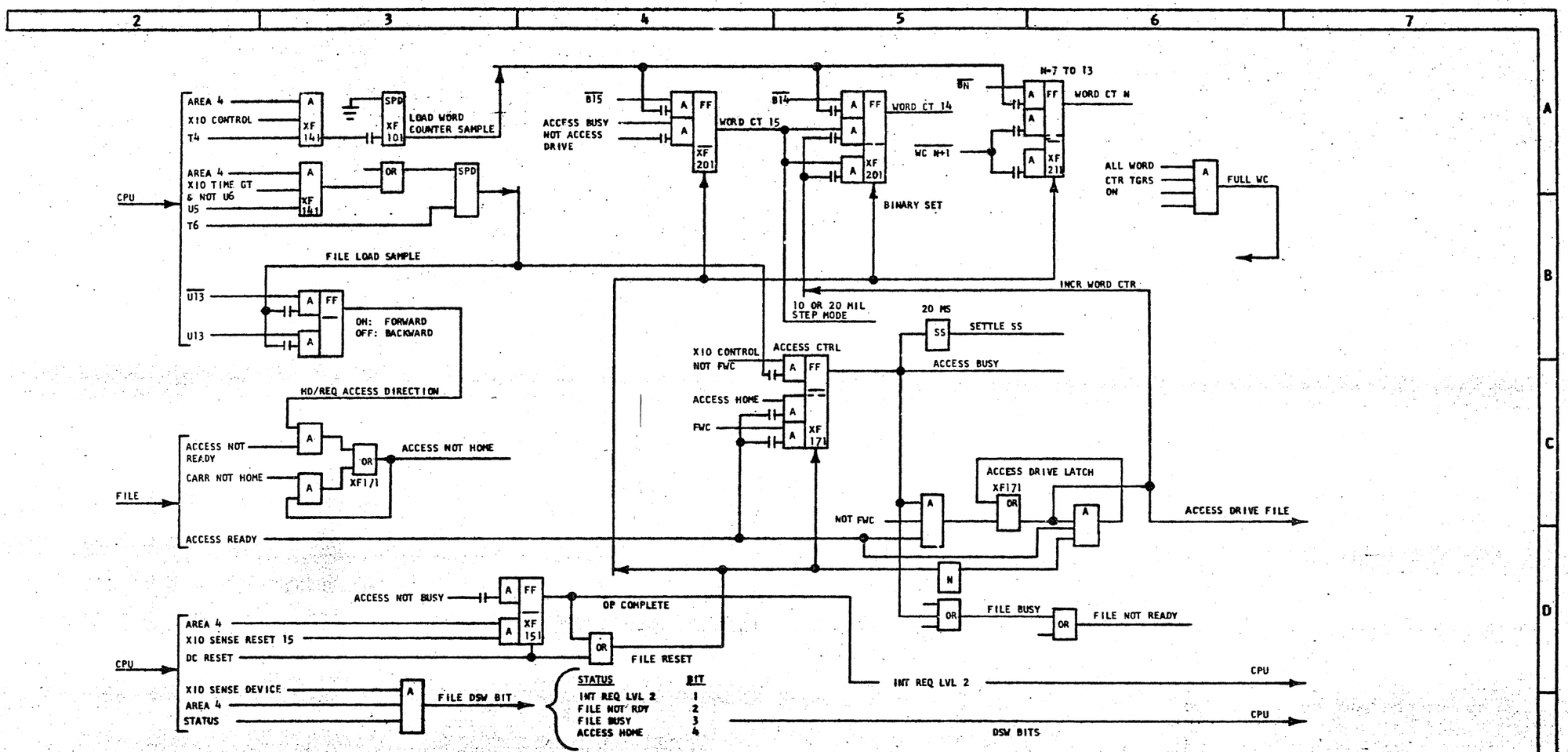
XF501



DATE	EC NUMBER	DATE	EC NUMBER	DISK FILE -
AUG-65	A15480 E			READ OPERATION
				DATE / P N 2201243
				TYPE 1130
				IBM XF511

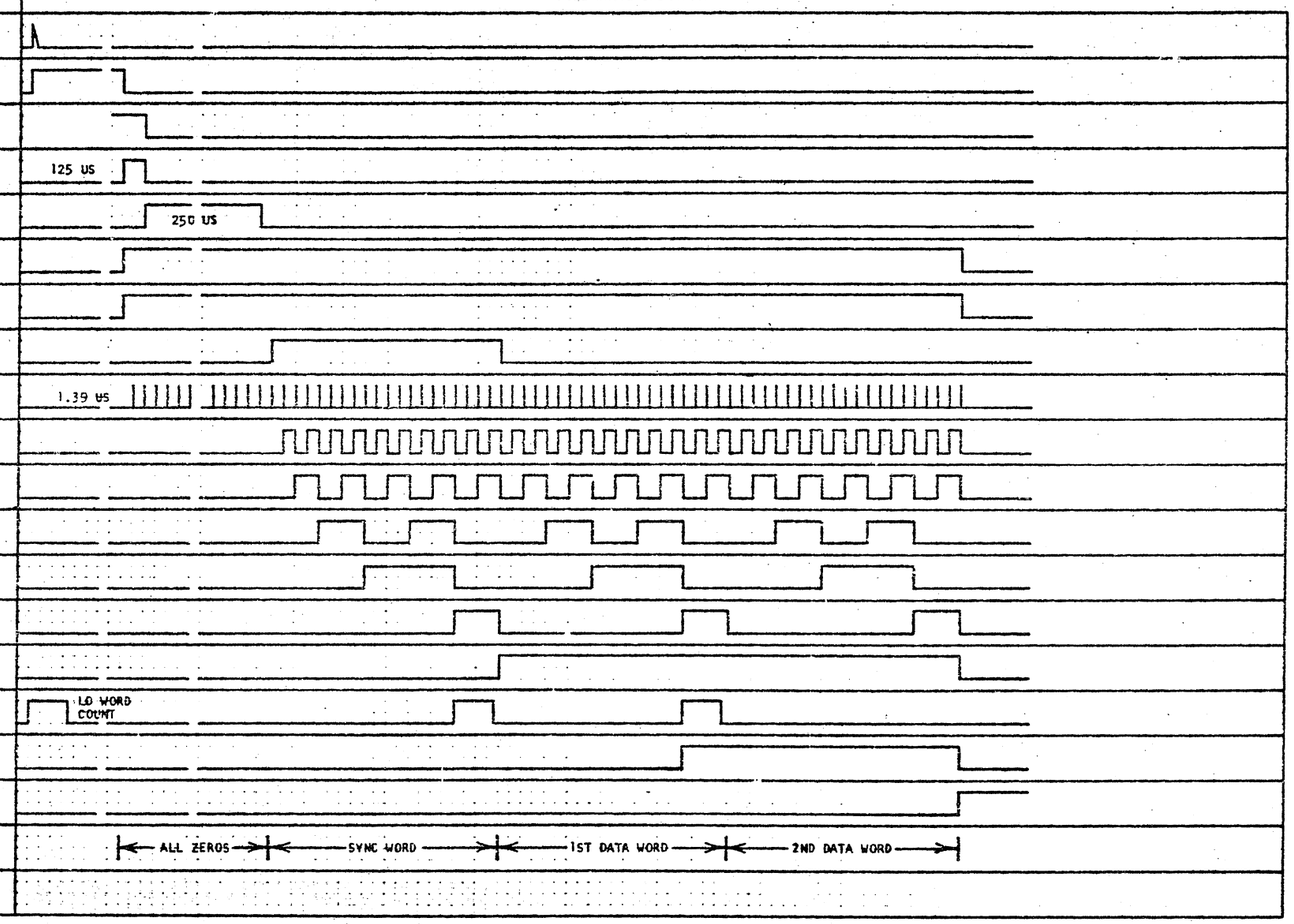
XF511

XF511



DATE	EC NUMBER	DATE	EC NUMBER	DISK FILE -
AUG-65	415480 E			CONTROL OP (ACCESS)
OCT 65	415483A			DATE 3-29-65 P/N 2201244
				TYPE 1130
				IBM XF521

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
-	FILE LOAD SPL (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	XF131AQ2	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		



DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		

DISC FILE

WRITE TIMING

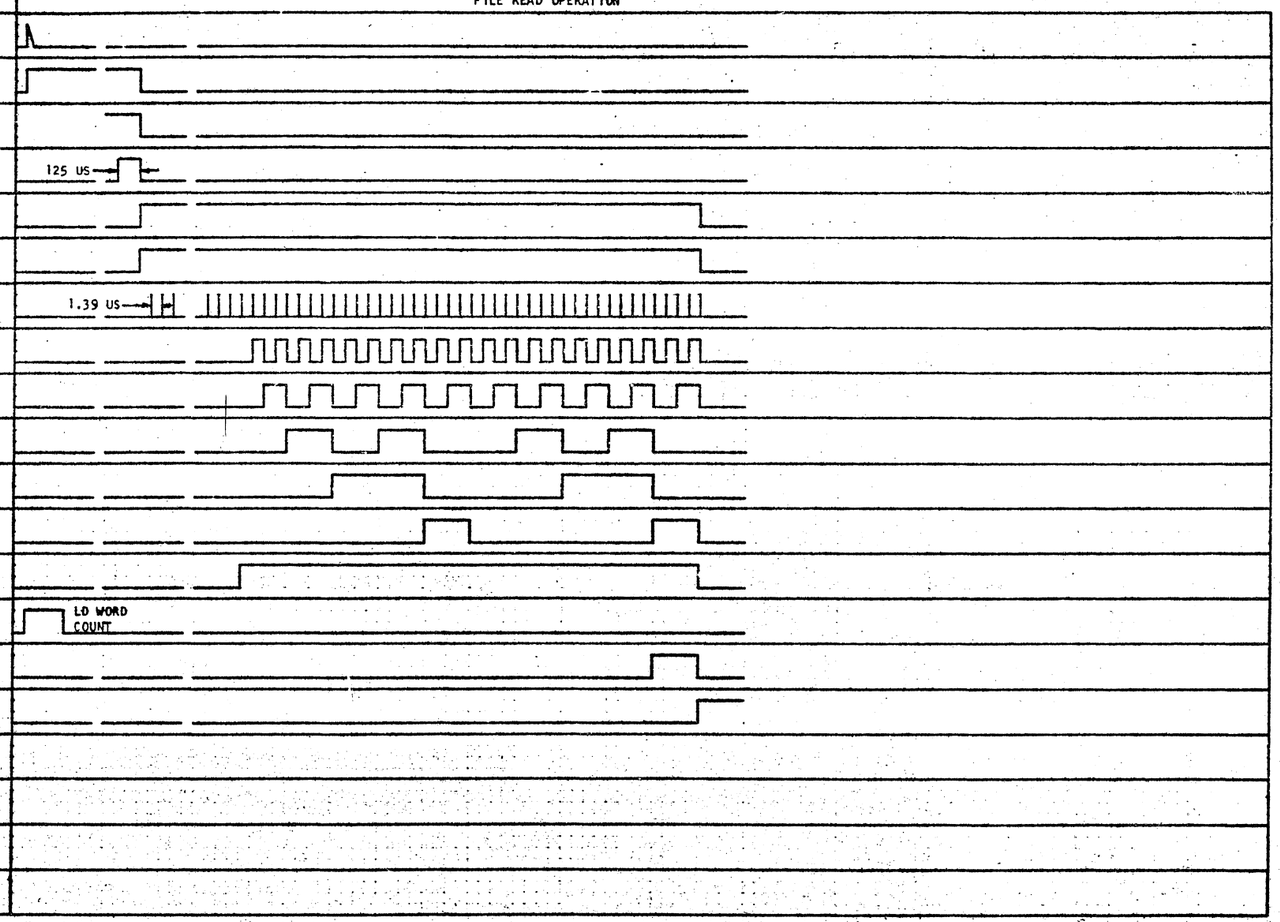
DATE 3-18-65 P/N 2201245

TYPE 1130

IBM XF701

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
-	FILE LOAD SPL (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
+	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-C1KGD12

FILE READ OPERATION



DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		

DISC FILE

READ TIMING

DATE 3-17-65 | P/N 2201246

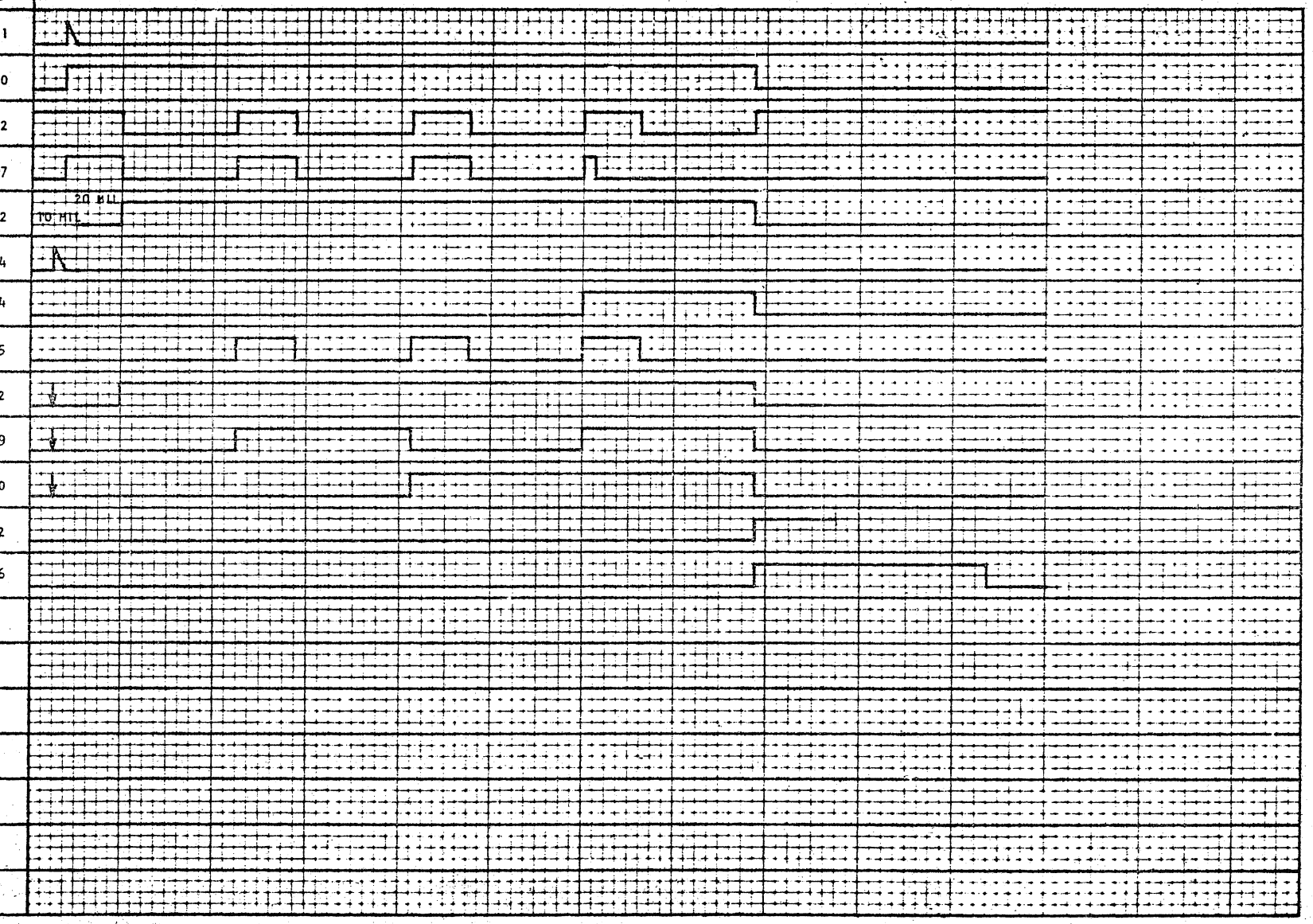
TYPE 1130

IBM XF711

2 | 3 | 4 | 5 | 6 | 7

XF721

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
1	- FILE LOAD SPL (X10 E - 2 T - 6)	XF101AR2	A-C1H6D11
2	+ ACCESS CONTROL TGR	XF171AH2	A-C1M6B10
3	+ ACCESS READY PWR	XF171AX4	A-C1E7B12
4	+ ACCESS DRIVE	XF171AN4	A-C1M6G07
5	- STEPPING MODE	XF201AG2	A-C1M6G12
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-C1M6G12
10	+ WORD COUNTER 14	XF201AS2	A-C1M6G09
11	+ WORD COUNTER 13	XF211AN2	A-C1G6D10
12	+ OP COMPLETE	XF151AR2	A-C1K6D12
13	- SETTLE S-S	XF171AQ4	A-C1M6J06



A
B
C
D
E

DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		

DISK FILE - ACCESS TIMING

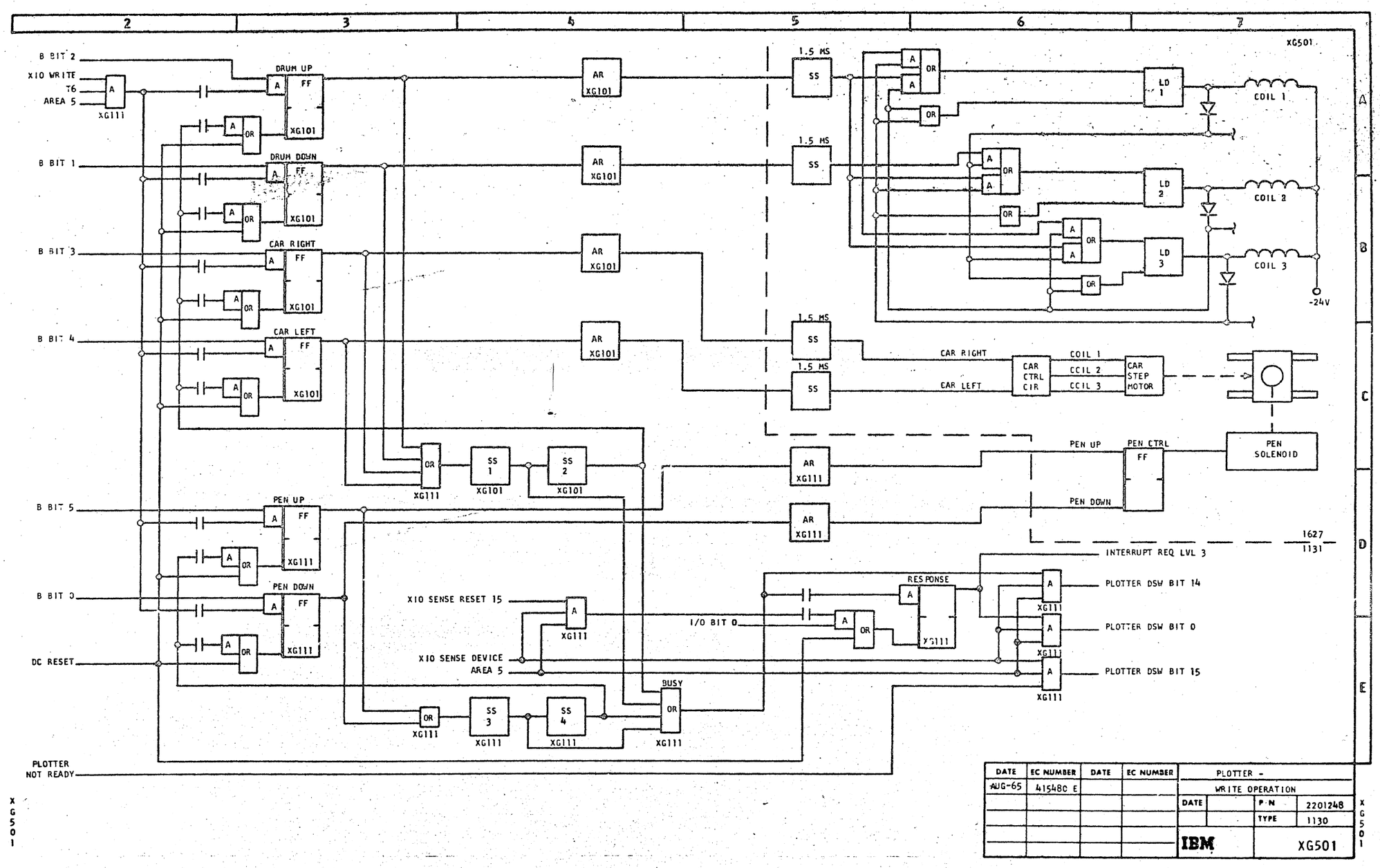
DATE 3-19-65 P/N 2201247

TYPE 1130

IBM XF721

XF721

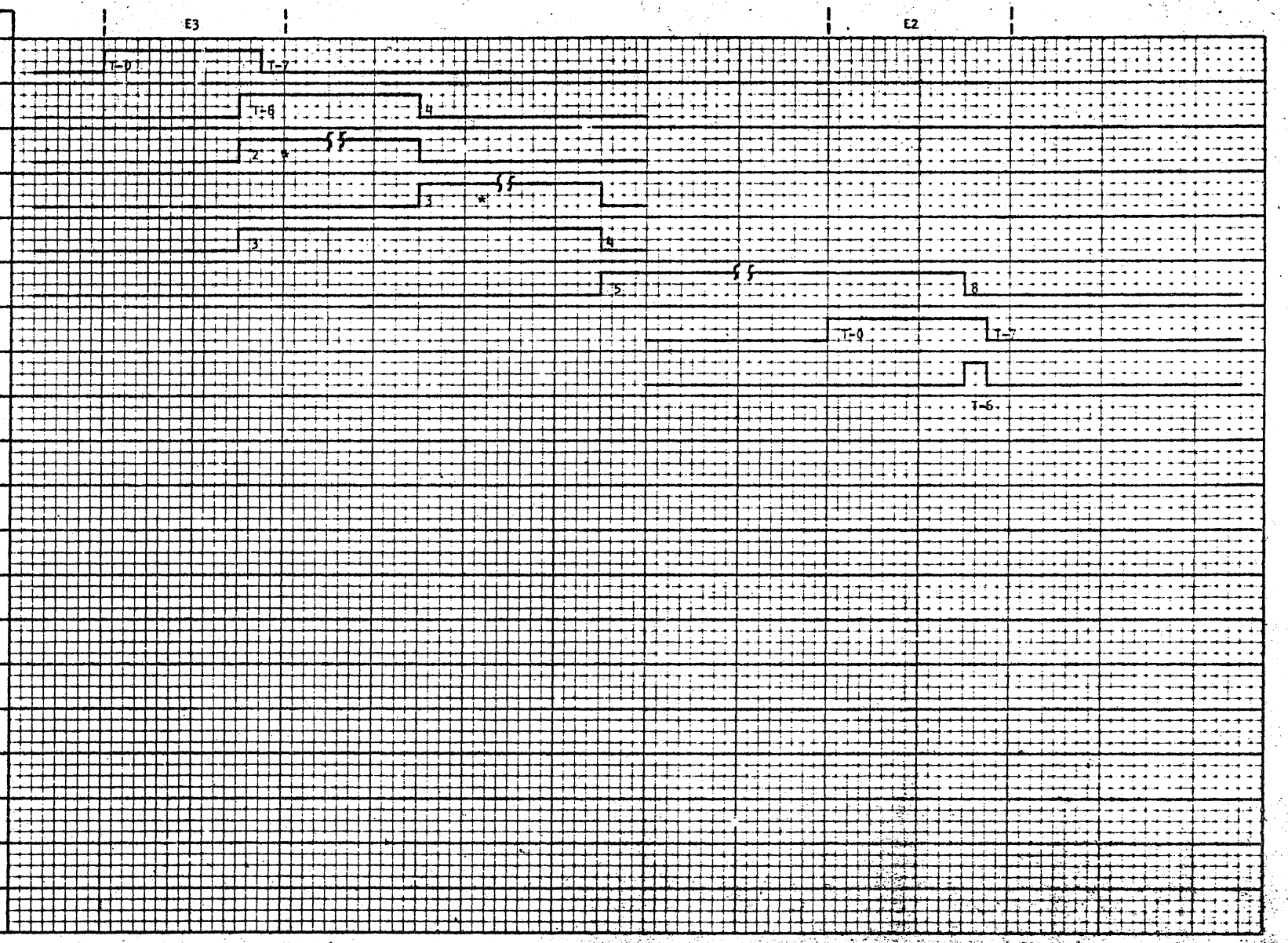
XF721


2
3
4
5
6
7
XG501
B BIT 2
X10 WRITE
T6
AREA 5
XG111
DRUM UP
FF
XG101
B BIT 1
DRUM DOWN
B BIT 3
CAR RIGHT
B BIT 4
CAR LEFT
AR
XG101
1.5 MS
SS
OR
LD 1
LD 2
LD 3
COIL 1
COIL 2
COIL 3
-24V
CAR RIGHT
CAR LEFT
CAR CTRL CIR
COIL 1
COIL 2
COIL 3
CAR STEP MOTOR
PEN UP
PEN CTRL
PEN SOLENOID
PEN DOWN
SS 1
SS 2
SS 3
SS 4
B BIT 5
B BIT 0
DC RESET
X10 SENSE RESET 15
X10 SENSE DEVICE
AREA 5
I/O BIT 0
BUSY
RESPONSE
INTERRUPT REQ LVL 3
PLOTTER DSW BIT 14
PLOTTER DSW BIT 0
PLOTTER DSW BIT 15
1627
1131
PLOTTER
NOT READY
A
B
C
D
E
DATE
EC NUMBER
AUG-65
41548C E
PLOTTER -
WRITE OPERATION
P/N
2201248
TYPE
1130
IBM
XG501

2	3	4	5	6	7

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	DU111AN4	A-C1M4D09



A
B
C
D
E

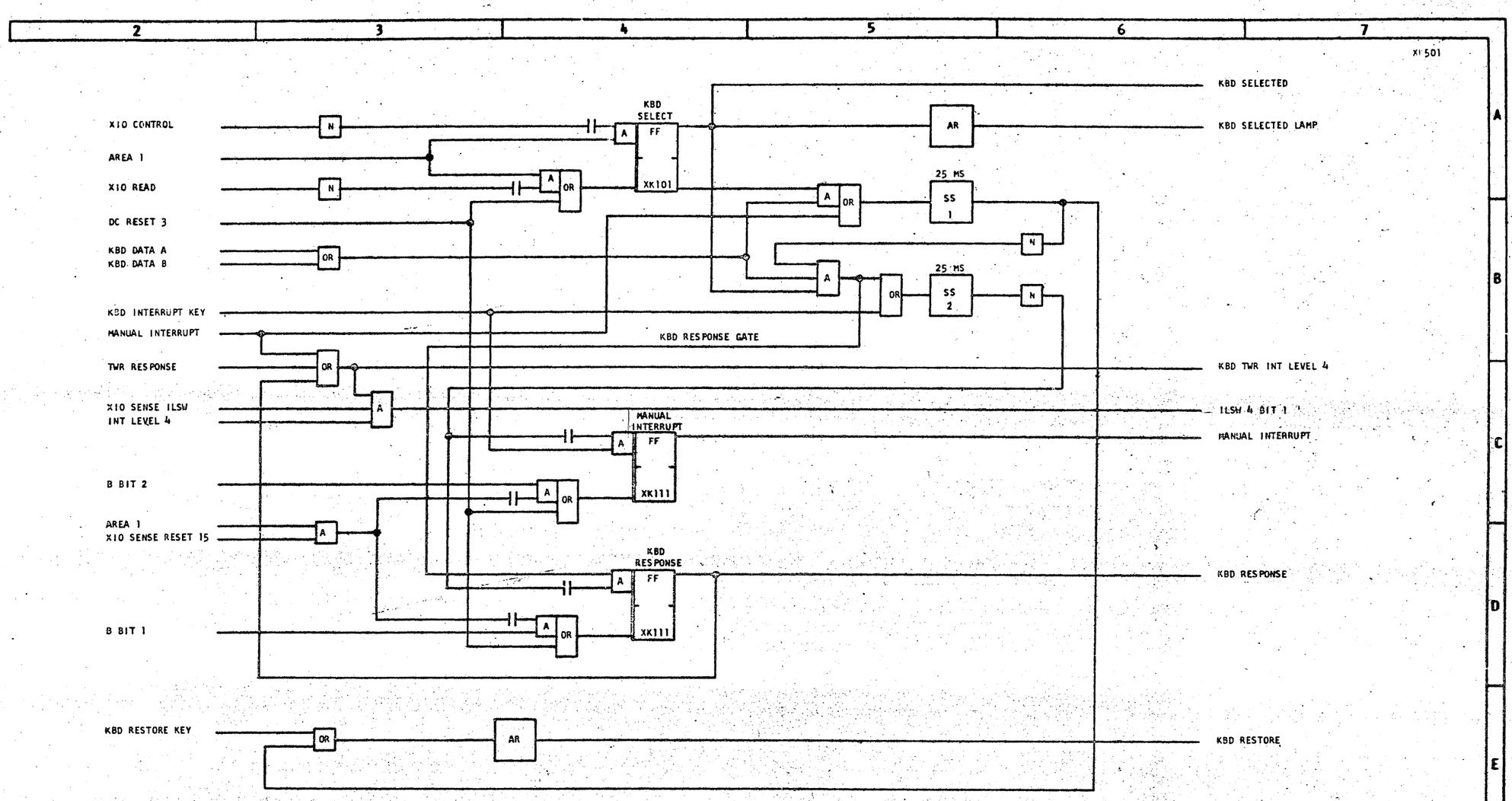
NOTE: DRUM OR CARRIAGE : 1.9 MS FOR 12" 1627
2.9 MS. FOR 30" 1627

PEN : 50 MS

XG701

DATE	EC NUMBER	DATE	EC NUMBER	PLOTTER
AUG-65	615480 E			WRITE TIMING
				DATE P/N 2201249
				TYPE 1130
				IBM XG701

XG701



DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		

KEYBOARD READ &
CONTROL OPS

DATE 6-28-65 P N 2201250
TYPE 1130

IBM XK501

XK501

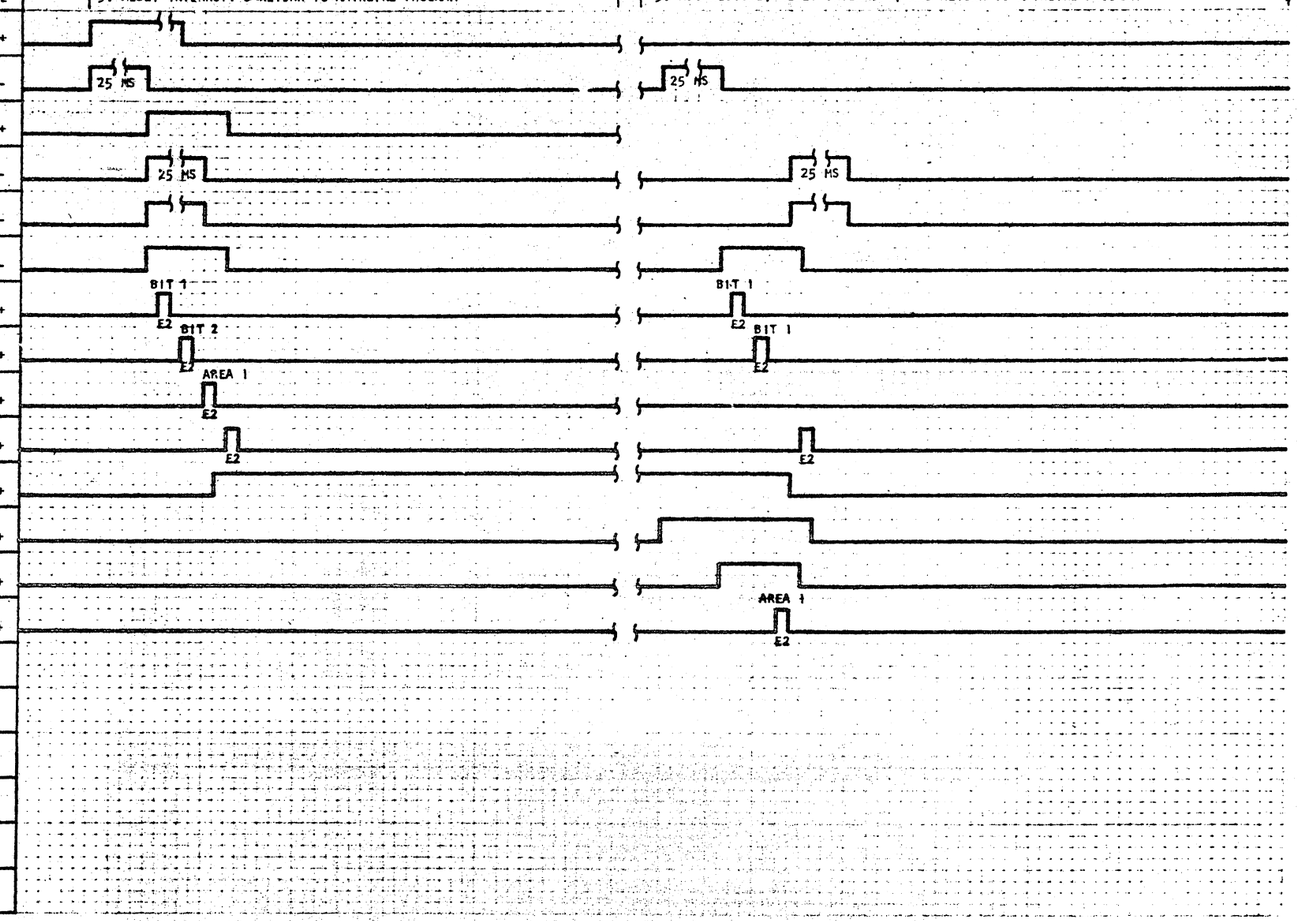
XK501

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	X10 SENSE ILSW	DU101EA4	A-C1G4B12	+
8	X10 SENSE DEVICE	DU101AY4	A-C1G3B12	+
9	X10 CONTROL	DU101BD4	A-C1E2D12	+
10	X10 SENSE RST 15	DU111AN4	A-C1F2B02	+
11	KBD SELECT	XK101AK2	A-C1E2D09	+
12	KBD DATA (A OR B)	XK101AE4	A-C1D2D06	+
13	KBD RESPONSE	XK111AS2	A-C1E2B09	+
14	X10 READ	DU101BB4	A-C1E2D13	+

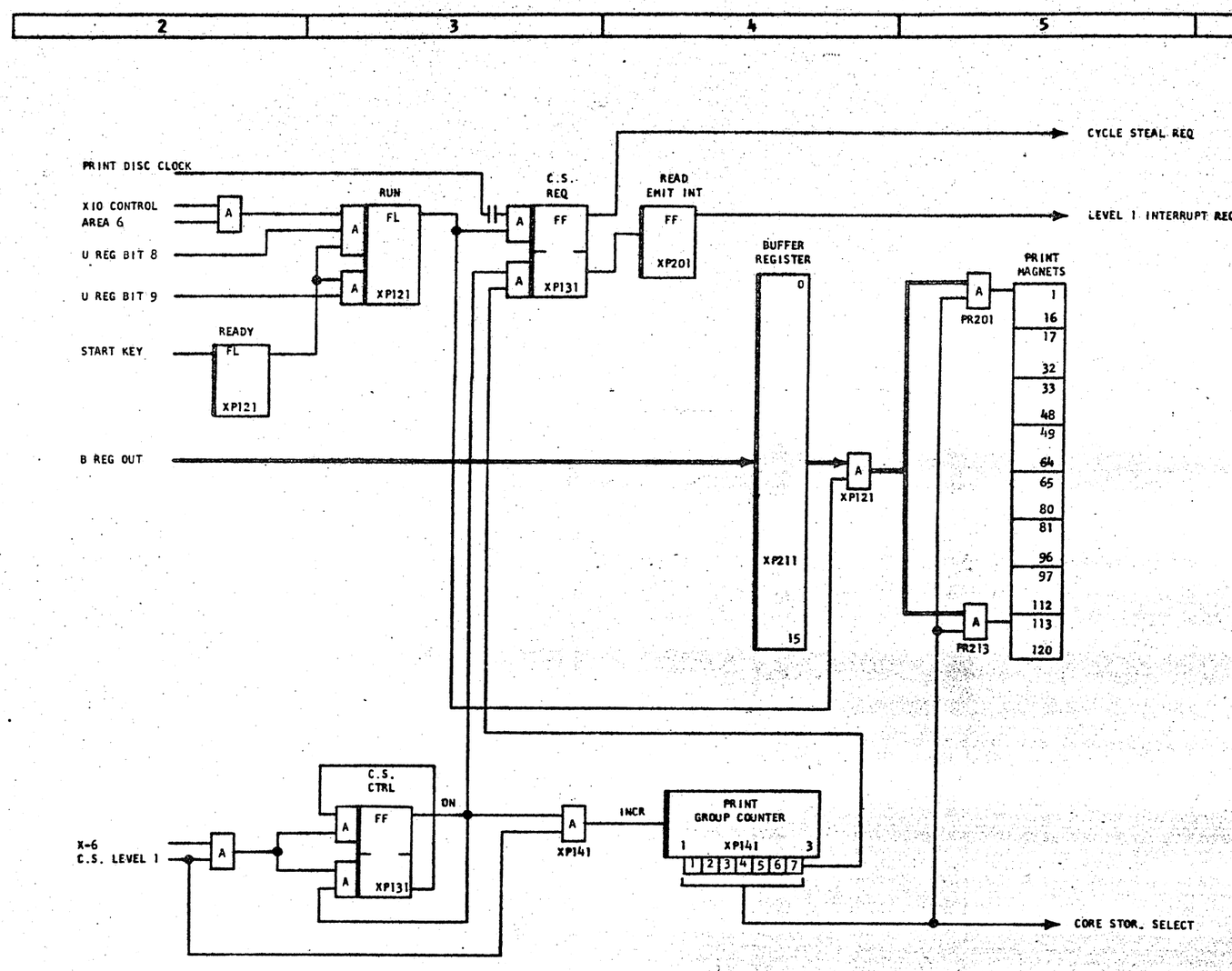
1. KBD INTERRUPT REQUEST KEY DEPRESSED
2. LVL 4 INTERRUPT & KBD RESTORE
3. PROGRAM INTERROGATION OF ILSW AND DSW
4. KBD SELECT LATCH SET
5. RESET INTERRUPT & RETURN TO MAINLINE PROGRAM

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
7
6
5
4
3
2
B REG. OUT
PRINT BUFFER
0 XP211 15
PRINT MAGNETS
1 PR201 120
A
XP141
SELECT PRINT SCAN FIELD IN STORAGE
CYC. STEAL CTRL. XP131
INCR
PRINTER GROUP COUNTER
1 XP141 3
CYCLE STEAL REQUEST
INTERRUPT REQUEST
BIT 5
PRINTER NOT READY XP121
BIT 4
PRINT SCAN ERROR XP201
B8-15
CARR. CHANNEL PR141
BIT 1
CARR. SKIP INT. XP201
BIT 2
CARR. SPACE INT. XP201
BIT 0
READ EMIT INT. XP201
A
XP301
X10 SENSE DEVICE
X10 READ
PRINT DISC SOLAR CELLS
0 PR101 7
B REG. IN
A
XP301
A
XP121
X10 CTRL.
CARR. BUSY BIT 3
PRINTER BUSY BIT 6
U BIT 14
SKIP STOP XP101
U BIT 13
SKIP START XP101
U BIT 15
LINE SPACE XP101
U BIT 8
RUN XP121
U BIT 9
STOP XP121
MANUAL SPACE XP101
DATE
AUG-65
OCT 65
EC NUMBER
415480 E
415483A
DATE
EC NUMBER
PRINTER UNIT DATA AND CONTROL DIAGRAM
DATE 3-26-65
P/N 2201253
TYPE 1130
IBM
XP401



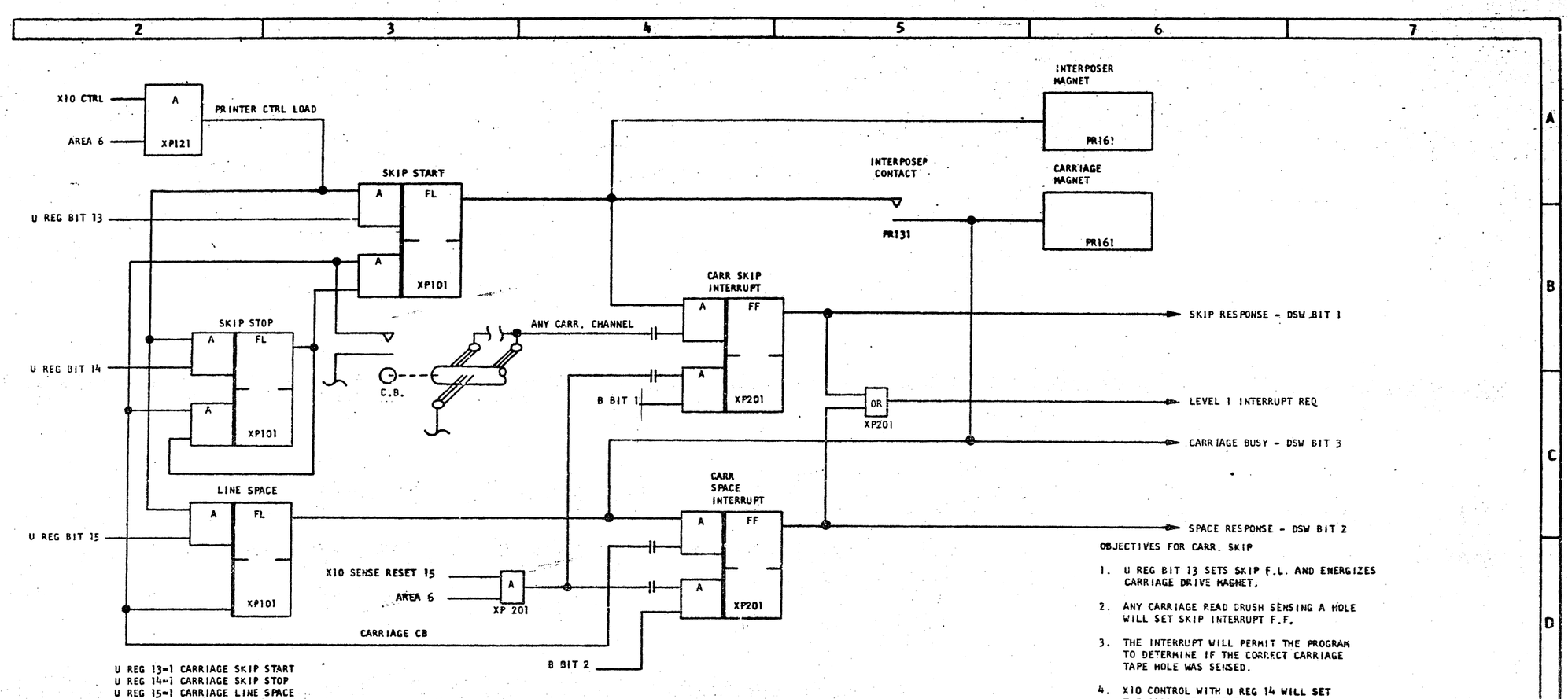
OBJECTIVES:

1. TURN ON RUN F.L. (X10, U REG BIT 8)
2. WHEN PRINT DISK CLOCK MAKES, TURN ON C.S. REQ F.F. (START X-CLOCK)
3. PRINT GROUP COUNTER WILL CONTROL ADDRESSING OF 1130 STORAGE, AND SELECT WHICH GROUP OF PRINT MAGNET COILS TO BE ENERGIZED.
4. TURN ON CYCLE STEAL CONTROL F.F. EVERY OTHER X-CLOCK CYCLE TO INCREMENT PRINT GROUP COUNTER.
5. RESET C.S. REQ F.F. WHEN PRINT GROUP COUNTER INCREMENTS TO GROUP SEVEN.
6. INITIATE READ EMITTER INTERRUPT.

U REG 8 = 1 START PRINT
U REG 9 = 1 STOP PRINT

DATE	EC NUMBER	DATE	EC NUMBER	PRINTER WRITE OP
AUG-65	415480 E			(READ EMITTER, PRINT)
				DATE: P/N 2201254
				TYPE 1130
				IBM XP501

XP501



OBJECTIVES FOR CARR. SKIP

1. U REG BIT 13 SETS SKIP F.L. AND ENERGIZES CARRIAGE DRIVE MAGNET,
2. ANY CARRIAGE READ BRUSH SENSING A HOLE WILL SET SKIP INTERRUPT F.F,
3. THE INTERRUPT WILL PERMIT THE PROGRAM TO DETERMINE IF THE CORRECT CARRIAGE TAPE HOLE WAS SENSED.
4. X10 CONTROL WITH U REG 14 WILL SET THE CARRIAGE STOP F.L.
5. THE STOP F.L. WILL RESET THE SKIP F.L. WHEN THE CARRIAGE C.B. MAKES CONTACT

DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
OCT 65	415483A		

PRINTER CONTROL OP
(START, STOP, SPACE)

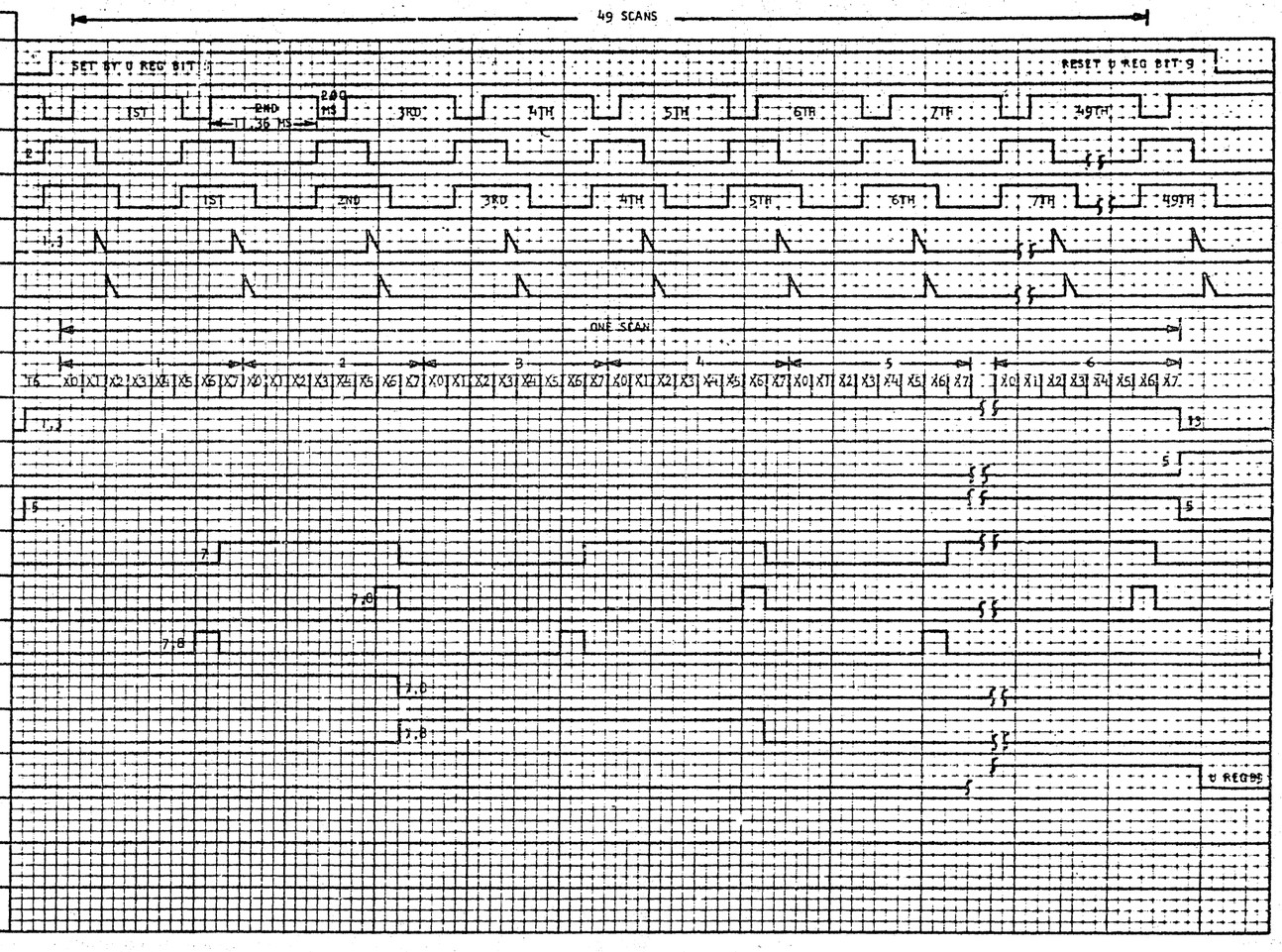
DATE		P/N	2201255
		TYPE	1130

IBM

XP511

XP701

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	XP131AC2	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		

PRINTER WRITE TIMING
(READ EMITTER, PRINT)

DATE		P/N	2201256
		TYPE	1130

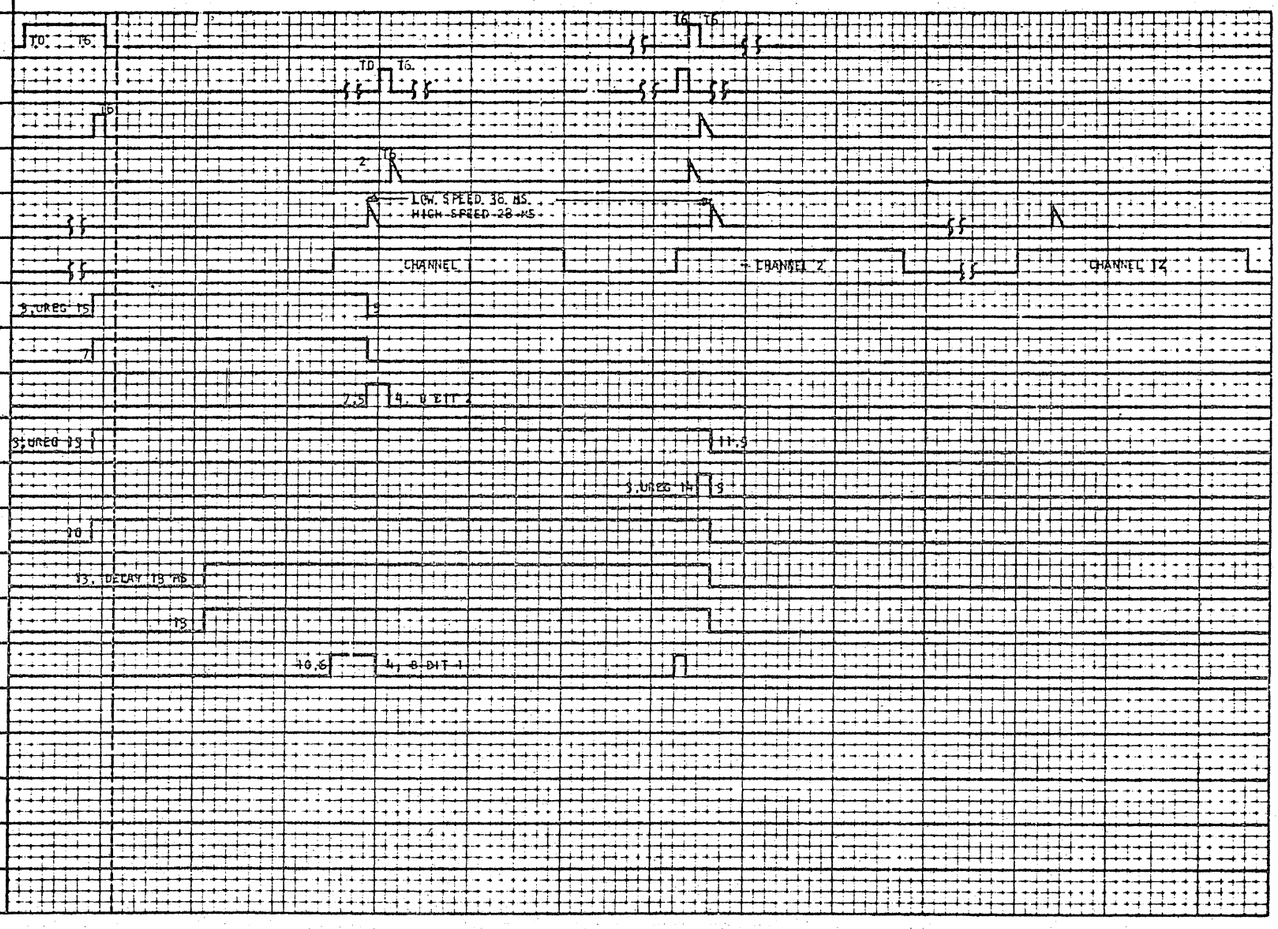
IBM XP701

XP701

XP701

XP711

	SIGNAL NAME	SOURCE PAGE	TEST POINT
1	+ X10 CONTROL	DU101BD4	A-A1G2D10
2	+ X10 SENSE DEVICE	DU111 DU101AY4	A-A1L3B13
3	- PRINTER CONTROL MODE	XP121AD4	A-A1G2D09
4	- X10 SENSE RESET BIT 15 AREA 6	XP201BH4	A-A1M2B02
5	+ CARRIAGE CB PULSE	XP101CM4	A-A1G3D04
6	- ANY CARRIAGE CHANNEL	XP111AS4	A-A1F3B02
7	- LINE SPACE LATCH	XP101AY4	A-A1D3D10
8	- CARRIAGE MAG SELECT	XP101BD4	A-A1F3D12
9	+ CARRIAGE SPACE INT	XP201AW2	A-A1J2B04
10	+ SKIP START LATCH	XP101AU4	A-A1D3B03
11	- SKIP STOP LATCH	XP101AR4	A-A1D3D04
12	- INTERPOSER MAG SELECT	XP101AZ4	A-A1G3D11
13	+ INTERPOSER CONTACT	XP331AM1	A-A1E3D09
14	- CARRIAGE MAG SELECT	XP101BD4	A-A1F3D12
15	+ CARRIAGE SKIP INT	XP201AV2	A-A1J2B09



A
B
C
D
E

DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		

PRINTER CONTROL TIMING

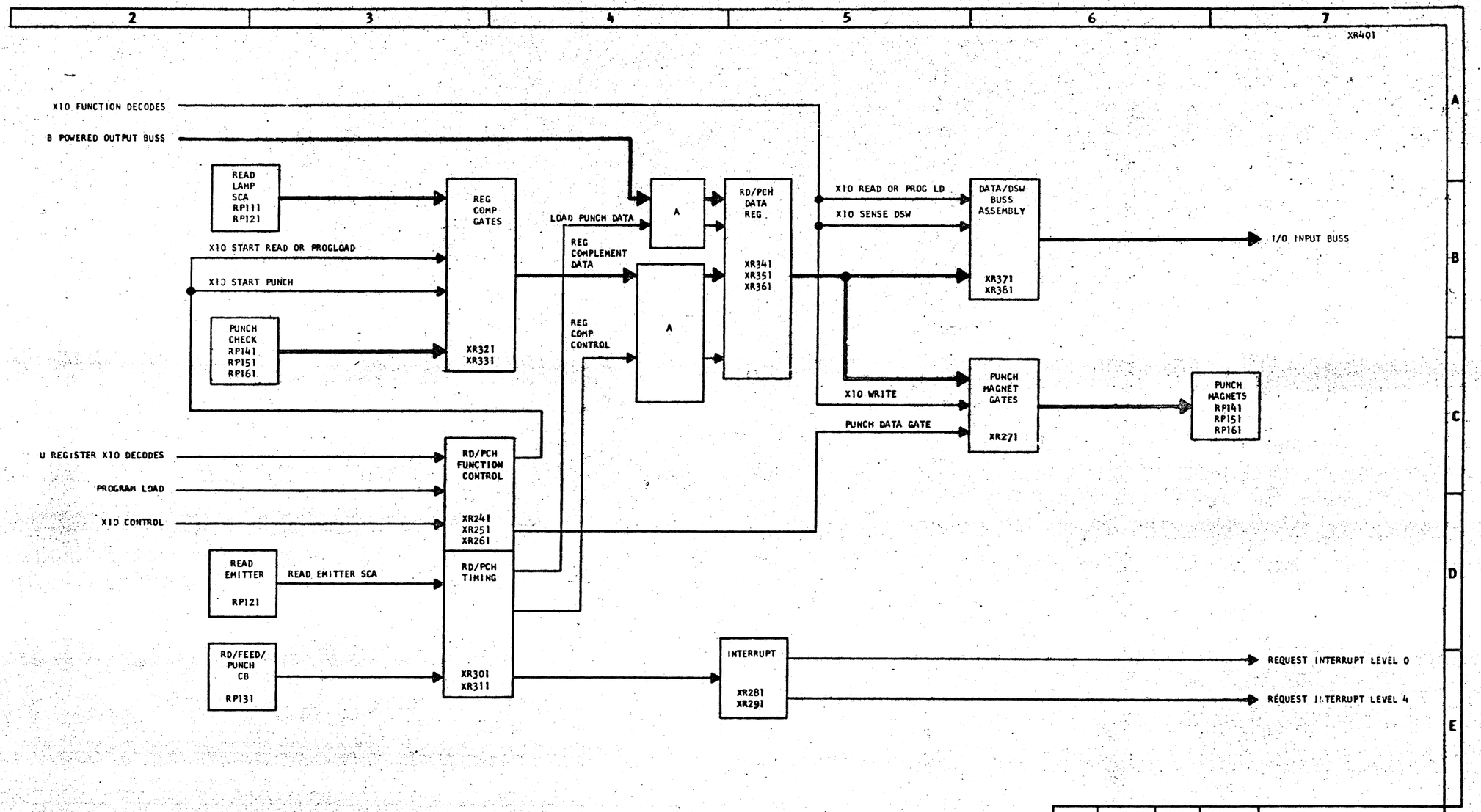
START, STOP, SPACE

DATE		P/N	2201257
		TYPE	1130

IBM XP711

XP711

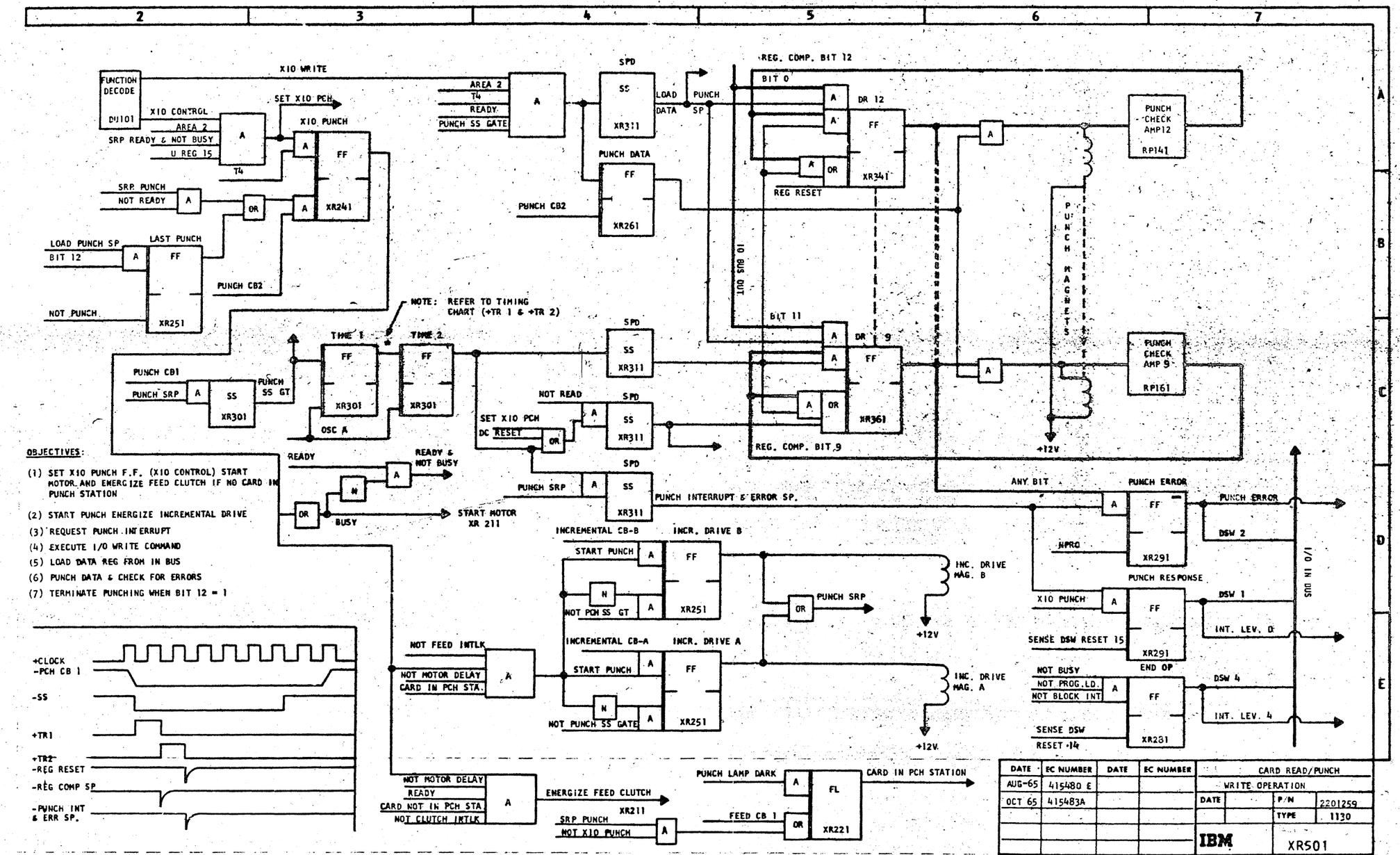
XP711

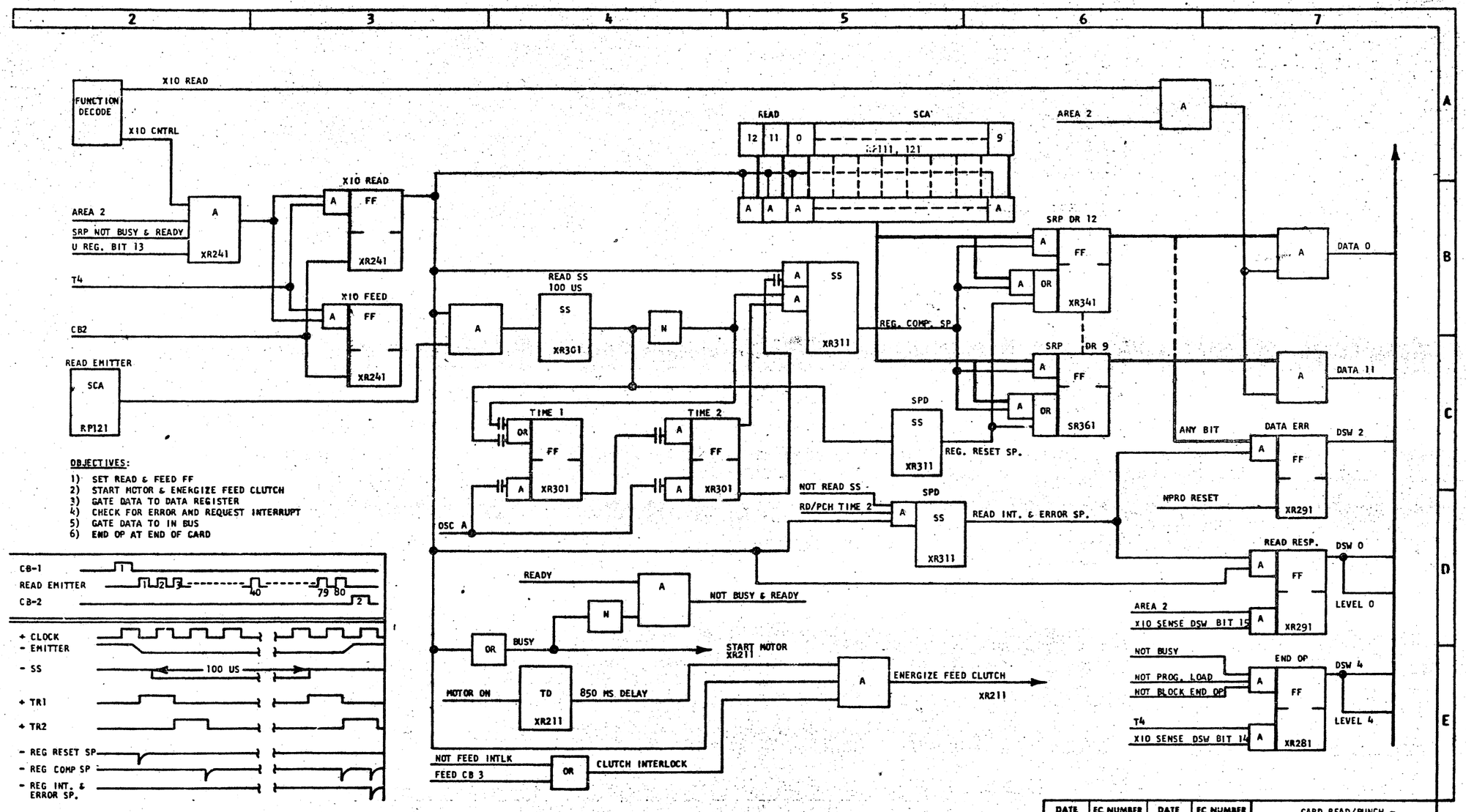


DATE	EC NUMBER	DATE	EC NUMBER	CARD READ/PUNCH UNIT DATA AND CONTROL DIAGRAM			
AUG-65	415480 E			DATE	3-25-65	P.N	2201258
						TYPE	1130
				IBM		XR401	

XR401

XR401


2
3
4
5
6
7
A
B
C
D
E
X10 WRITE
FUNCTION DECODE
DU101
X10 CONTROL
AREA 2
SRP READY & NOT BUSY
U REG 15
T4
SET X10 PCH
X10 PUNCH
FF
XR241
SRP PUNCH
NOT READY
OR
LOAD PUNCH SP
BIT 12
LAST PUNCH
XR251
PUNCH CB2
NOT PUNCH
NOTE: REFER TO TIMING CHART (+TR 1 & +TR 2)
TIME 1
TIME 2
XR301
PUNCH CB1
PUNCH SRP
PUNCH SS GT
SS
XR301
OSC A
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
READY
READY & NOT BUSY
N
BUSY
START MOTOR XR 211
AREA 2
T4
READY
PUNCH SS GATE
SPD
SS
XR311
LOAD DATA
PUNCH SP
PUNCH DATA
PUNCH CB2
REG. COMP. BIT 12
BIT 0
DR 12
REG RESET
XR341
10 BUS OUT
BIT 11
DR 9
XR361
REG. COMP. BIT 9
NOT READ
SET X10 PCH
DC RESET
PUNCH SRP
PUNCH INTERRUPT & ERROR SP.
PUNCH MAGNETS
+12V
PUNCH CHECK AMP12
RP141
PUNCH CHECK AMP 9
RP161
ANY BIT
PUNCH ERROR
HPRQ
XR291
DSW 2
PUNCH RESPONSE
X10 PUNCH
DSW 1
INT. LEV. 0
SENSE DSW RESET 15
END OP
NOT BUSY
NOT PROG.LD.
NOT BLOCK INT
DSW 4
INT. LEV. 4
SENSE DSW RESET +14
XR231
I/O IN BUS
INCREMENTAL CB-B
INCR. DRIVE B
START PUNCH
NOT PCH SS GT
XR251
INC. DRIVE MAG. B
INCREMENTAL CB-A
INCR. DRIVE A
NOT PUNCH SS GATE
INC. DRIVE MAG. A
NOT FEED INTLK
NOT MOTOR DELAY
CARD IN PCH STA.
+CLOCK
-PCH CB 1
-SS
+TR1
+TR2
-REG RESET
-REG COMP SP
-PUNCH INT & ERR SP.
CARD NOT IN PCH STA
NOT CLUTCH INTLK
EMERGIZE FEED CLUTCH
XR211
SRP PUNCH
NOT X10 PUNCH
PUNCH LAMP DARK
FEED CB 1
FL
XR221
CARD IN PCH STATION
DATE
EC NUMBER
AUG-65
415480 E
OCT 65
415483A
CARD READ/PUNCH
WRITE OPERATION
P/N
2201259
TYPE
1130
IBM
XR501



OBJECTIVES:

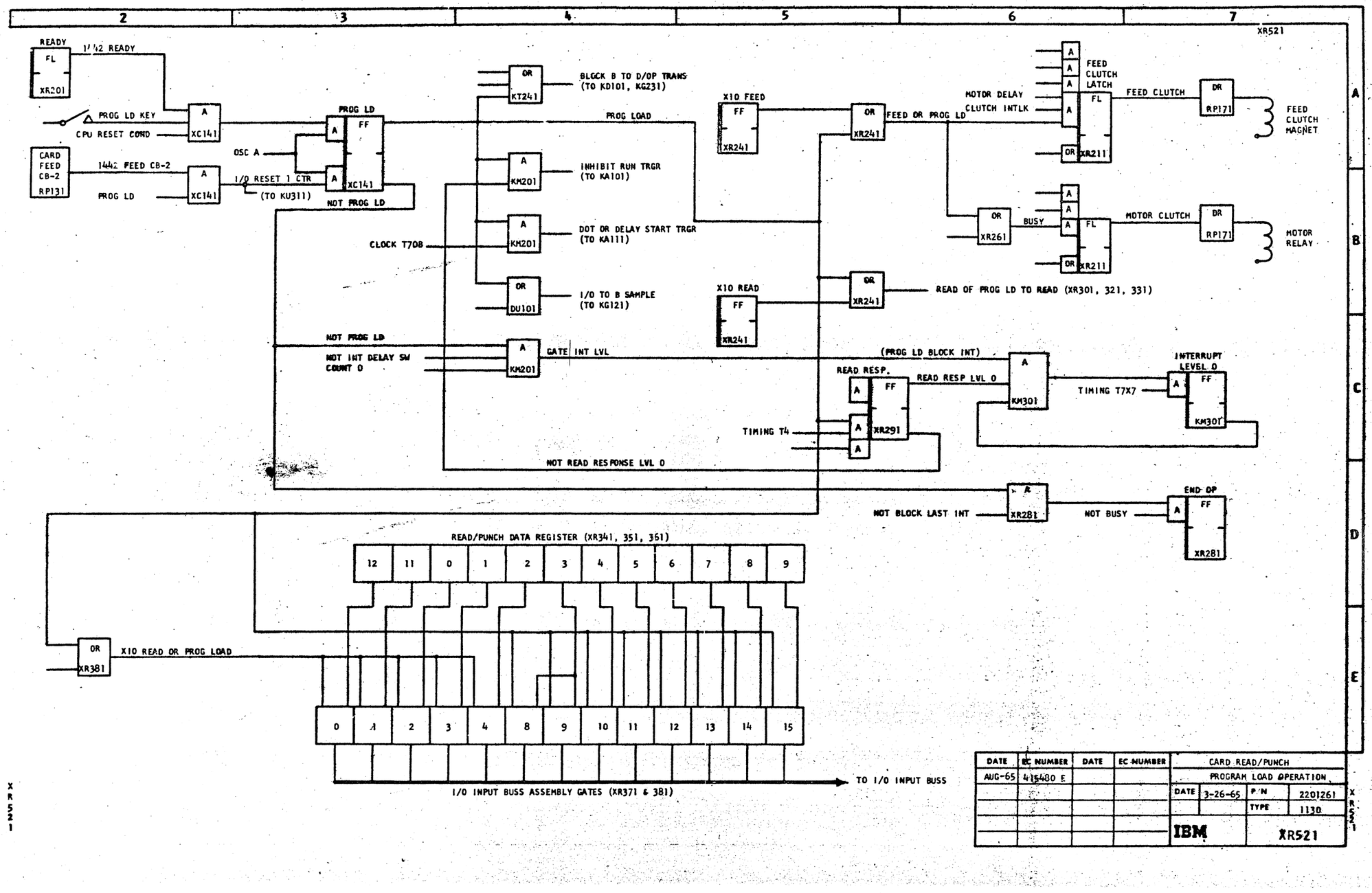
1) SET READ & FEED FF
2) START MOTOR & ENERGIZE FEED CLUTCH
3) GATE DATA TO DATA REGISTER
4) CHECK FOR ERROR AND REQUEST INTERRUPT
5) GATE DATA TO IN BUS
6) END OP AT END OF CARD

DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
OCT 65	415483A		

CARD READ/PUNCH - READ OPERATION

DATE	3-25-65	P/N	2201260
		TYPE	1130

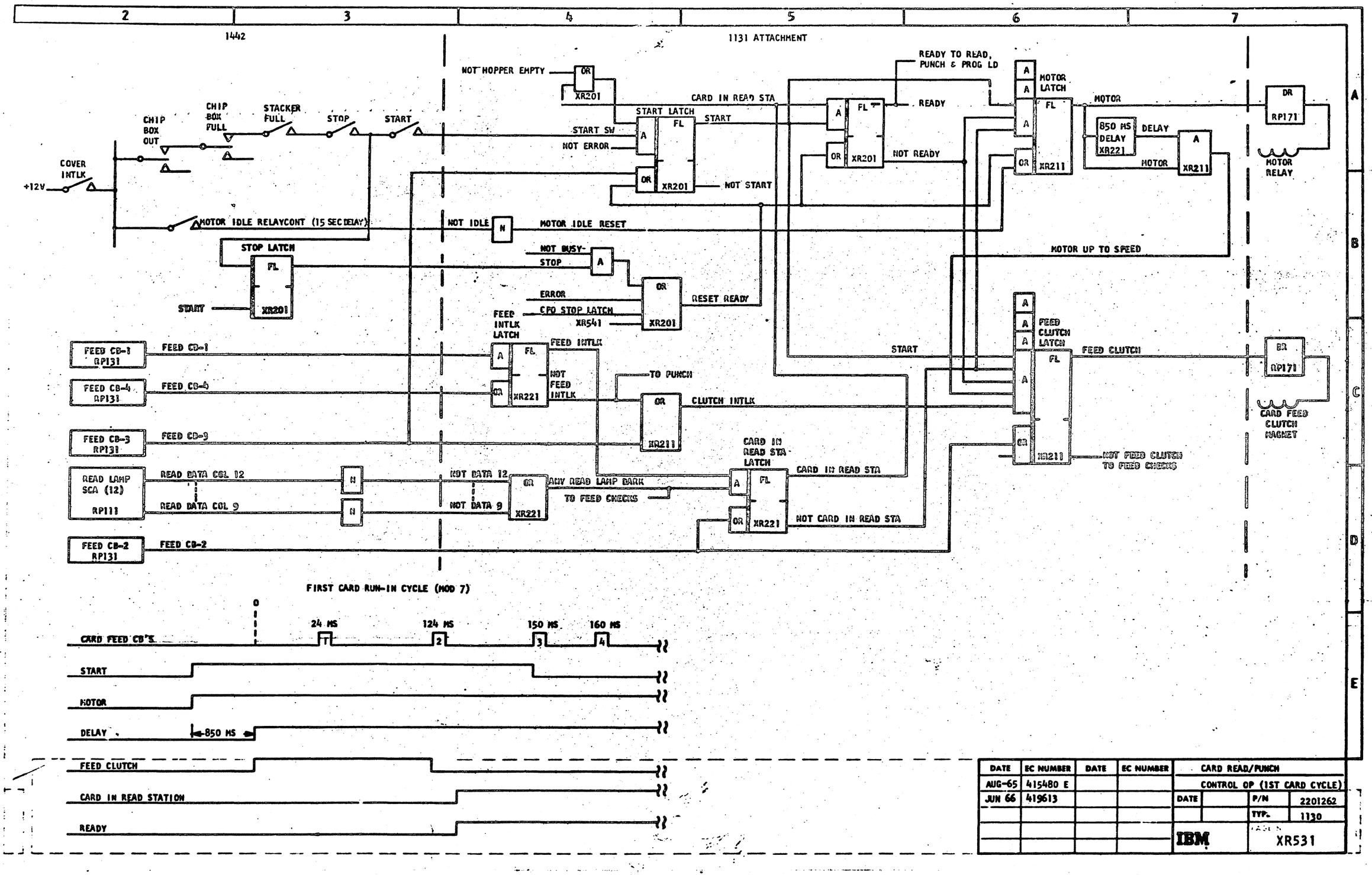
IBM XR511



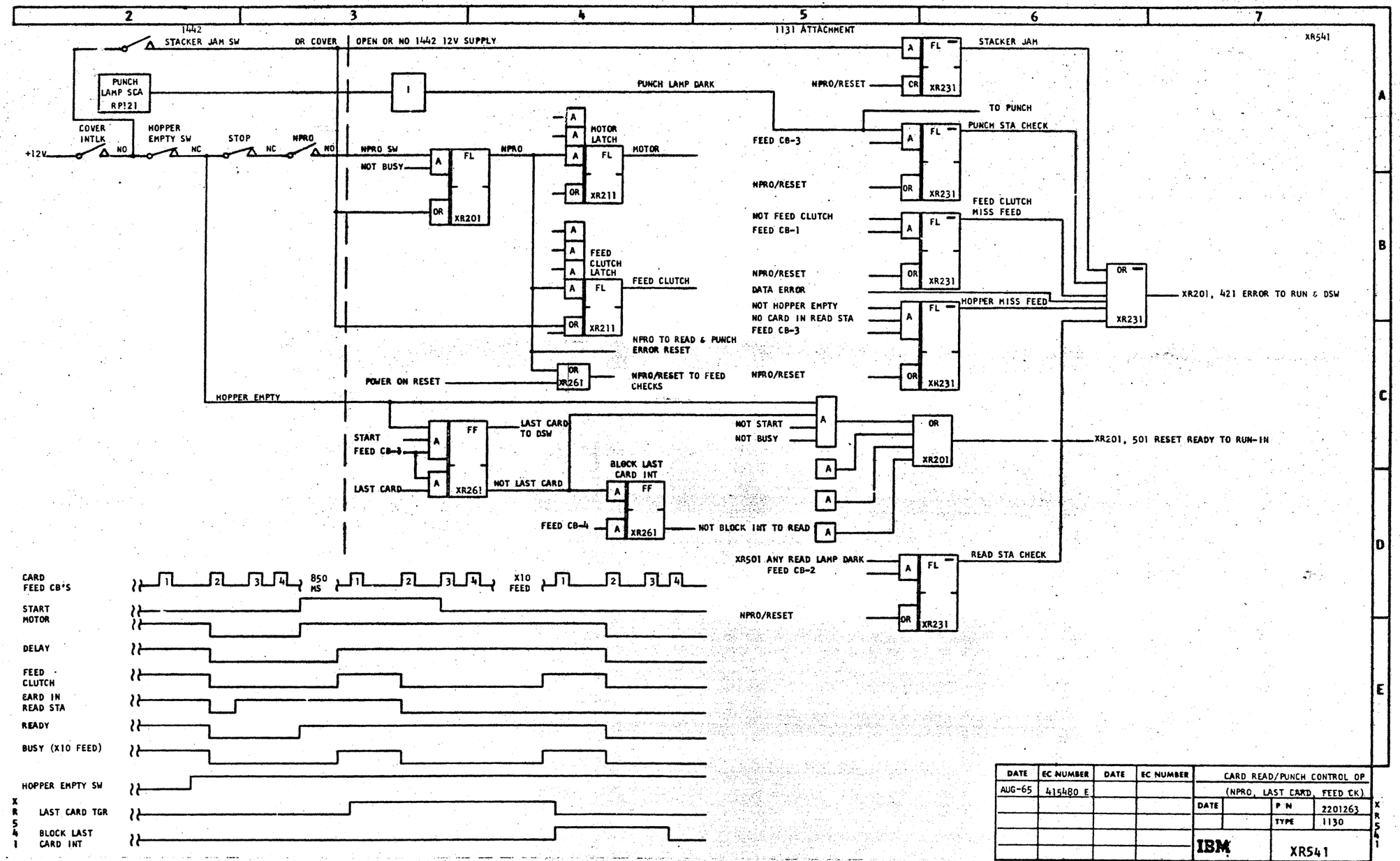
DATE	EC NUMBER	DATE	EC NUMBER	CARD READ/PUNCH
AUG-65	415480 E			PROGRAM LOAD OPERATION
				DATE 3-26-65 P/N 2201261
				TYPE 1130
				IBM XR521

XR521

XR521



DATE	EC NUMBER	DATE	EC NUMBER	CARD READ/PUNCH
AUG-65	415480 E			CONTROL OP (1ST CARD CYCLE)
JUN 66	419613			DATE P/N 2201262
				TYP. 1130
				IBM XR531



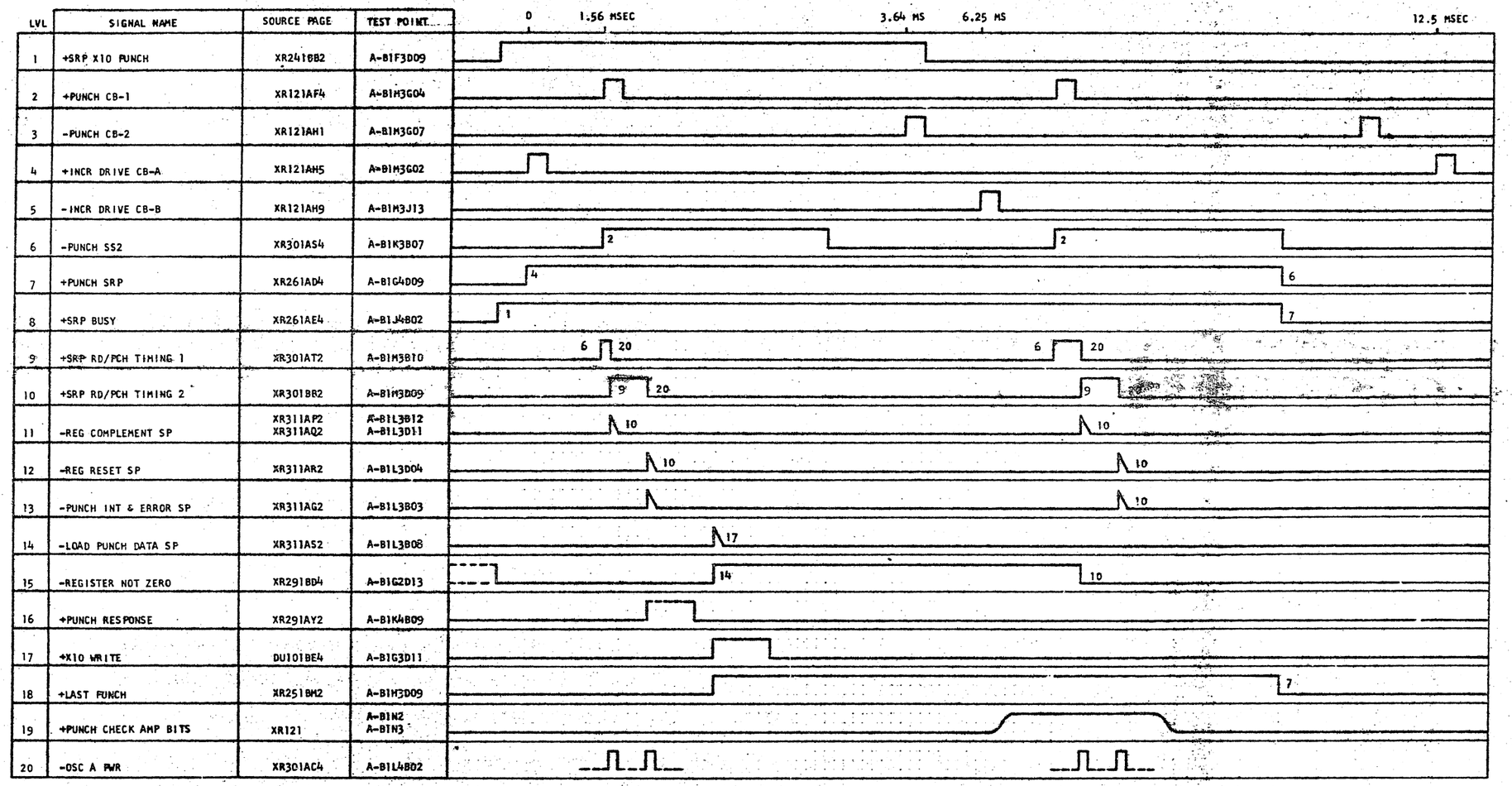
DATE	EC NUMBER	DATE	EC NUMBER	CARD READ/PUNCH CONTROL OP (NPRO, LAST CARD, FEED CK)
AUG-65	415480 E			DATE / P N 2201263
				TYPE 1130
				IBM XR541

XR541

2 | 3 | 4 | 5 | 6 | 7

XR701

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-B1L4B02



A B C D E

DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		

CARD READ/PUNCH
WRITE TIMING

DATE		P/N	2201264
		TYPE	1130

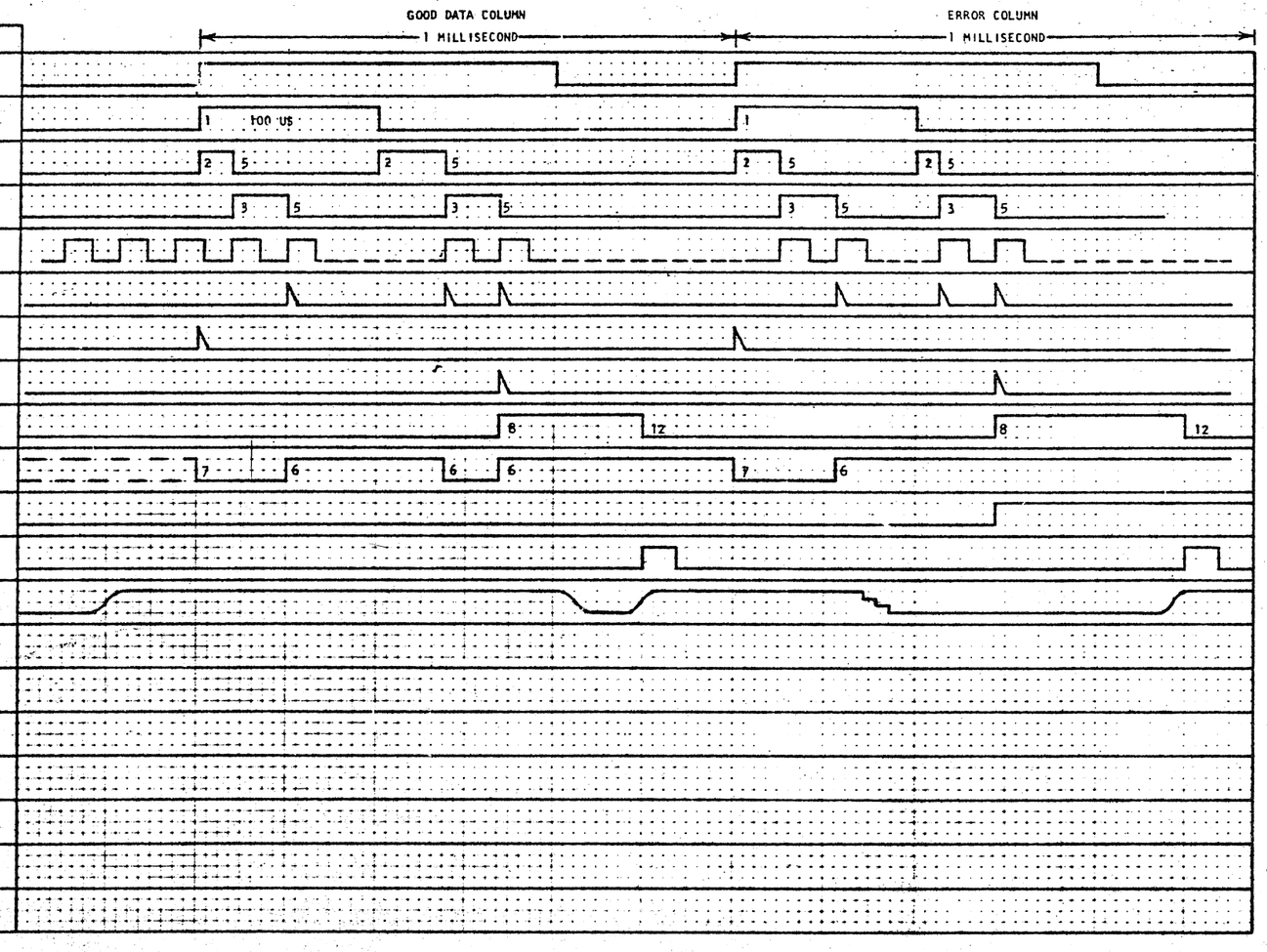
IBM XR701

XR701

XR701

XR711

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
1	+ READ EMITTER	XR121AD7	A-B1N3B06
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-B1M3B13
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-69	415480 E		

CARD READ/PUNCH READ AND PROGRAM LOAD TIMING

DATE | P/N 2201265

TYPE 1130

IBM XR711

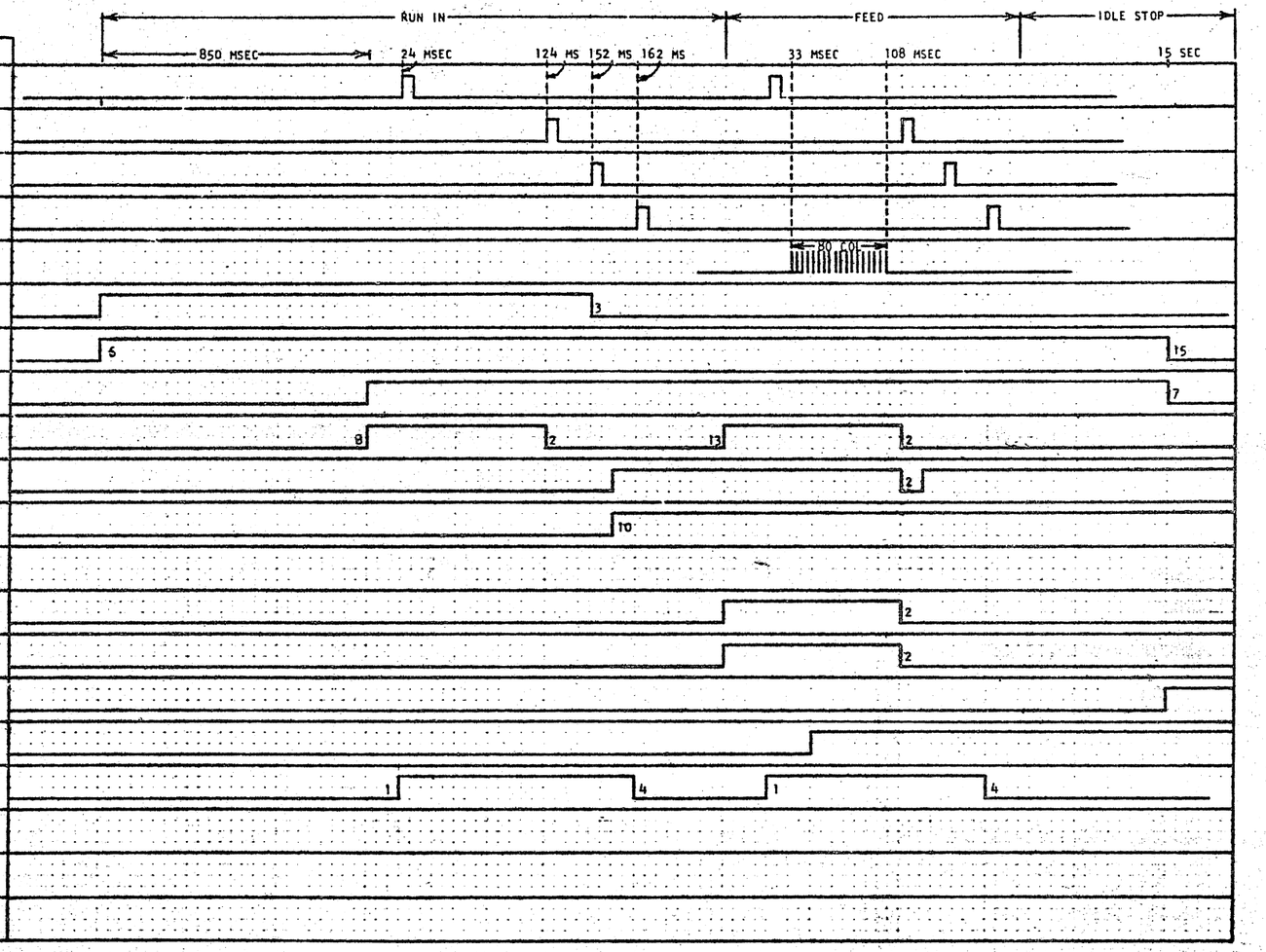
XR711

XR711

2	3	4	5	6	7

XR721

LVL	SIGNAL NAME	SOURCE PAGE	TEST POINT
1	+ FEED CB-1	XR121AF2	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	XR241CA2	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 FCED INTLK	XR221AV4	A-B1M3G13

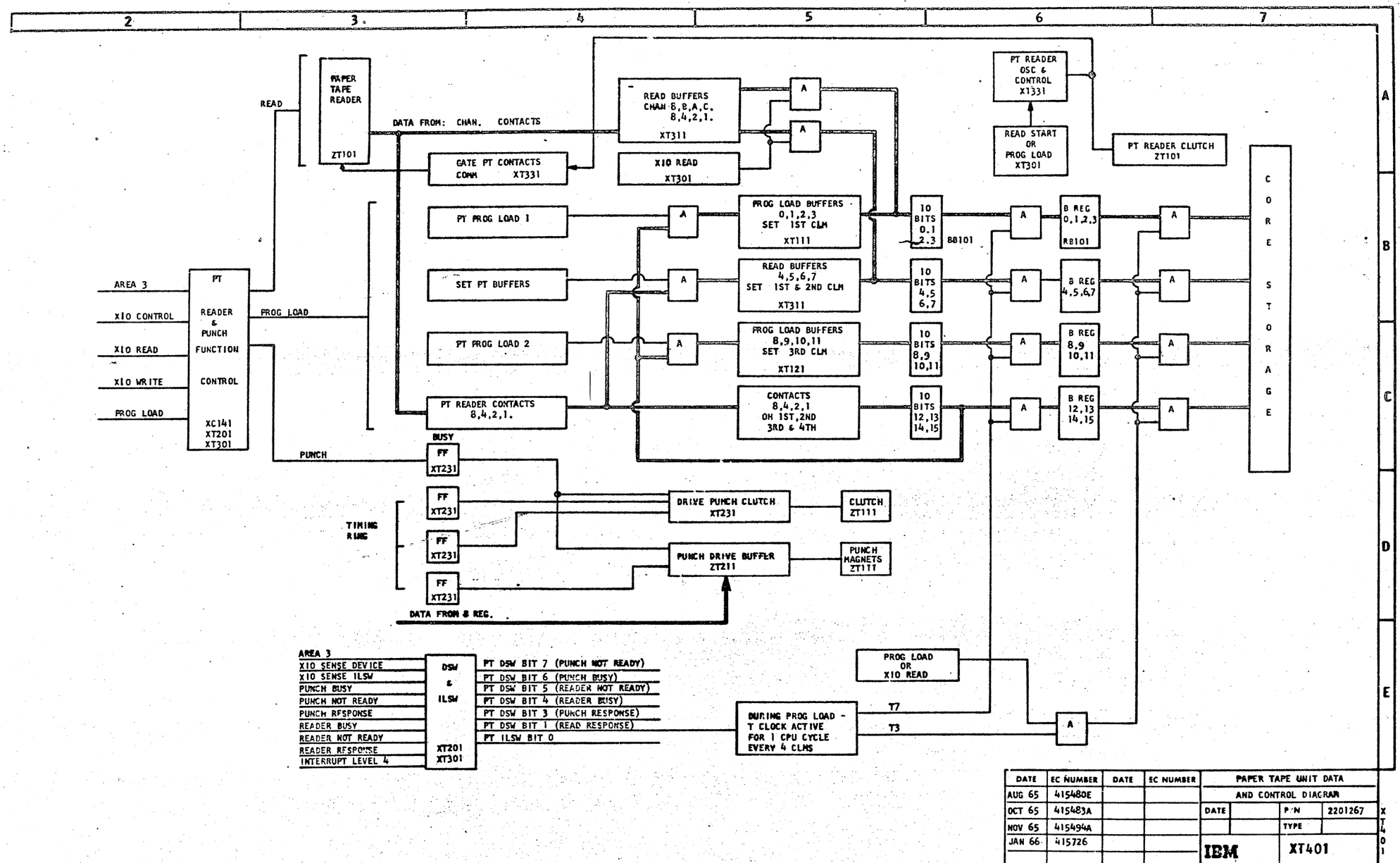


DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		

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

XR7211

XR7211



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

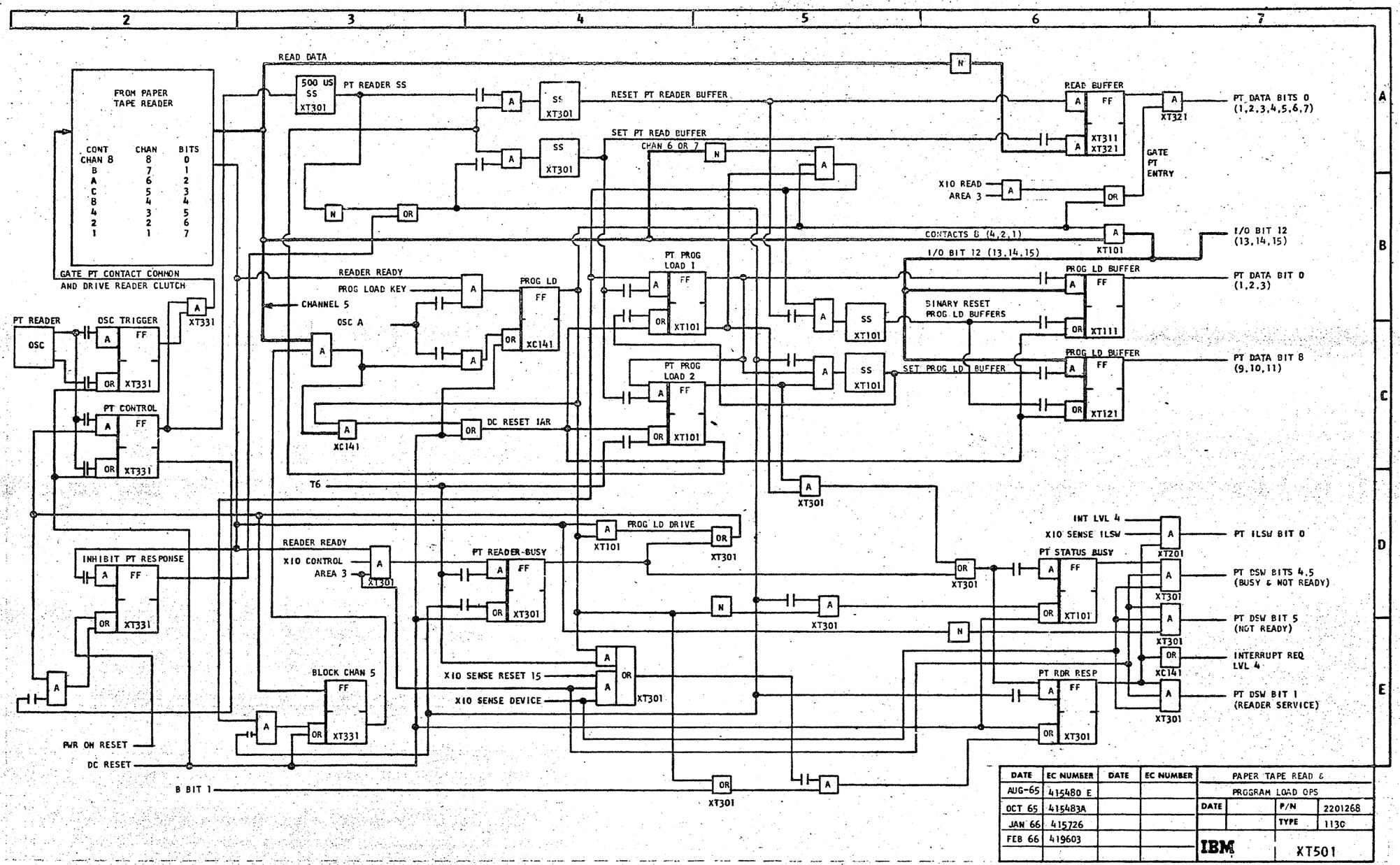
PAPER TAPE UNIT DATA AND CONTROL DIAGRAM

DATE | P/N 2201267

TYPE

IBM XT401

XT401



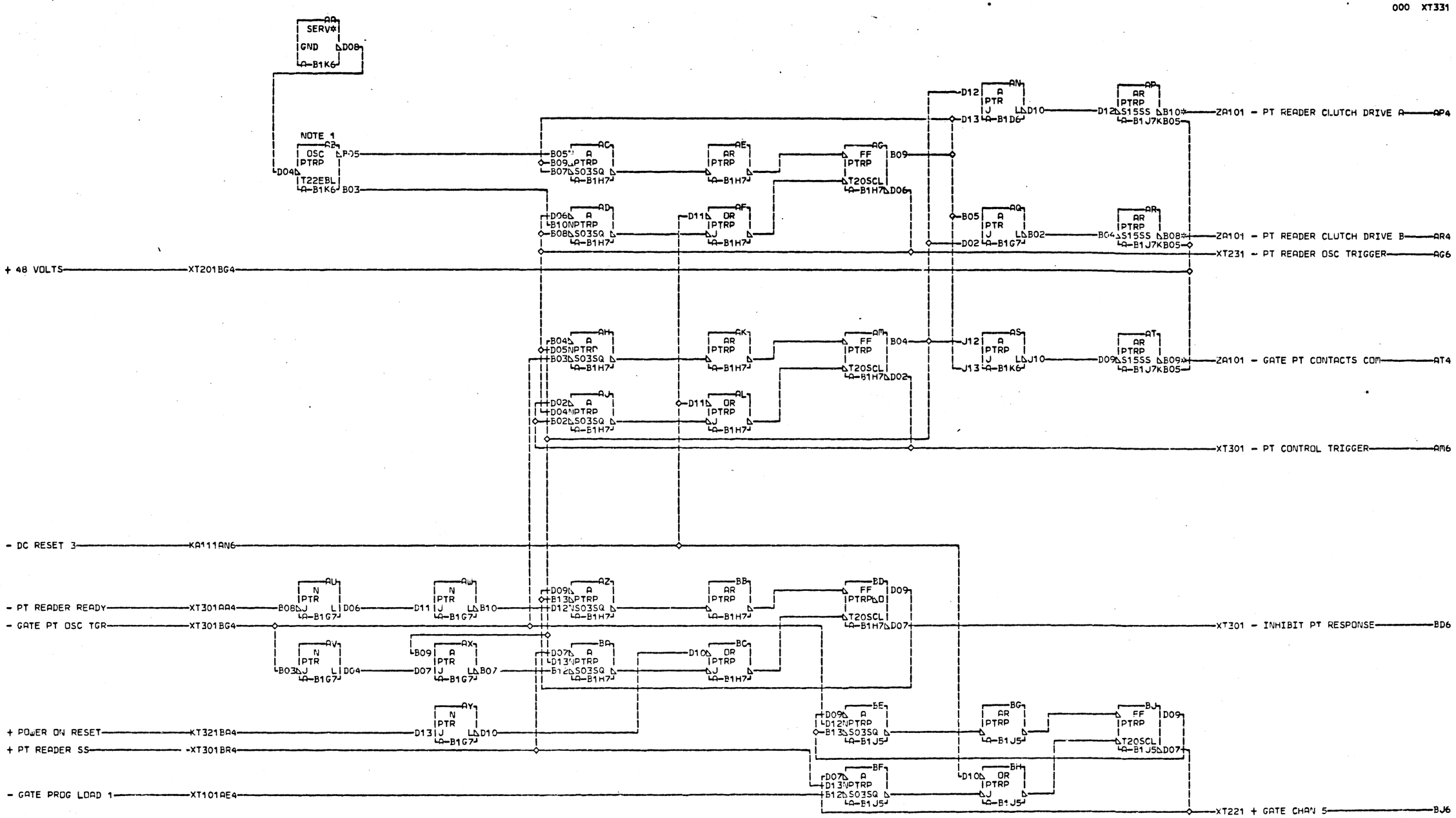
DATE	EC NUMBER	DATE	EC NUMBER
AUG-65	415480 E		
OCT 65	415483A		
JAN 66	415726		
FEB 66	419603		

PAPER TAPE READ & PROGRAM LOAD OPS

DATE | P/N 2201268

TYPE 1130

IBM XT501



NOTE 1 FREQUENCY IS 120 CPS. SEE PAGE AD000 FOR SYMMETRY AND ADJUSTMENTS

AP4 A-B1A6D06
AR4 A-B1A6D02
AT4 A-B1A6B02

LOC.	TYPE
A-B1D6	0000
A-B1G7	0000
A-B1H7	3794
A-B1J5	3794
A-B1J7	3819
A-B1K6	3734

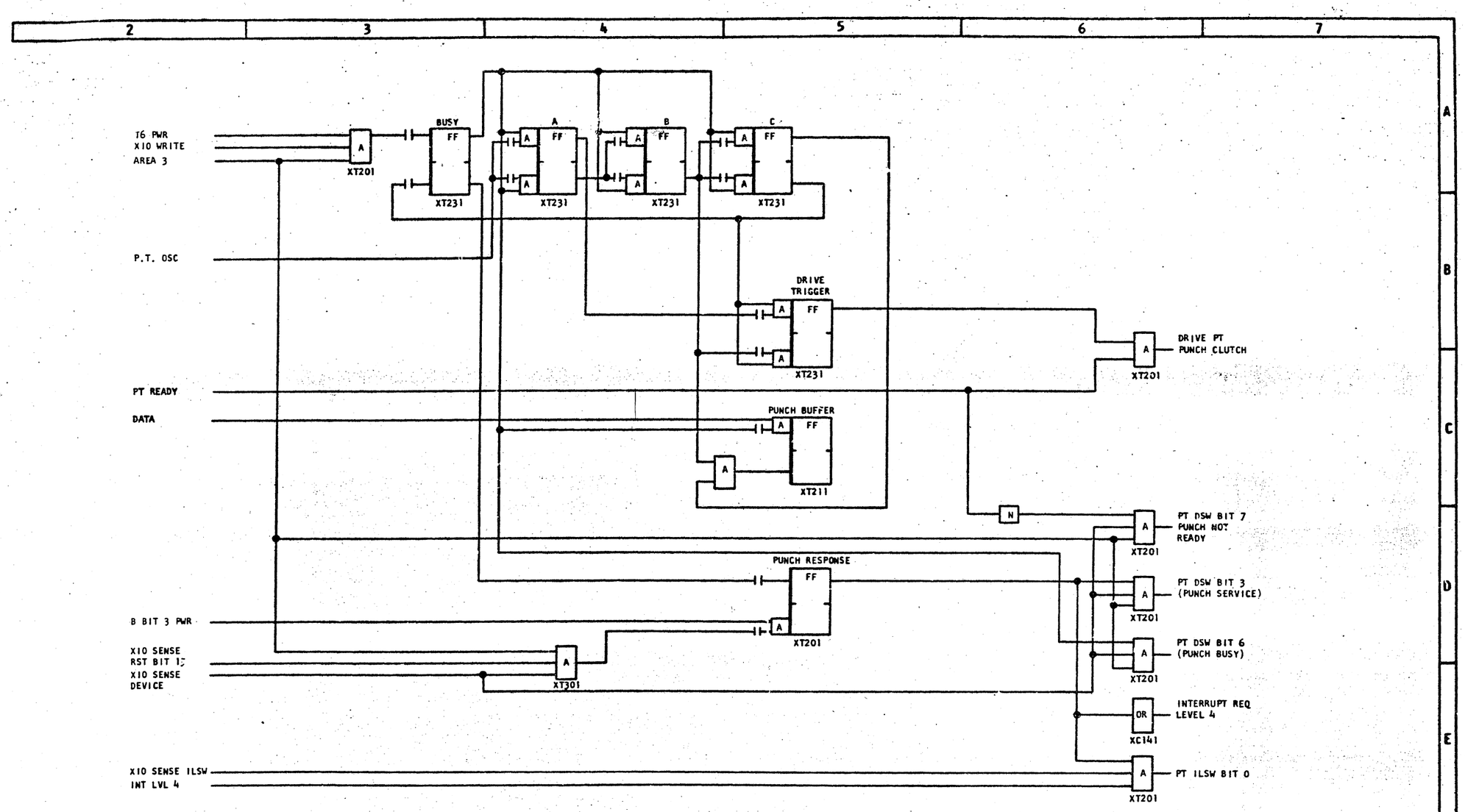
PAPER TAPE READER OSC AND CONTROL

E.C. HISTORY	
415725	419609
415726	
419603	
419608	

MACH. 1131
FRAME 01
IBM CORP. SDD
P.N. 2201287

DATE	LAST EC
06-05-69	571046

XT31 3 1 000



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

PAPER TAPE
WRITE OP

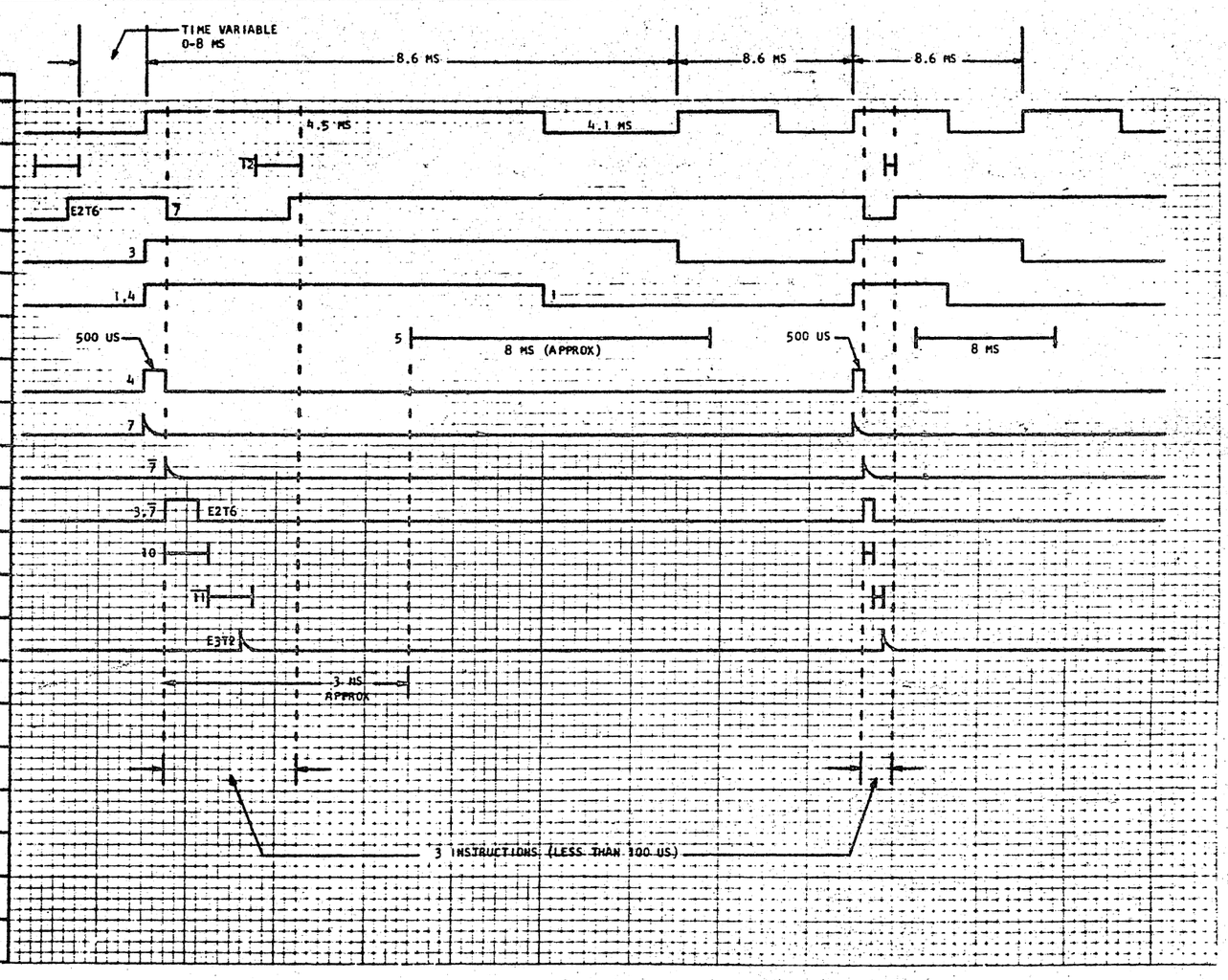
DATE		P/N	2201269
		TYPE	

IBM XT511

2	3	4	5	6	7

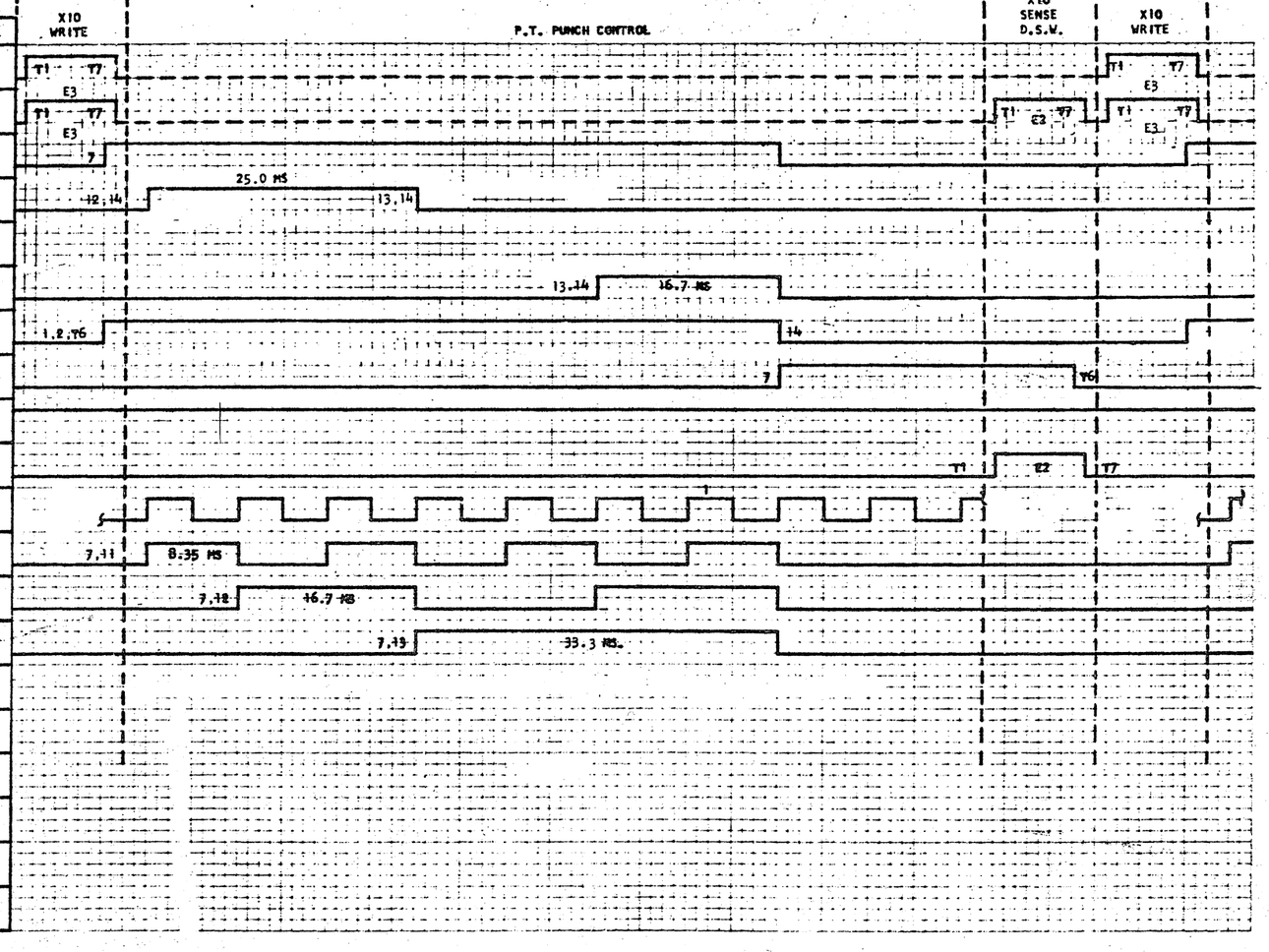
A-B1

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.	XT331	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	PAPER TAPE READ TIMING			
JAN 66	415726			DATE		P/N	2201270
						TYPE	1130
				IBM		XT701	

NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	X10 WRITE	DU101BE4	A-B1 J5B12	+
2	AREA 3	DU111AZ4	A-B1 J5D11	+
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	XT331BK2	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	XT231AW2	A-B1 F7B04	+



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

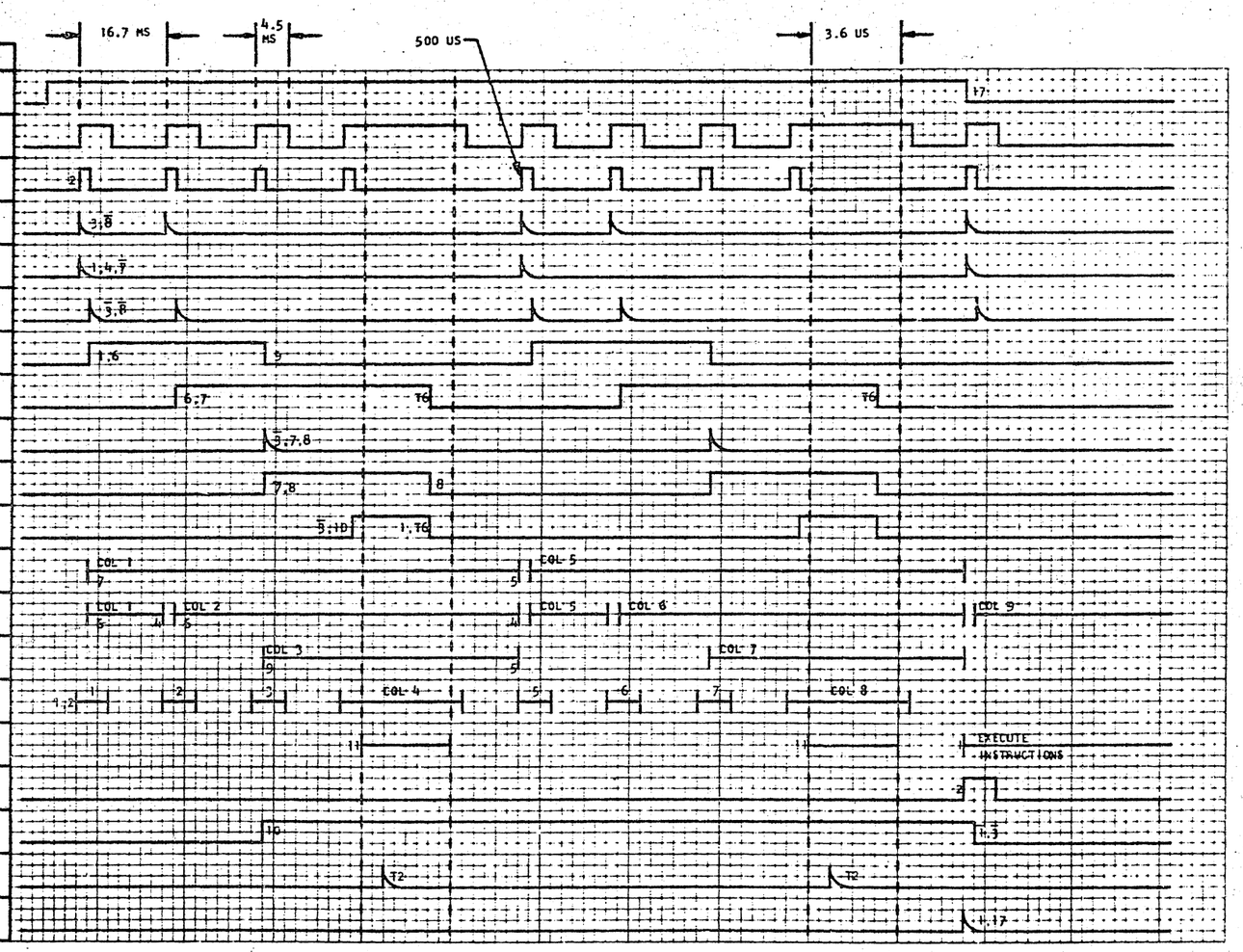
PAPER TAPE
WRITE TIMING
DATE 3-22-65 P/N 2201271
TYPE
IBM XT711

XT711

2	3	4	5	6	7

A-B1

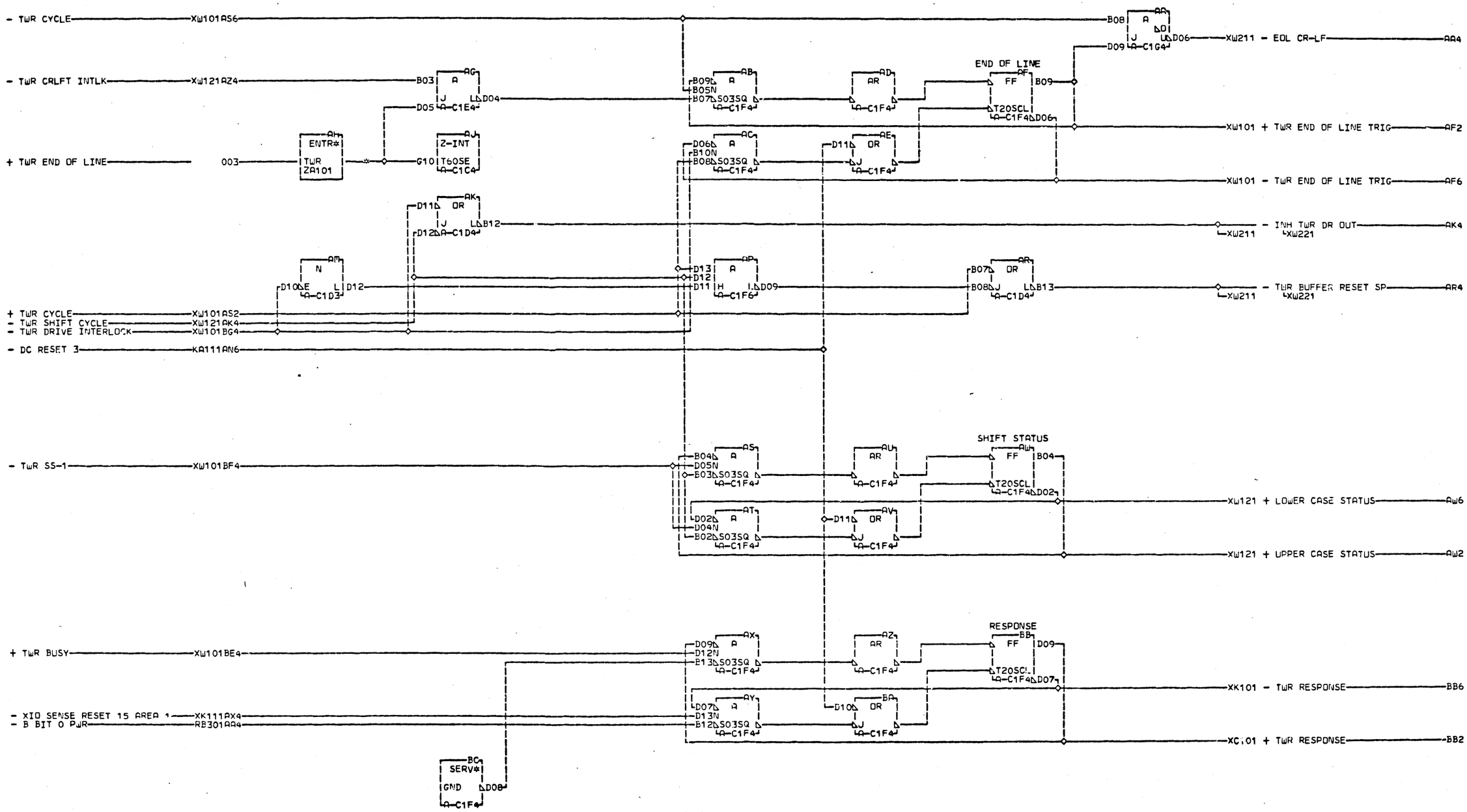
NO	SIGNAL NAME	LOGIC PAGE	TEST POINT	LVL
1	PROGRAM LOAD	XT301BC4	E6D04	+
2	DRIVE READER CLUTCH GATE CONTACTS	XT331		+
3	READER SS	XT301BB4	G6B07	-
4	RESET READ BUFFER	XT301BF2	H6D07	-
5	RESET PROGRAM LOAD BUFFERS	XT101BB2	H6B12	-
6	SET READ BUFFER	XT301BN2	H6B03	-
7	PROGRAM LOAD 1 TGR	XT101AV2	H5B09	+
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	XT101BF4	M7B10	+
19	4 COLUMNS (1 WORD) TO B REGISTER			+
20	DC RESET IAR	KU31,1AU4	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	PAPER TAPE
JAN 66	415726			PROGRAM LOAD TIMING
				DATE P/N 2201272
				TYPE 1130
				IBM XT721

A B C D E



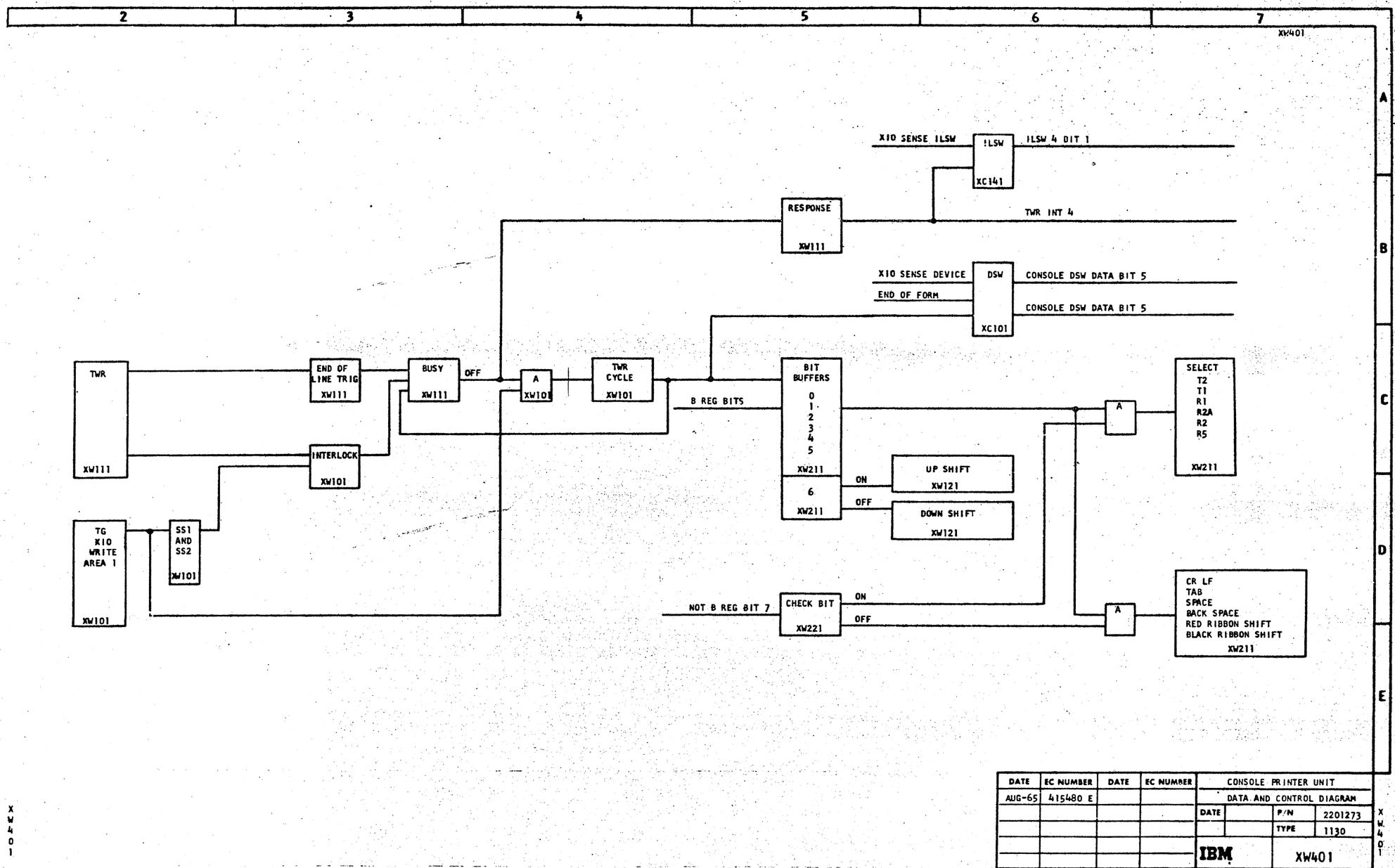
AH4 A-C1A4B09

LOC.	TYPE
C1C4	6208
C1D3	0509
C1D4	3404
C1E4	0000
C1F4	3794
C1F6	0453
C1G4	0236

TWR EOL CR-LF RESET SP
RESPONSE UPPER/LOWER CASE

E.C. HISTORY	MACH. 1131
4154800	
415481	FRAME 01
415483	
419607	IBM CORP. GPD
DATE LAST EC	
06-05-69 571046	P.N. 2201212

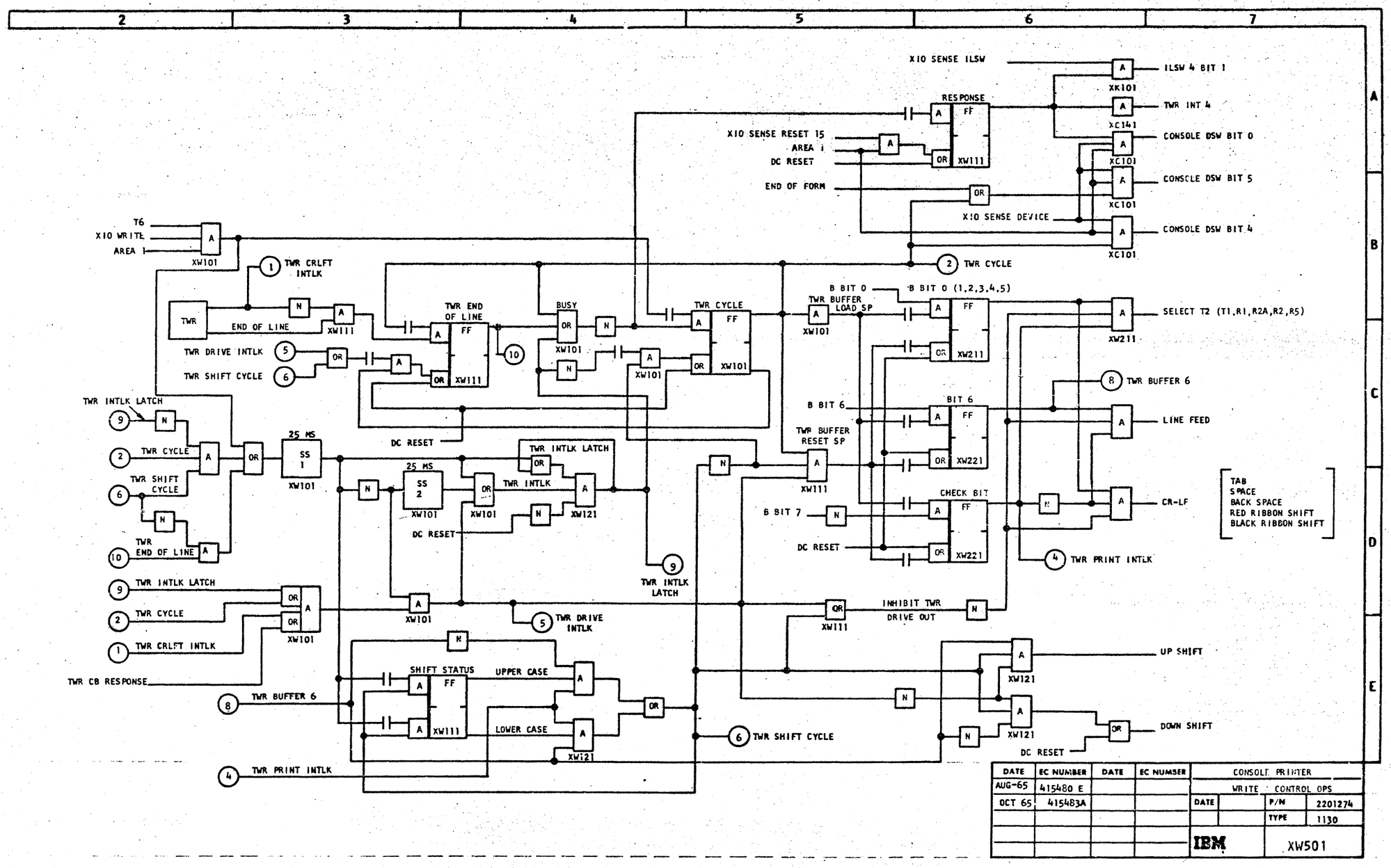
X E
1
1
1
000



DATE	EC NUMBER	DATE	EC NUMBER	CONSOLE PRINTER UNIT
AUG-65	415480 E			DATA AND CONTROL DIAGRAM
				DATE / P/N 2201273
				TYPE 1130
				IBM XW401

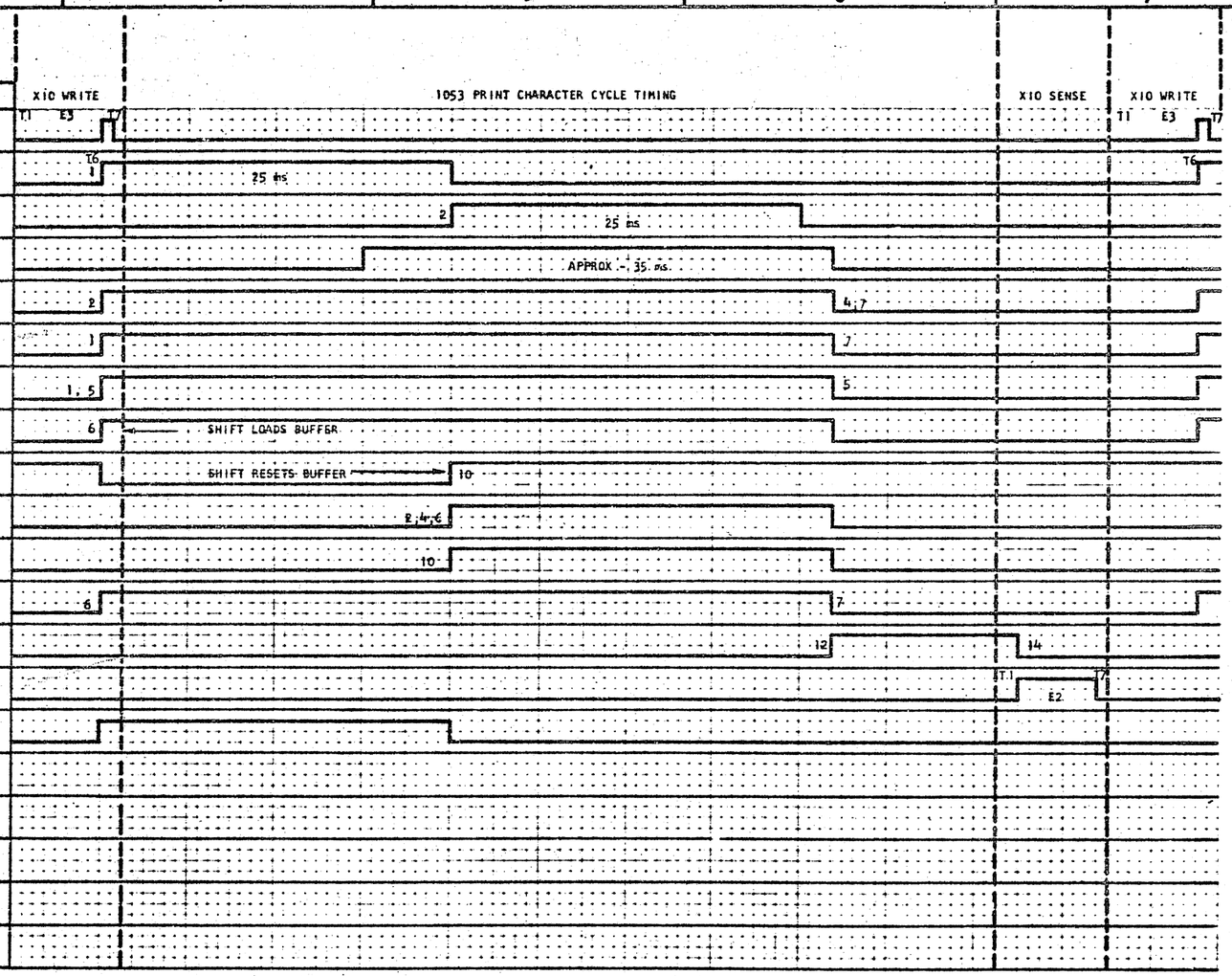
XW401

XW401



DATE	EC NUMBER	DATE	EC NUMBER	CONSOLE PRINTER			
AUG-65	415480 E			WRITE CONTROL OPS			
OCT 65	415483A			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	XW1218B4	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 15 AREA 1	XK111AX4	A-C1F4D13
15	- SELECT T1	XW2118H4	A-C1B4D06



DATE	EC NUMBER	DATE	EC NUMBER	CONSOLE PRINTER WRITE AND CONTROL TIMING			
AUG-65	415480 E			DATE		P/N	2201275
						TYPE	1130
				IBM		XW701	

XW701

XW701