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IBM Field Engineering Education
Student Self-Study Course

SYSTEM/360 Model 30 Attachment Feature
1419/1412 Reader/Sorter

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1419/1412 Reader/Sorter

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PREFACE

Prerequisites:

System 360 Training and Channel Concepts
1419 or 1412 Tie-In for any System

Material Needed:

System 360 Adapter Feature 1412/1419, 1418/1428	Form #225-3393
System 360 Adapter Feature 1412/1419 Student Self Study Guide	Form #R25-5166

When you complete the course, fill out the Self-Training Record (Form #R25-4280)

INTRODUCTION

This Self-Study Course is composed of sessions, none of which should take more than two hours to complete. Noted next to the title of each session, is the average time for completion. Each session begins with a paragraph describing the unit of study and explaining what you should learn. Bullet Type highlights are given, followed by an assignment. There can be more than one assignment for a session. Each assignment is reinforced by learning questions. On completing a session, you will find self-evaluation questions. You must be able to correctly answer all the questions to successfully complete the session.

Should you feel you already know the material about to be covered in any session, you may skip the assignments and answer the self-evaluation questions. If you are able to correctly answer the self-evaluation questions, you may skip ahead to the next session.

This course begins by explaining the principles and functional units of the Adapter Control Unit added to the 1419/1412 Reader/Sorter for System 360 operation. The control unit is then tied in to the standard 1419/1412 circuits to teach you the 1419/1412 on line with System 360.

Timing charts and ILD's are included in the rear of this book for your use while following circuit objectives.

CONTENTS PAGE

SESSION 1 - COMPREHENSIVE INTRODUCTION — 1.8 HOURS

In order to learn the Reader/Sorter Attachment Feature for System 360, you must have a firm foundation in the principles of Channel Operation. In this session, you will learn the fundamental operation of the 1419-1412 Control Unit as it effects System 360 Channel Operation.

You can determine if you have learned what is expected of you by answering the Self Evaluation questions at the end of this session. You may look at these questions now or at any time you want to see how much you are getting out of this session.

I/O CONTROL

Highlights

- A Control Unit is added to the Reader/Sorter to attach the Sorter to the System/360 Standard Interface.
- Each Reader/Sorter has its own Control Unit.
- The Reader/Sorter can be attached to the Selector Channel or the Multiplexor Channel.
- The CPU initiates an I/O operation by issuing one of these four I/O instructions:

  Start I/O
  Test I/O
  Halt I/O
  Test Channel

Assignment

Read: FEMI - Section 1 Comprehensive Introduction

Questions:

1. Where is the Control Unit that attaches the Reader/Sorter to the standard interface physically located? _____
   _____.
2. How many Reader/Sorters can be attached to one control unit?
   _____.
3. What is the major difference between the operation of a Reader/Sorter on a Selector Channel and a Multiplexor Channel? _____
   _____.

4. From where does a Start I/O instruction obtain the specific I/O command? _____
_____
_____.

Answers:

1. The Control Unit is physically located in the Reader/Sorter.

2. Only one Reader/Sorter is attached to a Control Unit.

3. A Reader/Sorter on the Multiplexor Channel can operate in byte mode or burst mode. It operates in burst mode only on the selector channel.

4. The Start I/O instruction obtains the specific I/O command from the Channel Command Word (CCW).

FUNCTIONAL UNITS

Highlights:

- In-bound Tag Lines identify the information on the bus-in lines.
- Jumper Cards compared the address on BUS OUT with the address assigned to the Control Unit, and generate the Control Unit address gated on BUS-IN.
- The Command byte sent to the Control Unit is stored in the Command Register.
- The Status byte is developed by five Status Latches.
- The Reader/Sorter develops two Sense bytes from 13 Sense Latches.

Assignment:

Read: FEMI Section 2 Functional Units

Questions:

1. The information on BUS OUT is stored in the _____ when Command Out is active.

2. Once a Command Latch is on, it remains on until _____
_____.

3. The purpose of the Status-In Latch is _____
_____ and _____.

4. What three lines turn on the Status-In Latch? _____

_____.

5. Two Jumper Cards are used for Address Assignment. What is the purpose of both cards? _____

_____.

6. There are _____ (number) Status Latches in the Control Unit.

Answers:

1. Command Register.

2. Command Execution

3. The Status -In Latch allows the Status Register to condition Bus-In and activates the Status-In Tag Line.

4. a. Interrupt required.
   b. Control Unit Request.
   c. Not Command Out Sample.

5. a. One Jumper Card compares the Address on Bus-Out with the Unit Address.
   b. One Jumper Card generates the Unit Address to be sent to the channel on Bus-In.

6. Five Status Latches.

Self-evaluation Questions:

1. Voltage Level conversion is accomplished in the _____ _____, which is physically housed in the _____.

2. The CPU initiates an I/O operation by issuing one of four I/O instructions. List them.

3. A count of the number of Data Transfers to be made is kept in the _____.

4. Reader/Sorters are normally connected to the _____ channel.

5. The Control Unit sends _____ Status to the channel to end the Data Transfer portion of a command.

6. Three In-bound Tag Lines identify the information on Bus-In. List them.

7. The Service-In Latch allows the contents of the _____ _____ to condition Bus-In during a Sense Command.

8. During a Read backward command, to send data from the Reader/Sorter to the channel, the _____ _____ Latch must be turned on to condition Bus-In.

9. If a unit check occurs, it causes the Control Unit to _____ command execution.

10. Busy is turned off when _____ _____ status is accepted by the channel.

11. _____ (number) Sense bytes are developed by _____ (number) Sense Latches.

Self-evaluation Answers:

1. Control Unit, Reader/Sorter

2. a. Start I/O
   b. Halt I/O
   c. Test I/O
   d. Test Channel

3. Channel Command Word (CCW)

4. Multiplexor

5. Channel-End

6. a. Address-In
   b. Status-In
   c. Service-In

7. Sense Register

8. Service-In Latch

9. Terminate

10. Device End

11. Two, Thirteen

SESSION 2 - 1419/1412 THEORY OF OPERATION — 2.1 HOURS

At this time, you are ready to learn the Theory of Operation of a 1419/1412 attached to the System/360. As you proceed through your reading assignments, if Circuit objectives are given, observe them in the ILD'S.

START I/O AND INITIAL SELECTION

Highlights:

- Service Request in the 1419 activates Request-In in the Control Unit.
- Data is transferred from the Character Register in the Reader/Sorter to the Bus-In Assembler in the Control Unit.
- The Initial Selection Sequence attaches the Control Unit to the Channel Interface.
- A Read Backward command transfers data from the Reader/Sorter to the Channel.

Assignment:

Read: FEMI - Section 3. Not Ready to Ready
Start I/O
Initial Selection

Questions:

1. Request-In in the Control Unit is turned on by _____ _____ in the Reader/Sorter.

2. The Service-In Latch gates information from the _____ _____ in the Reader/Sorter to the _____ _____ in the Control Unit.

3. During a Read operation, Channel End and Device End occur (seperately, together).

4. The Start I/O Command obtains its operating information from the _____.

5. When will the 1419/1412 Control Unit force burst mode?

6. Between characters of a Read Operation, the Control Unit drops off the channel when it receives _____.

7. An address compare equal in the Control Unit turns on its _____ _____ Latch.

Answers:

1. Service Request.
2. Character Register, Bus-In Assembler.
3. Together.
4. Channel Command Word (CCW).
5. Executing Sense Control or Write Commands.
6. Service-Out.
7. Channel Request.

CONTROL COMMANDS AND READING

Highlights:

- All Control Commands are a modification of the Start I/O instruction.
- Control Command modifiers specify the Stacker Selection.
- A Read Backward Command transfers Data from the Reader/Sorter to the CPU.
- The Read Backward CCW:
    1. Selects the Reader/Sorter.
    2. Assigns the first position of storage to be used.
    3. Sets the Address Update Unit to modify minus.

Assignment:

Read: FEMI - Control Commands
Read Backward
Read
Write

Questions:

1. The Bit configuration of an Engage Command is _____.
2. A Disengage Command is executed during the _____ _____

sequence.

3. An Engage Command turns on the _____ Latch in the Reader/Sorter.

4. When is Device End Transmitted for an Engage Command?

5. Bits _____ of the Command byte are decoded to select a stacker.

6. When should a Stacker Select be issued?
Why?

7. Pocket Light Control (1419) is only operative for what pockets?

8. A Read Backward Command is terminated with the _____ _____ passing the Read Head.

9. What is the difference between a Read Command and a Read Backward Command?

10. What causes a Channel-End on the 1419? 1412?

11. What is a Write Command used for?

Answers:

1. 1110 1111

2. Initial Selection.

3. Feed Latch.

4. When the Reader/Sorter has a document to be read.

5. Bits 0-3 of the Command Byte.

6. Before a Read Backward is issued for the following document. If a Late Stacker Select should occur, an overrun condition occurs.

7. Pockets A, B, 0, 1, 2, 3.

8. Trailing edge of the document.

9. On a Read Command the CPU storage address modifies plus. On a Read Backward command the CPU storage address modifies minus.

10. On a 1419 -- End of document passing the Read Head.
    On a 1412 -- 1. End of document passing the Read Head.
    2. PCL 3A Lead.
    3. The last select field having been read.

11. It is used for 1419 Statement Test Diagnostics only.

TEST I/O, HALT I/O, NO OP, SENSE

Highlights:

- Test I/O checks the status of the Control Unit.
- Halt I/O blocks data transmission from the Reader/Sorter to the channel.
- A No Op turns on Channel-End, Devise-End immediately to temporarily disable an existing command.
- A Sense Command is executed in Burst Mode.

Questions:

1. What is the bit configuration of a test I/O command?

2. If a Halt I/O instruction is issued, when does Channel-End and Devise-End occur?

3. The Halt I/O blocks _____ _____.

4. When do Channel-End and Devise-End occur for a No Op Command?

5. A sense command transmits _____ bytes of information.

Answers:

1. All bits zero.

2. At the end of the document.

3. Data Transmission.

4. As soon as the command is decoded.

5. Two.

DIAGNOSTIC MODE (STATEMENT TEST)

- A write command is valid if the statement test switch is on.
- A read command, with statement test on, turns on the clock control trigger immediately.
- The 1419 must be in a Not Ready State.
- Reducing the CCW count to zero ends the operation.
- A stacker select command interrogates the character register.

Assignment:

Read: FEMI Topic Diagnostic Mode

Questions:

1. For a write command to be valid, the _____ _____ switch must be on.

2. (Number) _____ bytes of information are required to fill the Matrix.

3. Service request for a write operation if generated by the _____ _____ _____trigger.

4. To end the write operation, the channel sends _____ _____ to turn on the channel end latch in the 1419.

5. If the stacker select command causes a compare equal, the _____ _____latch is turned on.

Answers:

1. Statement test

2. fourteen

3. Alternate Service Request Trigger

4. Command Out

5. Document under the Read Head Sense Latch.

SELF EVALUATION QUESTIONS

1. To send data to the channel, the Reader/Sorter activates _____ _____, whic h turns on Request In.

2. The byte configuration of a Read backward command is _____.

3. The stacker select demodifier is contained in bits _____ of the command byte.

4. A No Op Command turns on _____ ____ and _____ _____in the control unit.

5. If the Reader/Sorter receives a read backward command and there is no document to be read, _____ _____status is sent to the channel.

6. If a late stacker select is sent for a document, an _____ bit is set in the first sense byte.

SELF EVALUATION ANSWERS

1. Service Request

2. P MMMM 1100

3. bits 0-3

4. Channel End and Device End

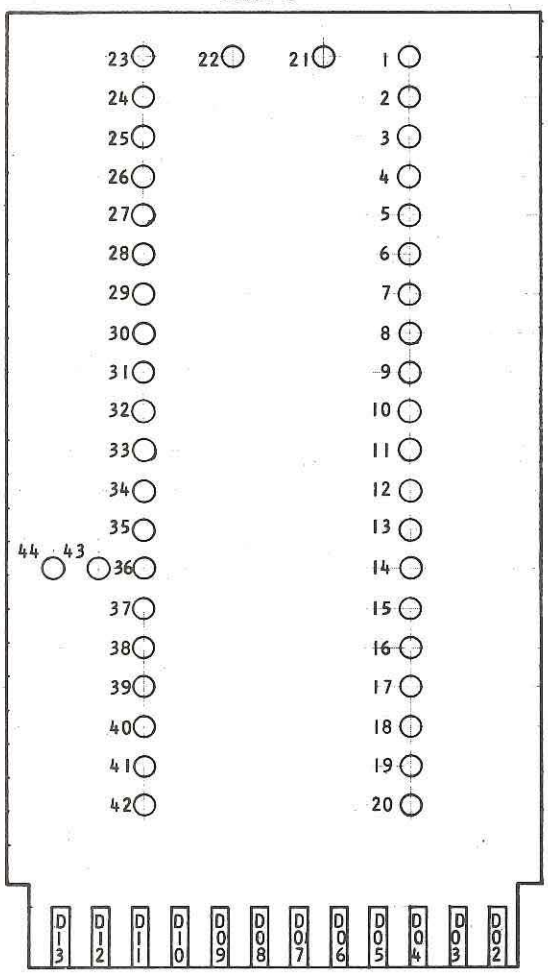
5. Unit Exception

6. Overrun

USING JUMPER STRIP 811824, PLUG JUMPERS ON SLT CARD ASSEMBLY 5803413 AS INDICATED BELOW FOR MACHINE USED.

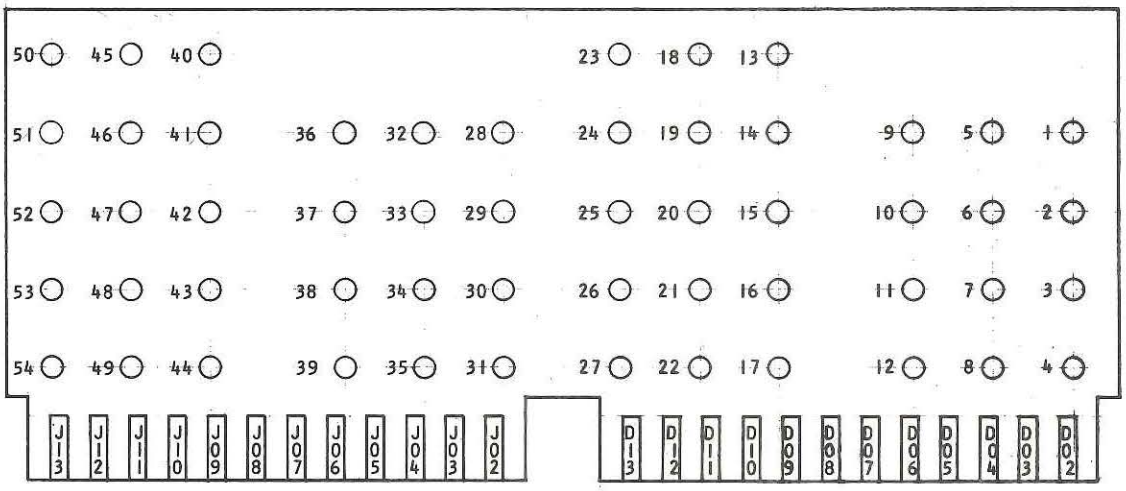
MACHINE USED	JUMPERS REQUIRED	PIN CONNECTED BY JUMPERS
1412	5 TO 6	B04 TO D04
1412	7 TO 11 TO 14	D05 TO D08 TO D09
1412	30 TO 31	B05 TO D06
1412	35 TO 37	B09 TO D10
1412	2 TO 3	B02 TO D02
1418	16 TO 17	B13 TO D13
1418	18 TO 19	B12 TO D12
1418	30 TO 31	B05 TO D06
1419	2 TO 3	B02 TO D02
1419	5 TO 6	B04 TO D04
1419	7 TO 11 TO 14	D05 TO D08 TO D09
1419	30 TO 31	B05 TO D06
1419	35 TO 37	B09 TO D10
1428	18 TO 19	B12 TO D12
1428	31 TO 32	B07 TO D06

JUMPER CARD
5803413



OPTIONAL MACHINE JUMPERS

ADDRESS SELECT AND GENERATE JUMPER CARD
5804095



PLUG JUMPERS IN CARD 5804095 FROM "COM" TO EITHER "BIT ON" OR "BIT OFF" TO MATCH ASSIGNED ADDRESS AS FOLLOWS:
USE 811824 STRIP AS REQUIRED.

ADDRESS SELECT

	BIT ON	COM	BIT OFF
BIT 0	54	49	44
BIT 1	53	48	43
BIT 2	52	47	42
BIT 3	51	46	41
BIT 4	50	45	40
BIT 5	39	35	31
BIT 6	38	34	30
BIT 7	37	33	29
BIT P	36	32	28

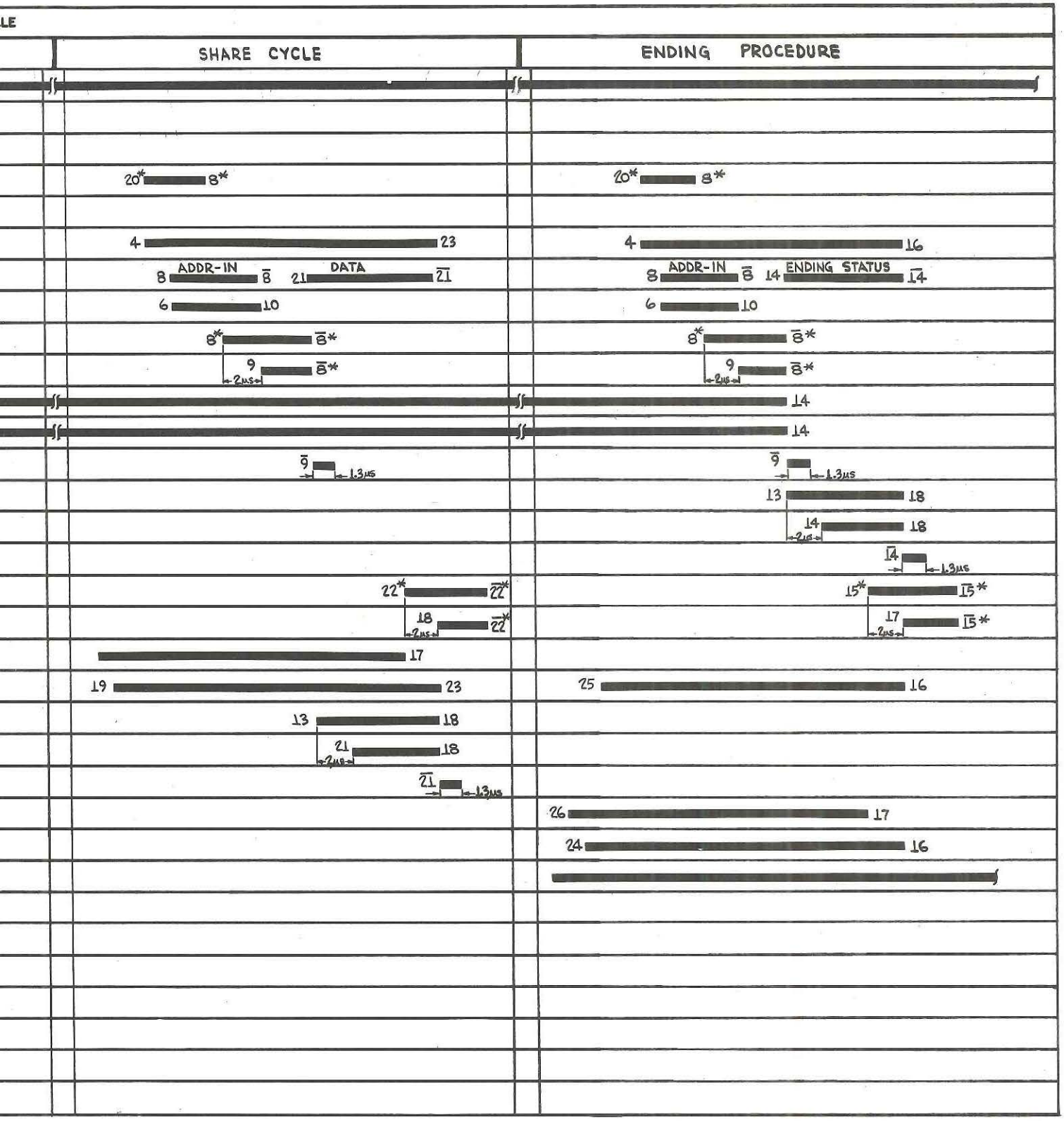
ADDRESS GENERATE

	BIT ON	COM	BIT OFF
BIT 0	17	22	27
BIT 1	16	21	26
BIT 2	15	20	25
BIT 3	14	19	24
BIT 4	13	18	23
BIT 5	4	8	12
BIT 6	3	7	11
BIT 7	2	6	10
BIT P	1	5	9

DATE	EC NO.	DATE	EC NO.	TITLE OPTIONAL MACHINE JUMPERS	
5-20-65	123289			IBM	TYPEPDS-NPL
6-30-65	125204			PART NO. 833331	PAGE CU180
13 AUG 65	123300				

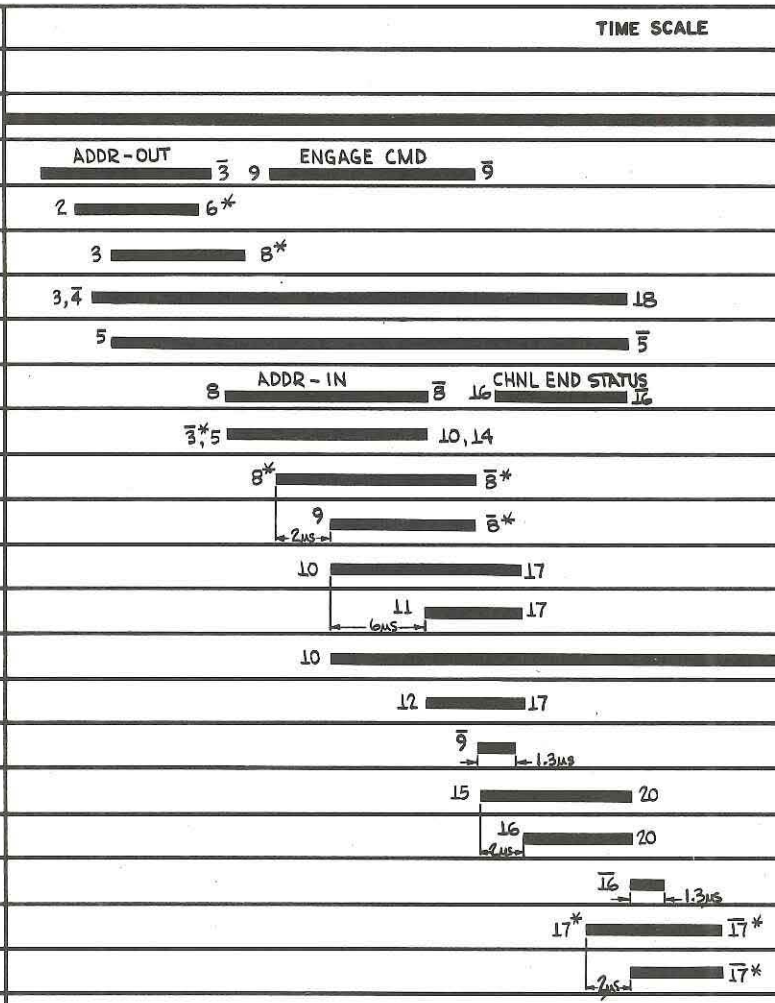
NO.	SIGNAL NAME	BOARD	SIGNAL PIN	A.L.D.	LEVEL	TIME SCALE — INITIAL SELECTION
1	-OP-OUT	B-B2	D3B04	CU141	0,+12	
2	-BUS-0 (9 LINES)					1 ADDR-0 9 CMD-0 $\bar{9}$
3	+ADDRESS-0	B-B2	D2D07	CU271	+12,0	2 8*
4	+SEL-OUT	B-B2	D3D13	CU041	+12,0	3 8*
5	+CHANNEL REQUEST	B-B2	C4B03	CU031	+12,0	3,$\bar{4}$ 16
6	+OP-IN	B-B2	F3B09	CU021	+12,0	4 16
7	-BUS-IN (9 LINES)					8 ADDR-IN $\bar{8}$ 14 STATUS-IN $\bar{14}$
8	+ADDRESS-IN	B-B2	G3D04	CU051	+12,0	6 10
9	+COMMAND OUT	B-B2	D2D12	CU271	+12,0	8* $\bar{8}$*
10	+COMMAND OUT DLY	B-B2	E3B13	CU071	+12,0	9 $\bar{8}$* 2μs
11	-READ CMD	B-B2	J5B10	CU111	0,+12	10
12	+COMMAND STORED	B-B2	C6B04	CU111	+12,0	11
13	+NOT CMD-0 SMPL	B-B2	E3D10	CU071	+12,0	$\bar{9}$ 1.3μs
14	+STATUS-IN	B-B2	G4D04	CU051	+12,0	13 18
15	+STATUS-IN DLY	B-B2	E3J12	CU071	+12,0	14 18 2μs
16	+NOT STA-IN SMPL	B-B2	E3B10	CU071	+12,0	$\bar{14}$ 1.3μs
17	+SERVICE OUT	B-B2	D2D09	CU271	+12,0	15* $\bar{15}$*
18	+SRV-0 DLY	B-B2	E3D07	CU071	+12,0	17 $\bar{15}$* 2μs
19	+SERVICE REQUEST	B-B2	E6B10	CU261	+12,0	
20	-CU REQUEST	B-B2	F3D06	CU011	0,+12	
21	+SERVICE IN	B-B2	G4B13	CU061	+12,0	
22	+SERVICE IN DLY	B-B2	E3J06	CU071	+12,0	
23	+NOT SRV-IN SMPL	B-B2	E3B08	CU071	+12,0	
24	+CHANNEL END	B-B2	J2B02	CU081	+12,0	
25	+INTERRUPTION REQ	B-B2	F3B02	CU011	+12,0	
26	+END OF DOC	B-B2	J7B13	CU201	+12,0	

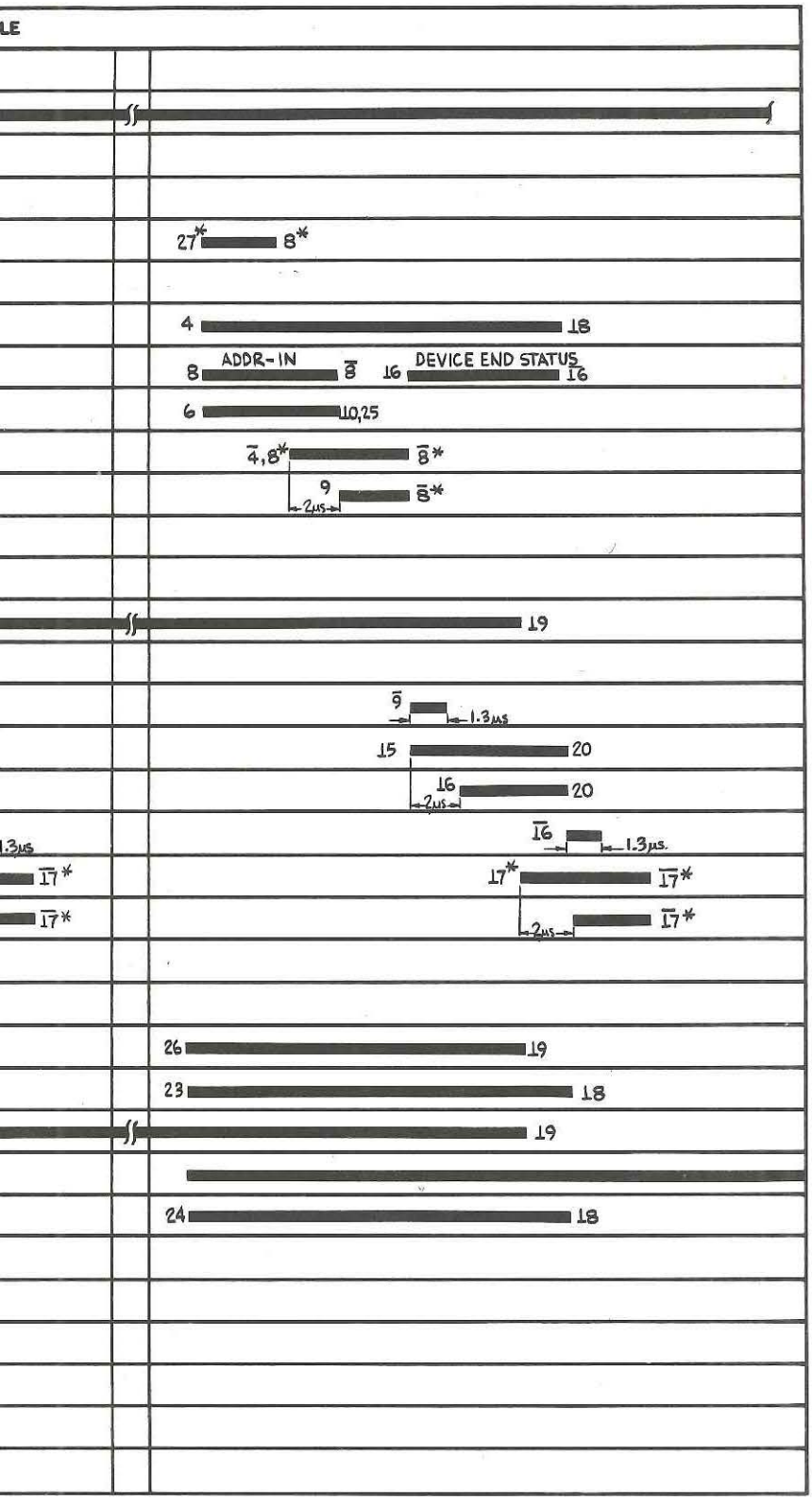
LE



DATE	EC NO.	DATE	EC NO.	TITLE: READ COMMAND
20 AUG 65	123300			MULTIPLEX CHANNEL
				IBM
				PART NO: 845800 PAGE: CT001

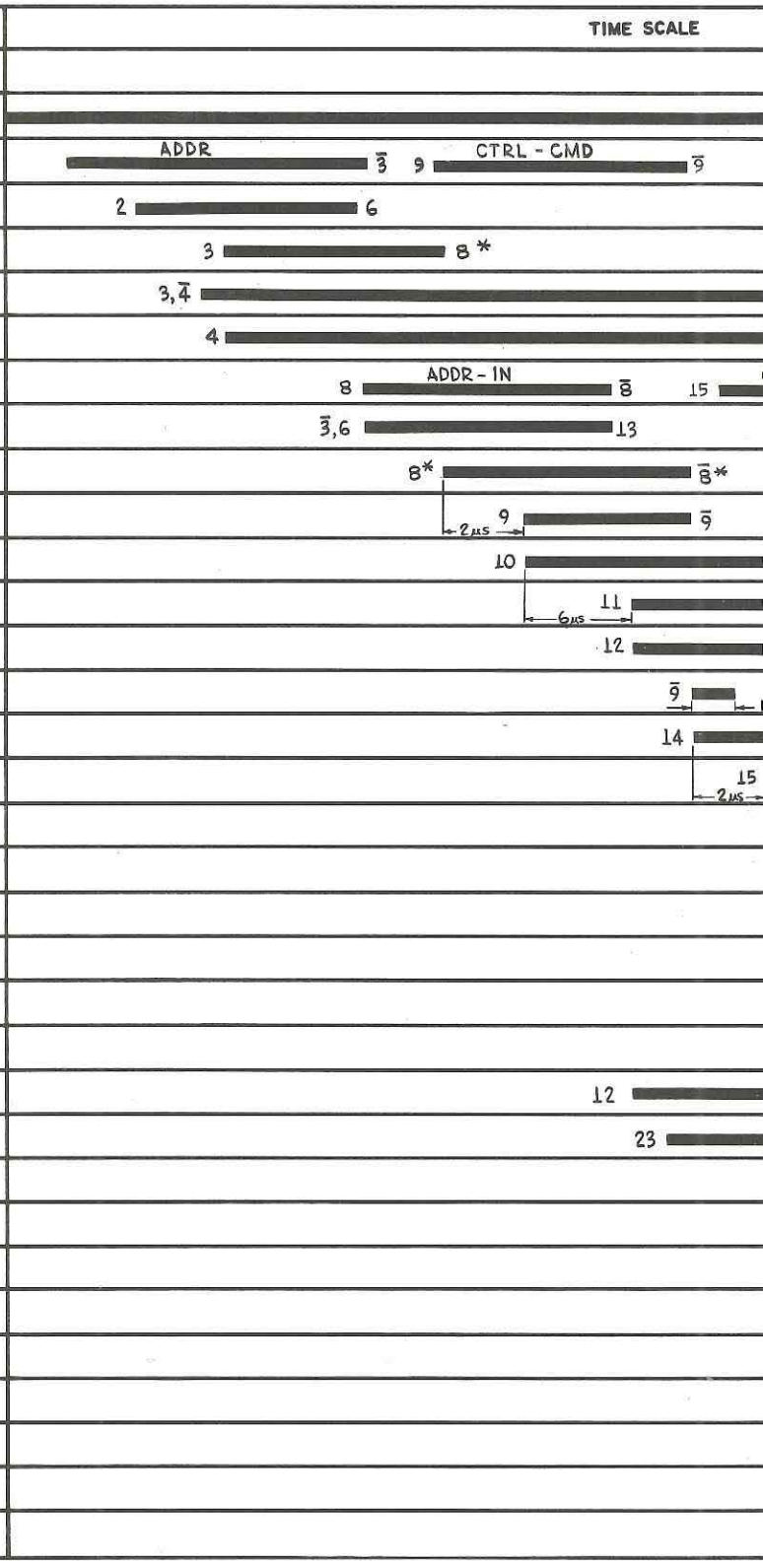
NO.	SIGNAL NAME	BOARD	SIGNAL PIN	A.L.D.	LEVEL
1	-OP-OUT	B-B2	D3B04	CU141	0, +12
2	-BUS-0 (9 LINES)				
3	+ADDRESS-0	B-B2	D2D07	CU271	+12, 0
4	+SEL-OUT	B-B2	D3D13	CU041	+12,0
5	+CHANNEL REQUEST	B-B2	C4B03	CU031	+12,0
6	+OP-IN	B-B2	F3B09	CU021	+12,0
7	-BUS-IN (9 LINES)				
8	+ADDRESS-IN	B-B2	G3D04	CU051	+12,0
9	+COMMAND OUT	B-B2	D2D12	CU271	+12,0
10	+COMMAND OUT DLY	B-B2	E3B13	CU071	+12,0
11	+CONTROL CMD	B-B2	D6D06	CU111	+12,0
12	+CONTROL CMD DLY	B-C2	B5B07	CU141	+12,0
13	+ ENGAGE	B-B2	K4D04	CU091	+12,0
14	+COMMAND STORED	B-B2	C6B04	CU111	+12,0
15	+NOT CMD-0 SMPL	B-B2	E3D10	CU071	+12,0
16	+STATUS-IN	B-B2	G4D04	CU051	+12,0
17	+STATUS-IN DLY	B-B2	E3J12	CU071	+12,0
18	+NOT STAT-IN SMPL	B-B2	E3B10	CU071	+12,0
19	+SERVICE OUT	B-B2	D2D09	CU271	+12, 0
20	+SRV-0 DLY	B-B2	E3D07	CU071	+12, 0
21	-CNTL SET CHNL END	B-B2	J7B02	CU141	0,+12
22	+CHANNEL END	B-B2	J2B02	CU081	+12,0
23	+ DEVICE END	B-B2	E7B10	CU091	+12,0
24	+ INTERRUPTION	B-B2	F3B02	CU021	+12,0
25	+ BUSY	B-B2	B7D06	CU081	+12,0
26	-DOC TO BE READ	B-B2	K4D09	CU091	0,+12
27	-CU REQUEST	B-B2	F3D06	CU011	0,+12

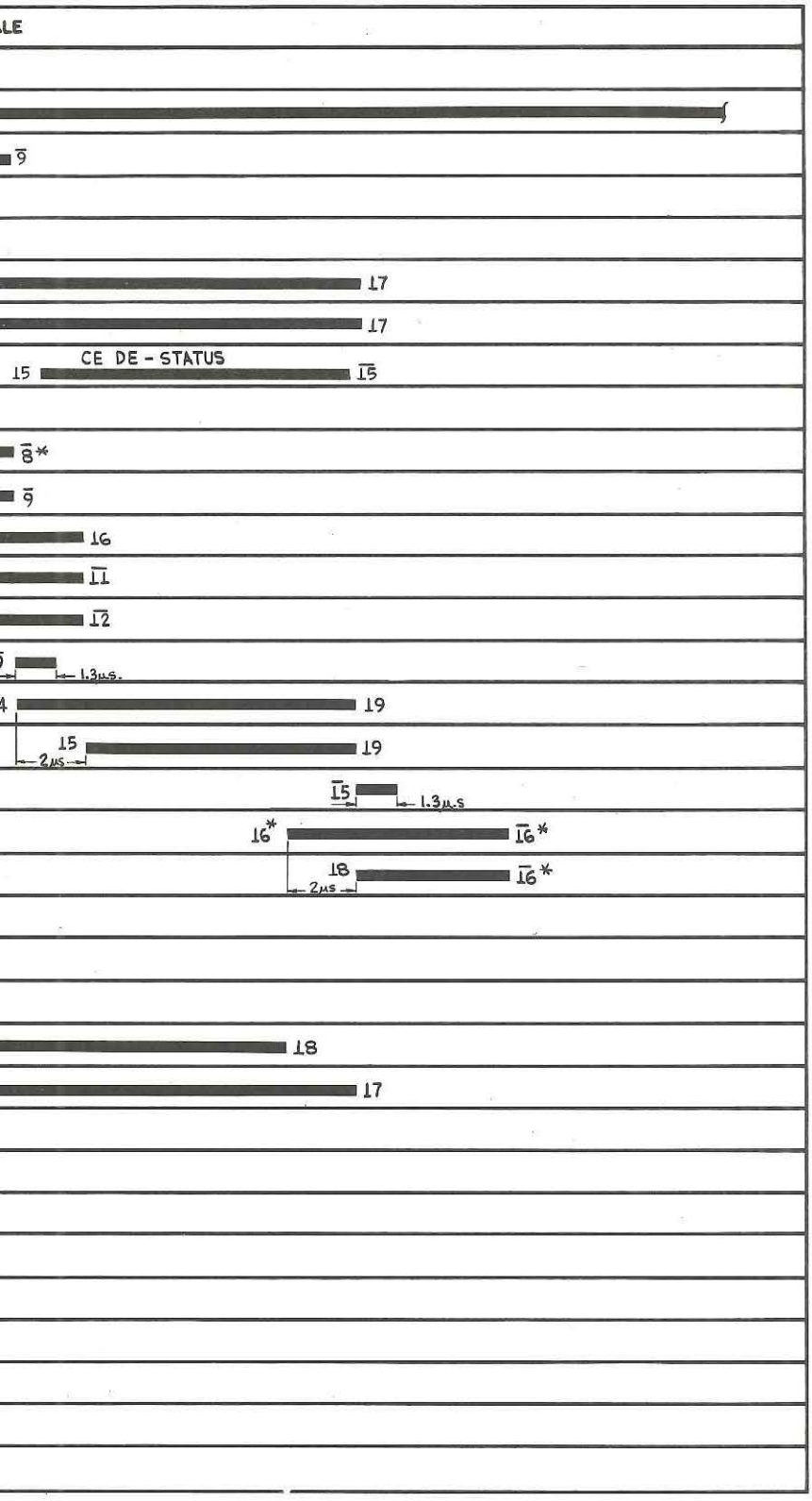




DATE	EC NO.	DATE	EC NO.	TITLE: ENGAGE COMMAND
20AUG65				
				IBM
				PART NO: 845801 PAGE: CT002

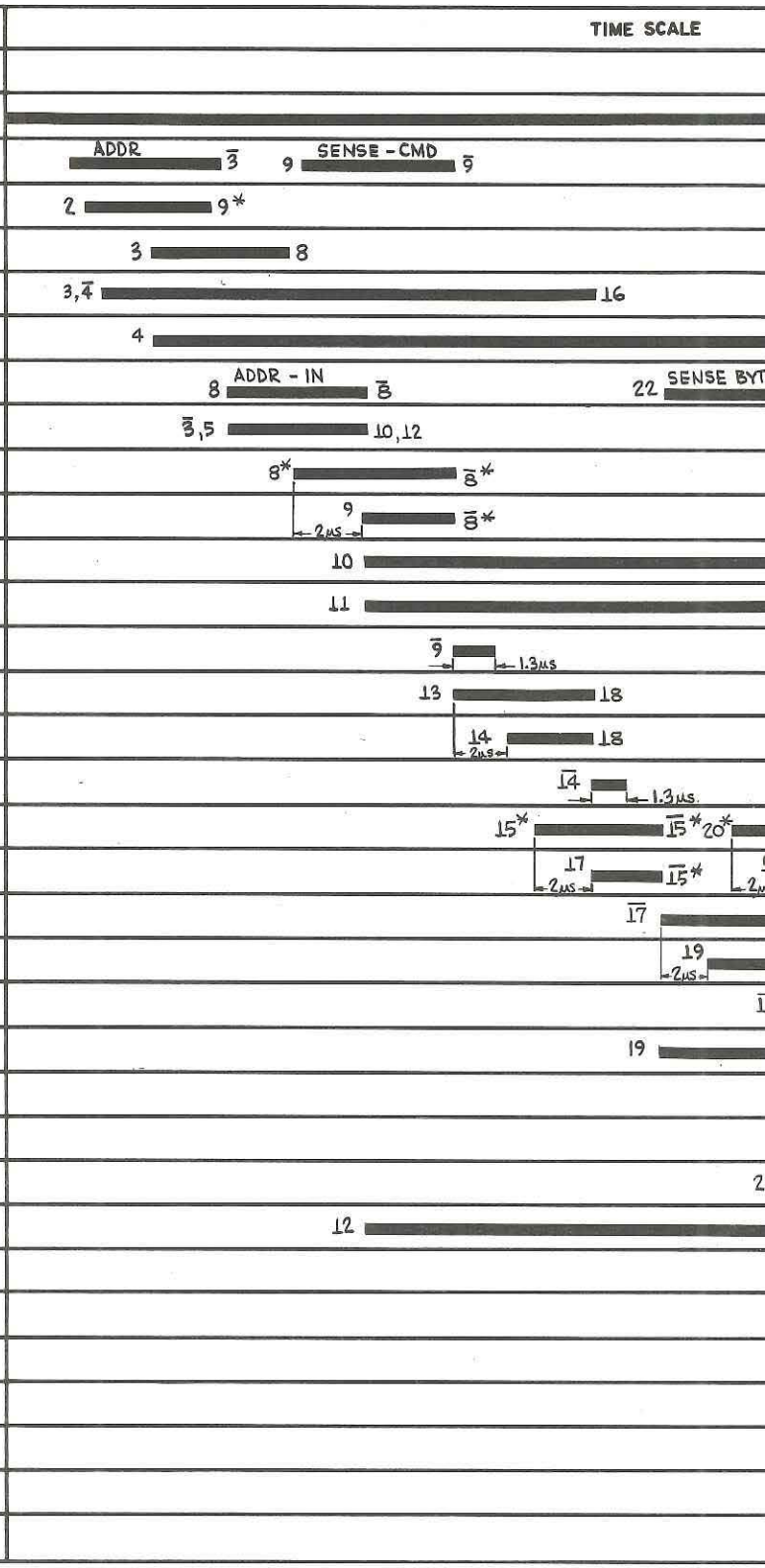
NO.	SIGNAL NAME	BOARD	SIGNAL PIN	A.L.D.	LEVEL
1	-OP-OUT	B-B2	D3B04	CU141	0,+12
2	-BUS-0 (9 LINES)				
3	+ADDRESS-0	B-B2	D2D07	CU271	+12,0
4	+SEL-OUT	B-B2	D3D13	CU041	+12,0
5	+CHANNEL REQUEST	B-B2	C4B03	CU031	+12,0
6	+OP-IN	B-B2	F3B09	CU021	+12,0
7	-BUS-IN (9 LINES)				
8	+ADDRESS-IN	B-B2	G3D04	CU051	+12,0
9	+COMMAND OUT	B-B2	D2D12	CU271	+12,0
10	+COMMAND OUT DLY	B-B2	E3B13	CU071	+12,0
11	+CONTROL CMD	B-B2	D6D06	CU111	+12,0
12	+CONTROL CMD DLY	B-C2	B5B07	CU141	+12,0
13	+CMD STORED	B-B2	C6B04	CU111	+12,0
14	+NOT CMD-0 SMPL	B-B2	E3D10	CU071	+12,0
15	+STATUS-IN	B-B2	G3J04	CU051	+12,0
16	+STATUS-IN DLY	B-B2	E3J12	CU071	+12,0
17	+NOT STAT-IN SMPL	B-B2	E3B10	CU071	+12,0
18	+SERVICE OUT	B-B2	D2D09	CU271	+12,0
19	+SERVICE-0 DLY	B-B2	E3D07	CU071	+12,0
20	+SERVICE IN	B-B2	G3G13	CU061	+12,0
21	+SERVICE-IN DLY	B-B2	E3J06	CU071	+12,0
22	+NOT SRV-IN SMPL	B-B2	E3B08	CU071	+12,0
23	+CHANNEL END	B-B2	J2B02	CU081	+12,0
24	+INTERRUPTION REQ	B-B2	F3B02	CU011	+12,0

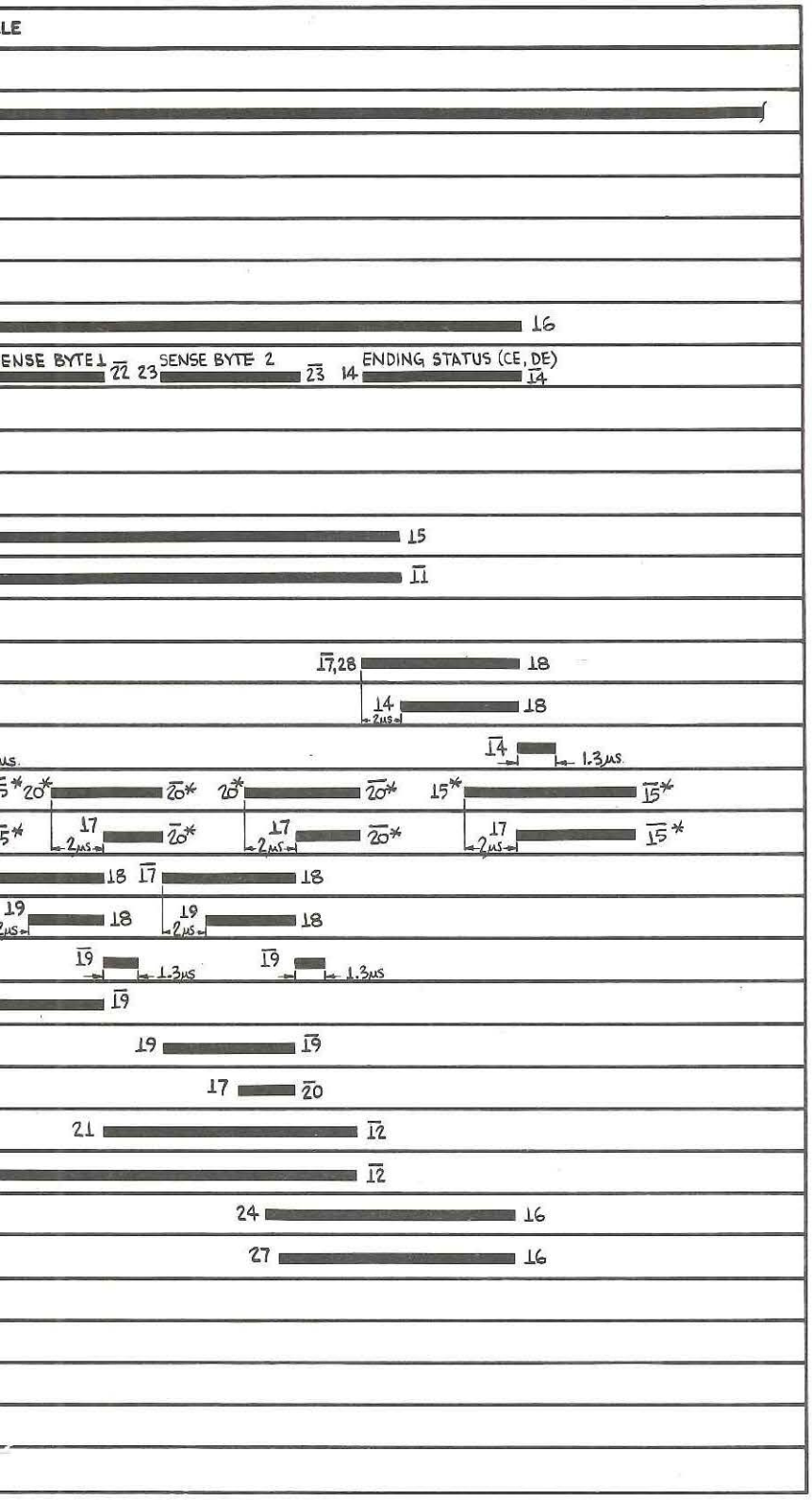




DATE	EC NO.	DATE	EC NO.	TITLE: CONTROL COMMAND
20AUG65				
				IBM
				PART NO: 845802 PAGE: CT003

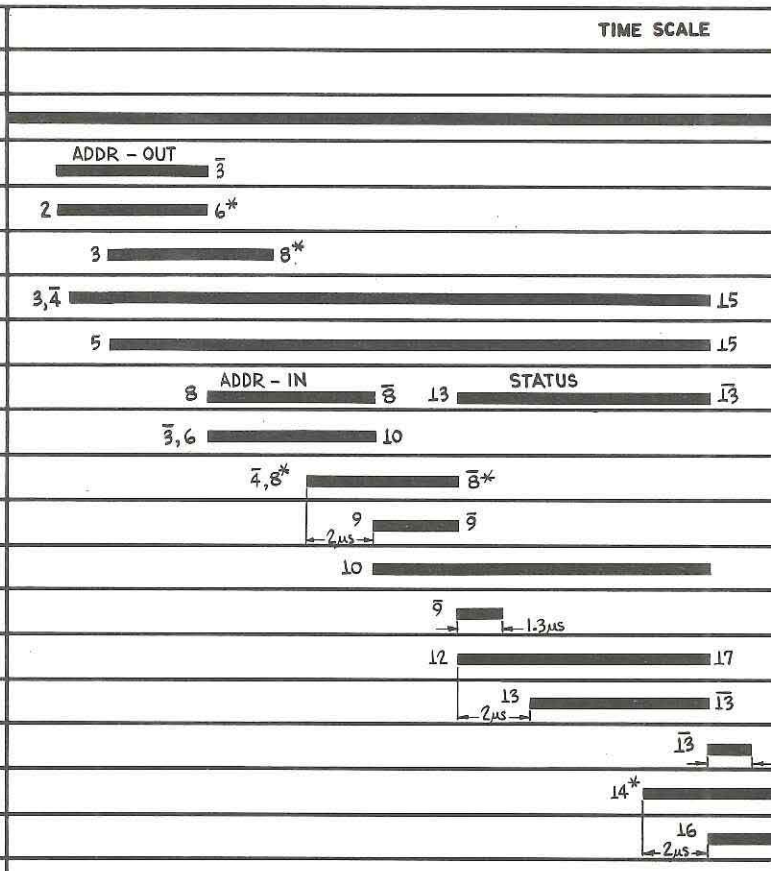
NO.	SIGNAL NAME	BOARD	SIGNAL PIN	A.L.D.	LEVEL
1	-OP-OUT	B-B2	D3B04	CU141	0, +12
2	-BUS-O (9 LINES)				
3	+ADDRESS-O	B-B2	D2D07	CU271	+12, 0
4	+SEL-OUT	B-B2	D3D13	CU041	+12, 0
5	+CHANNEL REQUEST	B-B2	C4B03	CU031	+12, 0
6	+OP-IN	B-B2	F3B09	CU021	+12, 0
7	-BUS-IN (9 LINES)				
8	+ADDRESS-IN	B-B2	G3D04	CU041	+12, 0
9	+COMMAND OUT	B-B2	D2D12	CU271	+12, 0
10	+COMMAND OUT DLY	B-B2	E3B13	CU071	+12, 0
11	+SENSE CMD	B-B2	D6D05	CU111	+12, 0
12	+COMMAND STORED	B-B2	C6B04	CU111	+12, 0
13	+NOT CMD-O SMPL	B-B2	E3D10	CU071	+12, 0
14	+STATUS-IN	B-B2	G4D04	CU051	+12, 0
15	+STA-IN DLY	B-B2	E3J12	CU071	+12, 0
16	+NOT STA-IN SMPL	B-B2	E3B10	CU071	+12, 0
17	+SERVICE OUT	B-B2	D2D09	CU271	+12, 0
18	+SRV-O DLY	B-B2	E3D07	CU071	+12, 0
19	+SERVICE IN	B-B2	G4B13	CU061	+12, 0
20	+SERVICE IN DLY	B-B2	E3J06	CU071	+12, 0
21	+NOT SRV-IN SMPL	B-B2	E3B08	CU071	+12, 0
22	+SENSE GATE BYTE1	B-B2	H7B03	CU191	+12, 0
23	+SENSE GATE BYTE2	B-B2	H7D02	CU191	+12, 0
24	-SENSE END	B-B2	G6B10	CU191	0, +12
25	+SENSE BYTE 2 LATCH	B-B2	K7B12	CU191	+12, 0
26	+SEL-O OR BURST	B-B2	J2B04	CU041	+12, 0
27	+CHANNEL END	B-B2	J2B02	CU081	+12, 0
28	+INTERRUPTION REQ	B-B2	F3B02	CU011	+12, 0

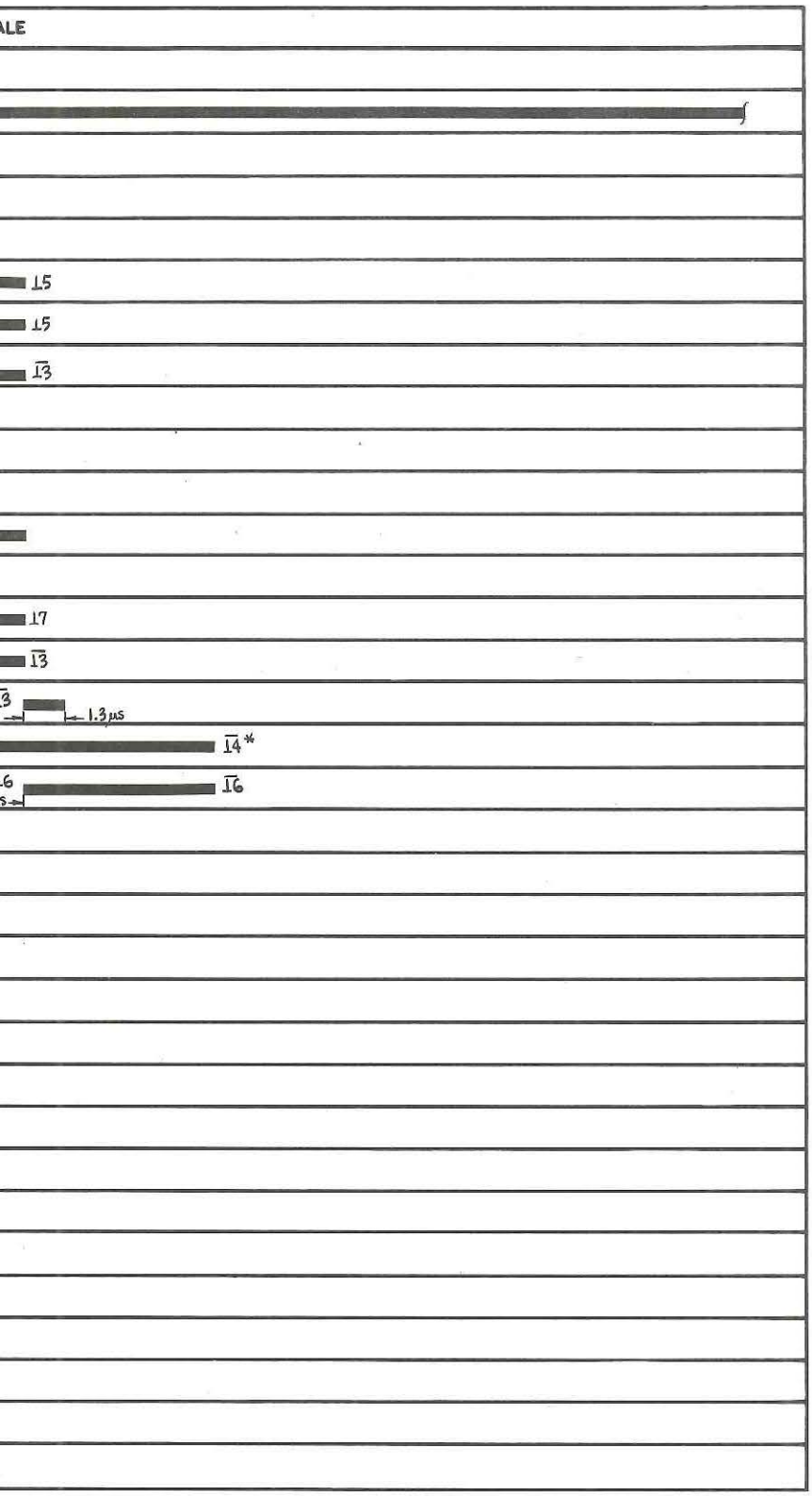




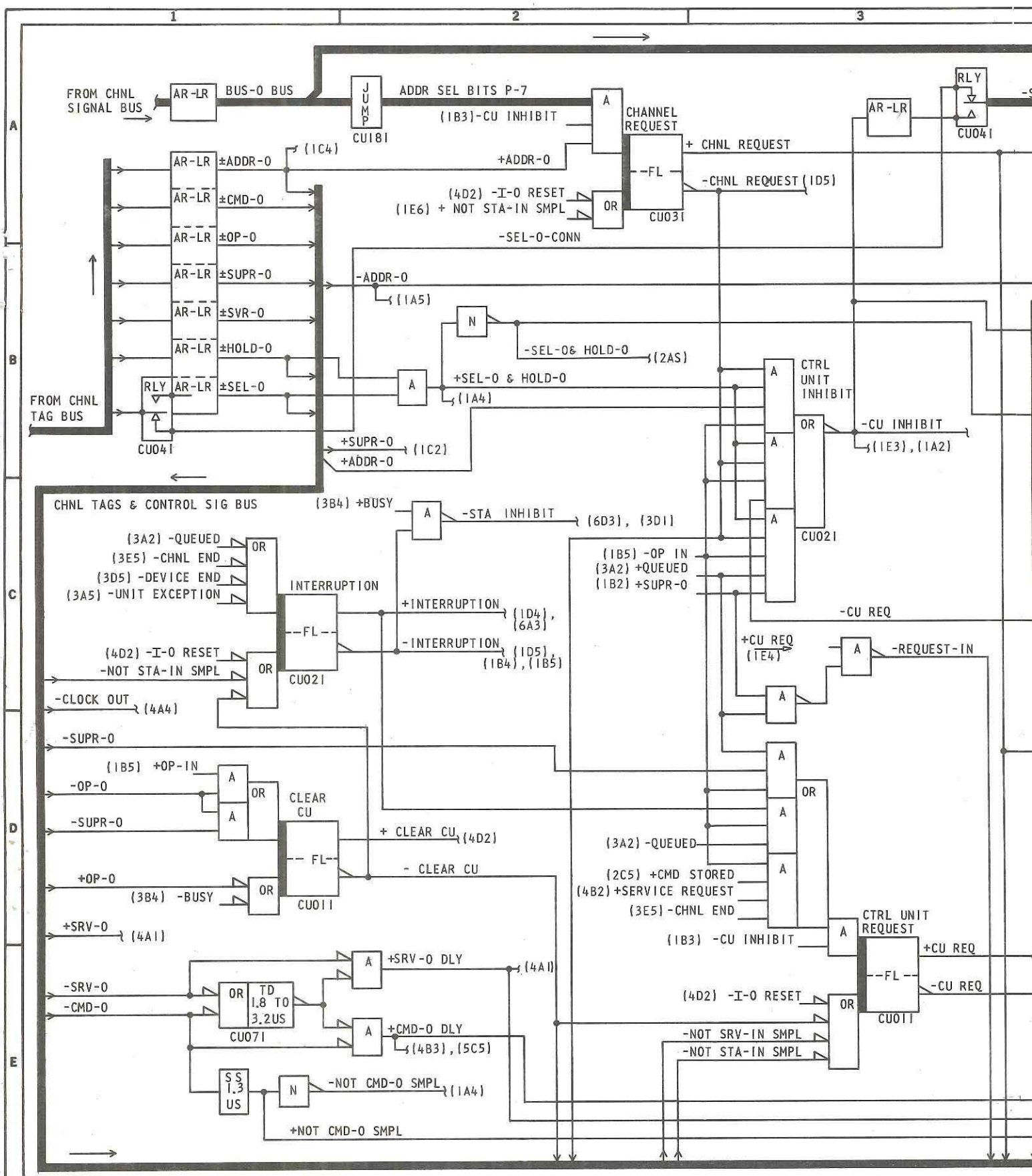
DATE	EC NO.	DATE	EC NO.	TITLE: SENSE COMMAND
20AUG65				
				IBM
				PART NO: 845803 PAGE: CT004

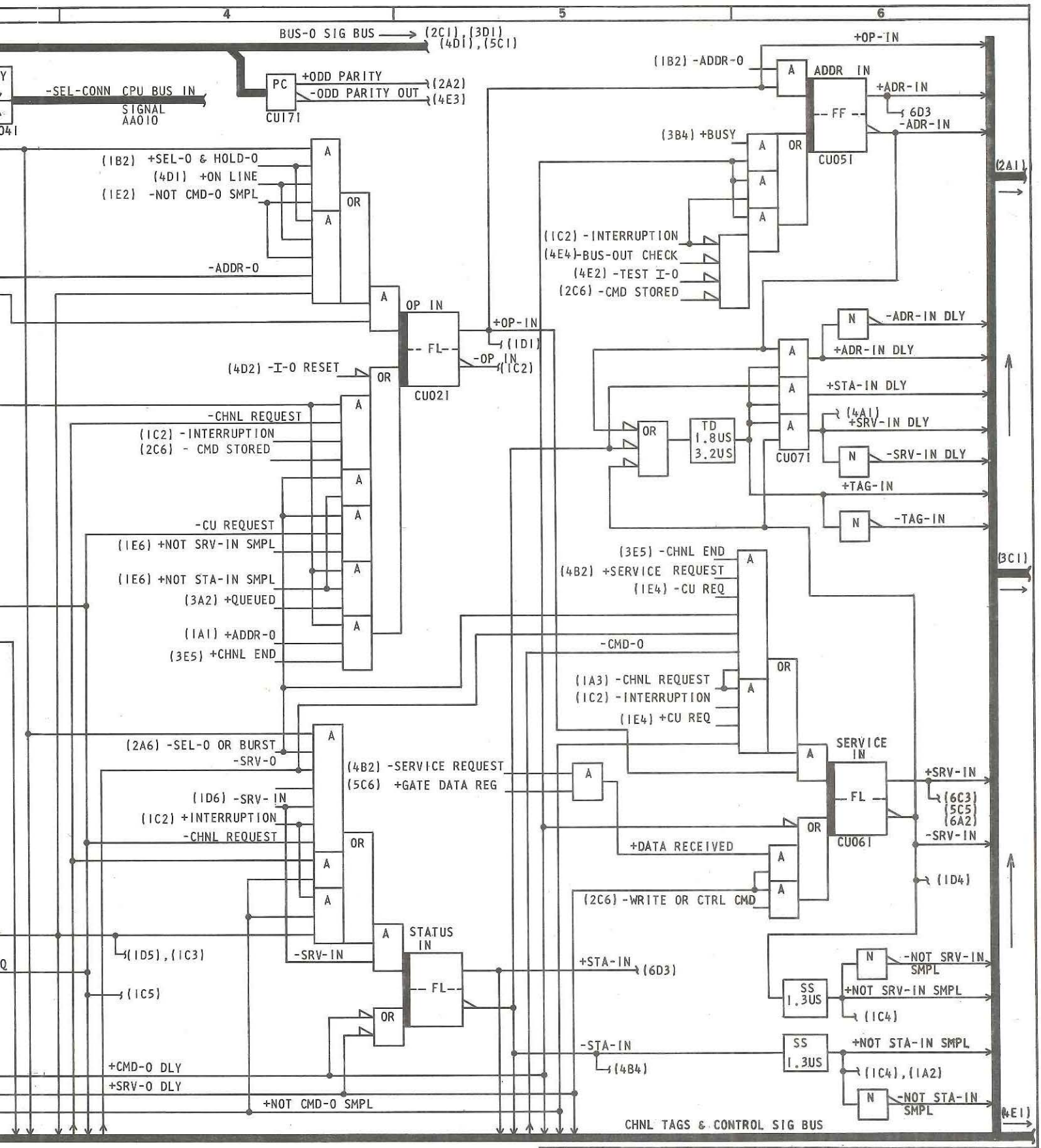
NO.	SIGNAL NAME	BOARD	SIGNAL PIN	A.L.D.	LEVEL
1	-OP-OUT	B-B2	D3B04	CU141	0, +12
2	- BUS-O (9 LINES)				
3	+ADDRESS-O	B-B2	D2D07	CU271	+12, 0
4	+SEL-OUT	B-B2	D3D13	CU041	+12, 0
5	+CHANNEL REQUEST	B-B2	C4B03	CU031	+12, 0
6	+OP-IN	B-B2	F3B09	CU021	+12, 0
7	- BUS-IN (9 LINES)				
8	+ADDRESS-IN	B-B2	G3D04	CU051	+12, 0
9	+COMMAND OUT	B-B2	D2D12	CU271	+12, 0
10	+COMMAND OUT DLY	B-B2	E3B13	CU071	+12, 0
11	- TEST I-O	B-B2	C4D11	CU031	0, +12
12	+NOT CMD-O SMPL	B-B2	E3D10	CU071	+12, 0
13	+STATUS-IN	B-B2	G4D04	CU051	+12, 0
14	+STATUS-IN DLY	B-B2	E3J12	CU071	+12, 0
15	+NOT STAT-IN SMPL	B-B2	E3B10	CU071	+12, 0
16	+SERVICE OUT	B-B2	D2D09	CU271	+12, 0
17	+SRV-O DLY	B-B2	E3D07	CU071	+12, 0



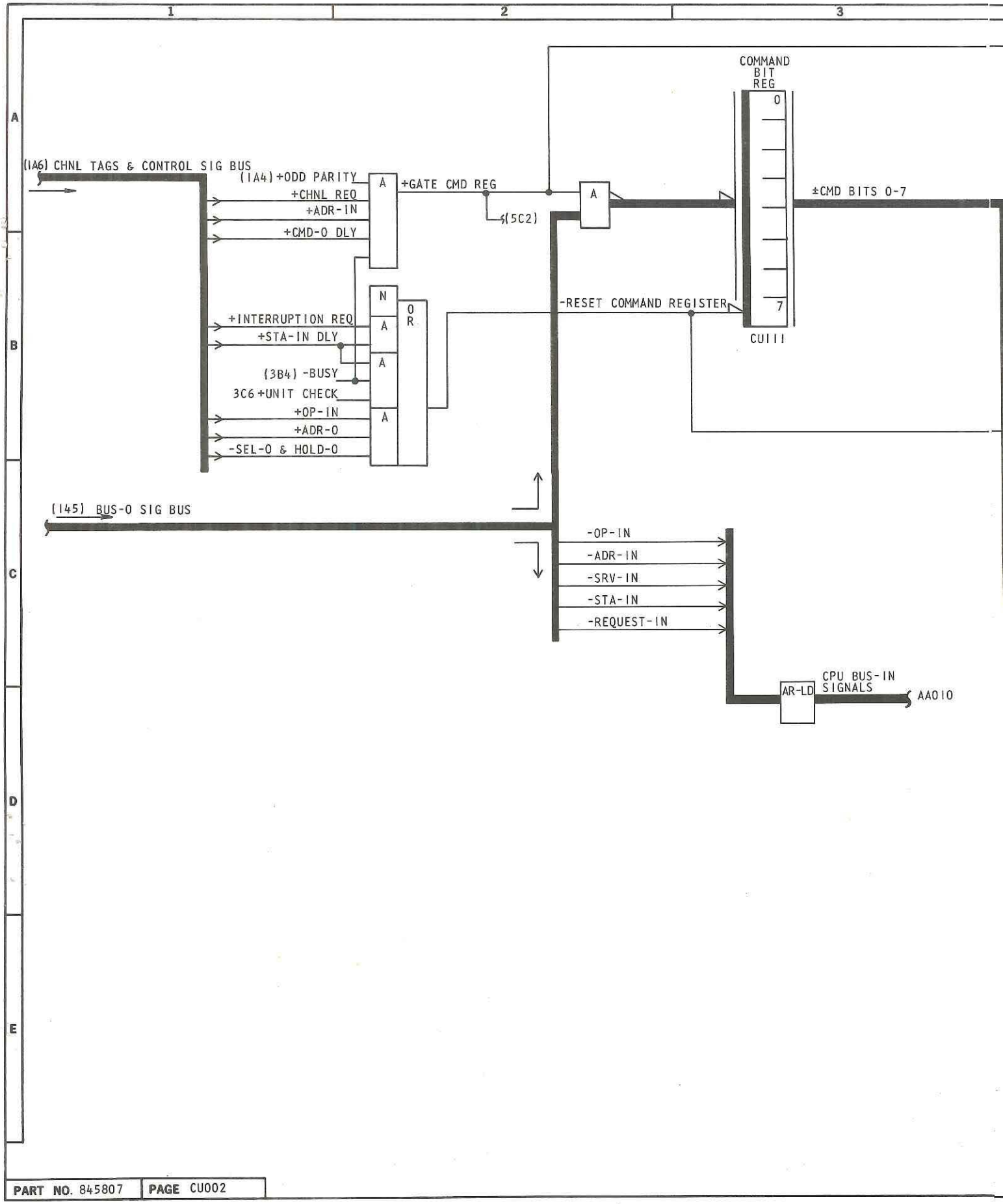


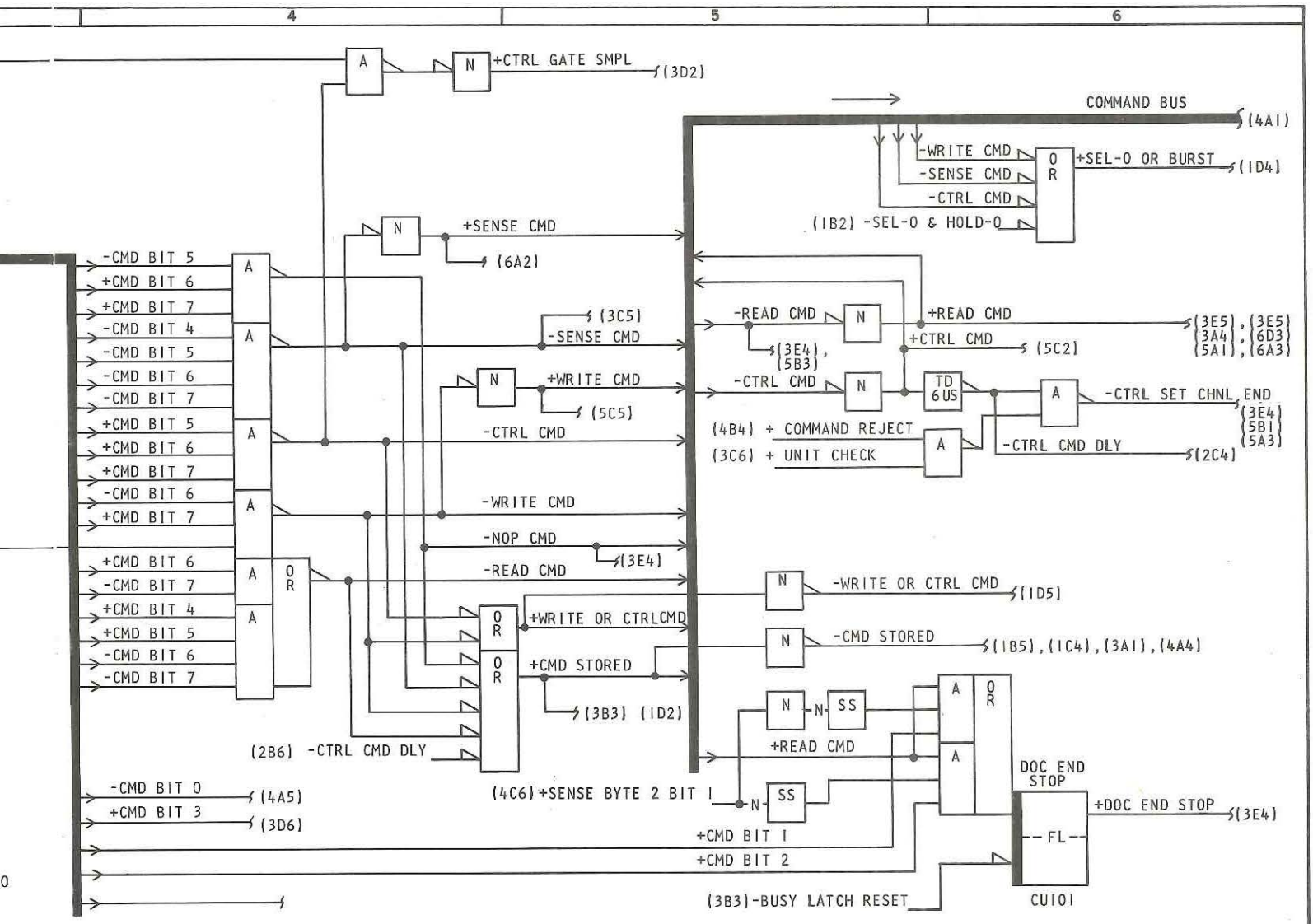
DATE	EC NO.	DATE	EC NO.	TITLE: TEST I-O
20AUG65				
				IBM
				PART NO: 845804 PAGE: CT005


FROM CHNL SIGNAL BUS
AR-LR
BUS-0 BUS
JUMP
CU181
ADDR SEL BITS P-7
(1B3)-CU INHIBIT
A
CHANNEL REQUEST
+ CHNL REQUEST
-FL-
-CHNL REQUEST (1D5)
(4D2) -I-O RESET
(1E6) + NOT STA-IN SMPL
OR
CU031
+ADDR-0
(1C4)
AR-LR ±ADDR-0
AR-LR ±CMD-0
AR-LR ±OP-0
AR-LR ±SUPR-0
AR-LR ±SVR-0
AR-LR ±HOLD-0
RLY AR-LR ±SEL-0
FROM CHNL TAG BUS
CU041
-SEL-0-CONN
-ADDR-0
(1A5)
N
-SEL-0& HOLD-0
(2A5)
A
+SEL-0 & HOLD-0
(1A4)
+SUPR-0
+ADDR-0
(1C2)
CHNL TAGS & CONTROL SIG BUS
(3B4) +BUSY
-STA INHIBIT
(6D3), (3D1)
CTRL UNIT INHIBIT
OR
-CU INHIBIT
(1E3), (1A2)
CU021
(3A2) -QUEUED
(3E5) -CHNL END
(3D5) -DEVICE END
(3A5) -UNIT EXCEPTION
INTERRUPTION
+INTERRUPTION
(1D4), (6A3)
-INTERRUPTION
(1D5), (1B4), (1B5)
(1B5) -OP IN
(3A2) +QUEUED
(1B2) +SUPR-0
-CU REQ
+CU REQ (1E4)
-REQUEST-IN
(4D2) -I-O RESET
-NOT STA-IN SMPL
-CLOCK OUT
(4A4)
-SUPR-0
(1B5) +OP-IN
-OP-0
CLEAR CU
+ CLEAR CU (4D2)
- CLEAR CU
+OP-0
(3B4) -BUSY
CU011
+SRV-0
(4A1)
(3A2) -QUEUED
(2C5) +CMD STORED
(4B2) +SERVICE REQUEST
(3E5) -CHNL END
(1B3) -CU INHIBIT
CTRL UNIT REQUEST
+CU REQ
-CU REQ
-SRV-0
-CMD-0
TD 1.8 TO 3.2US
CU071
+SRV-0 DLY
+CMD-0 DLY
(4B3), (5C5)
SS 1.3 US
-NOT CMD-0 SMPL
(1A4)
+NOT CMD-0 SMPL
-NOT SRV-IN SMPL
-NOT STA-IN SMPL

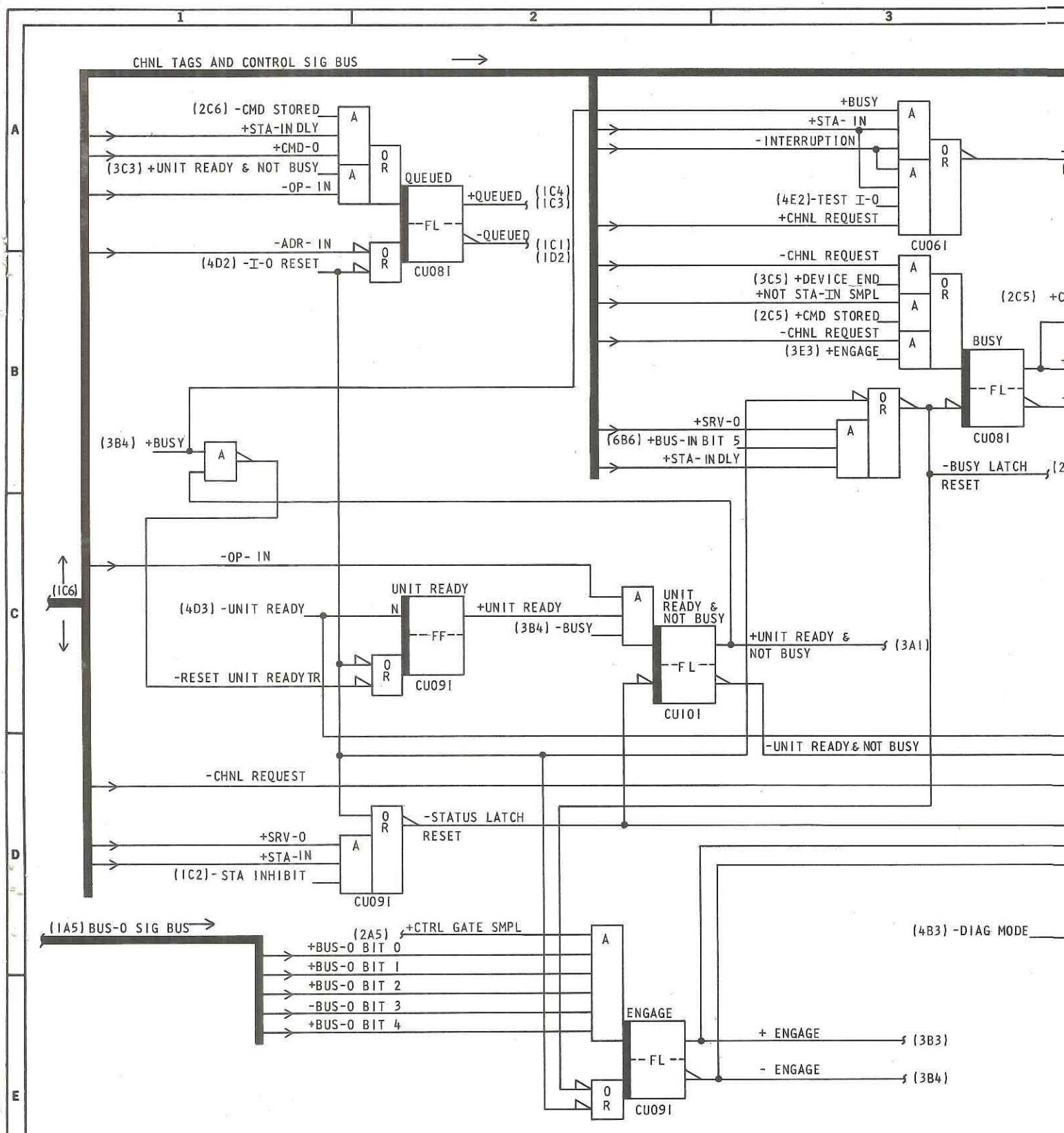


DATE	EC NO.	DATE	EC NO.	TITLE CU-INTERFACE CONTROL	
20AUG65	123300			IBM	TYPE
				PART NO. 845806	PAGE CU001

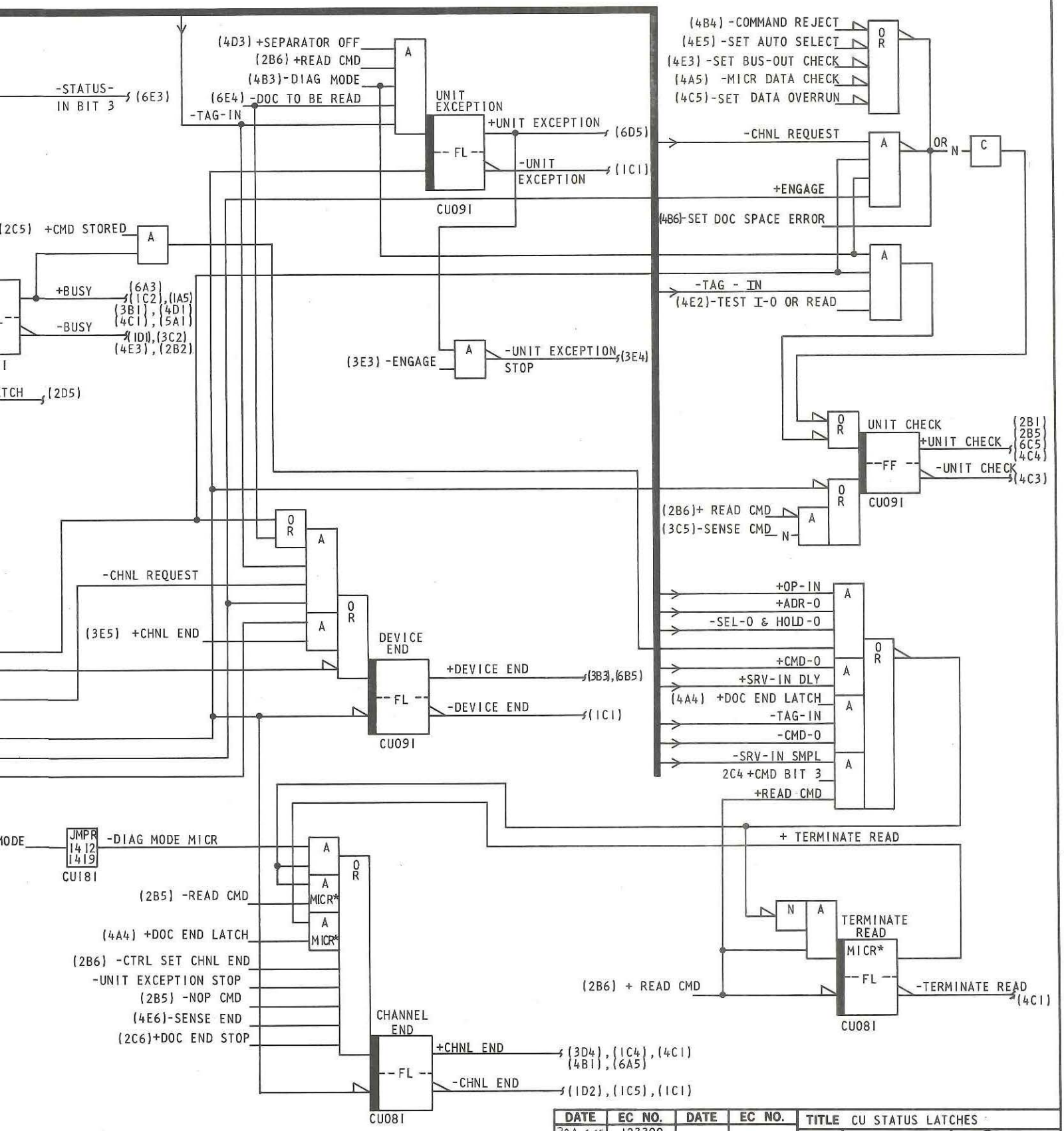

1
2
3
A
B
C
D
E
COMMAND BIT REG
0
7
CU111
(1A6) CHNL TAGS & CONTROL SIG BUS
(1A4) +ODD PARITY
+CHNL REQ
+ADR-IN
+CMD-0 DLY
A
+GATE CMD REG
(5C2)
A
±CMD BITS 0-7
N
A
A
A
O
R
+INTERRUPTION REQ
+STA-IN DLY
(3B4) -BUSY
3C6 +UNIT CHECK
+OP-IN
+ADR-0
-SEL-0 & HOLD-0
-RESET COMMAND REGISTER
(145) BUS-0 SIG BUS
-OP-IN
-ADR-IN
-SRV-IN
-STA-IN
-REQUEST-IN
AR-LD
CPU BUS-IN SIGNALS
AA010



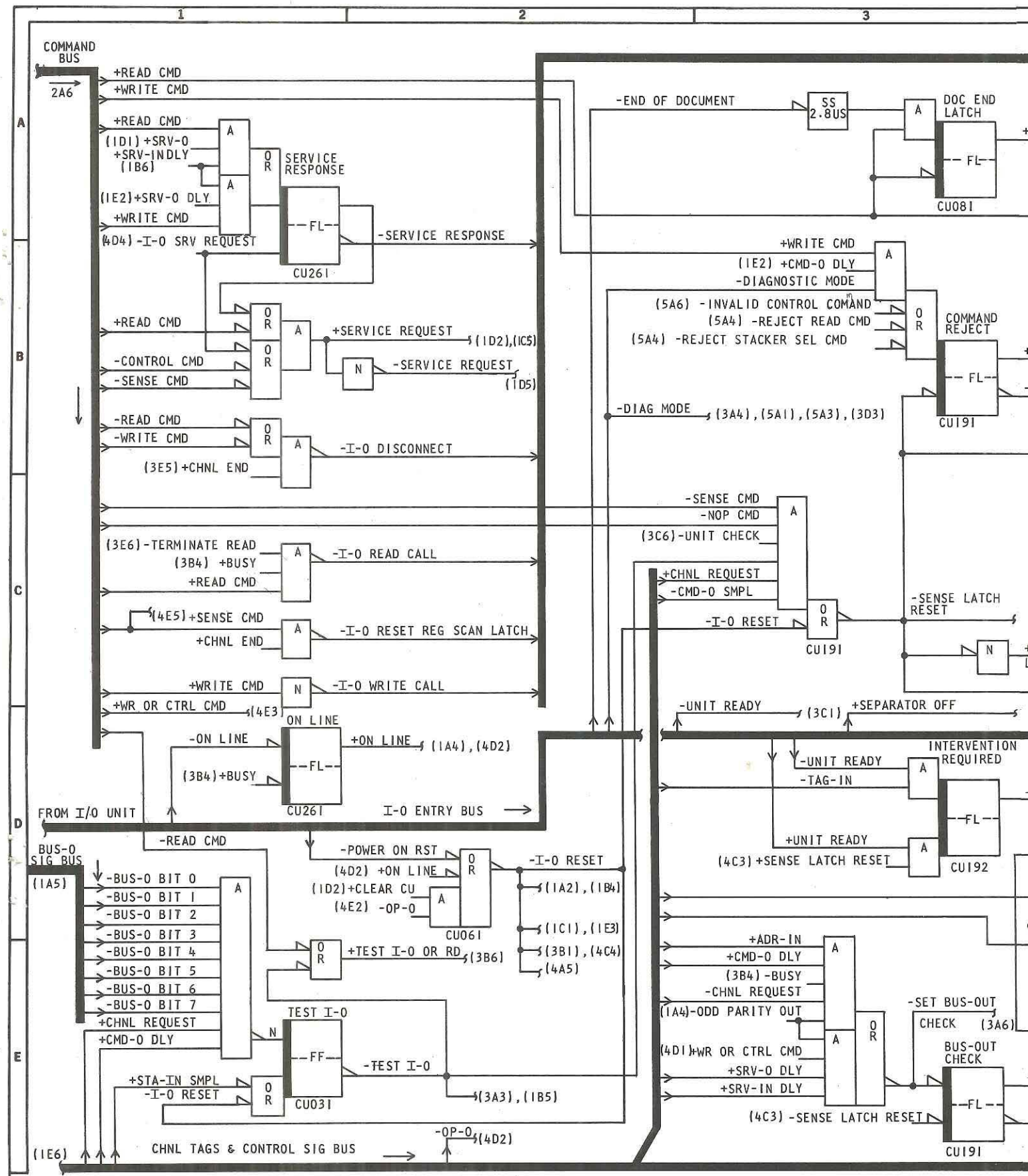
DATE	EC NO.	DATE	EC NO.	TITLE CU COMMAND REGISTER	
20 AUG 65	123300			IBM	TYPE
				PART NO. 845807	PAGE CU002

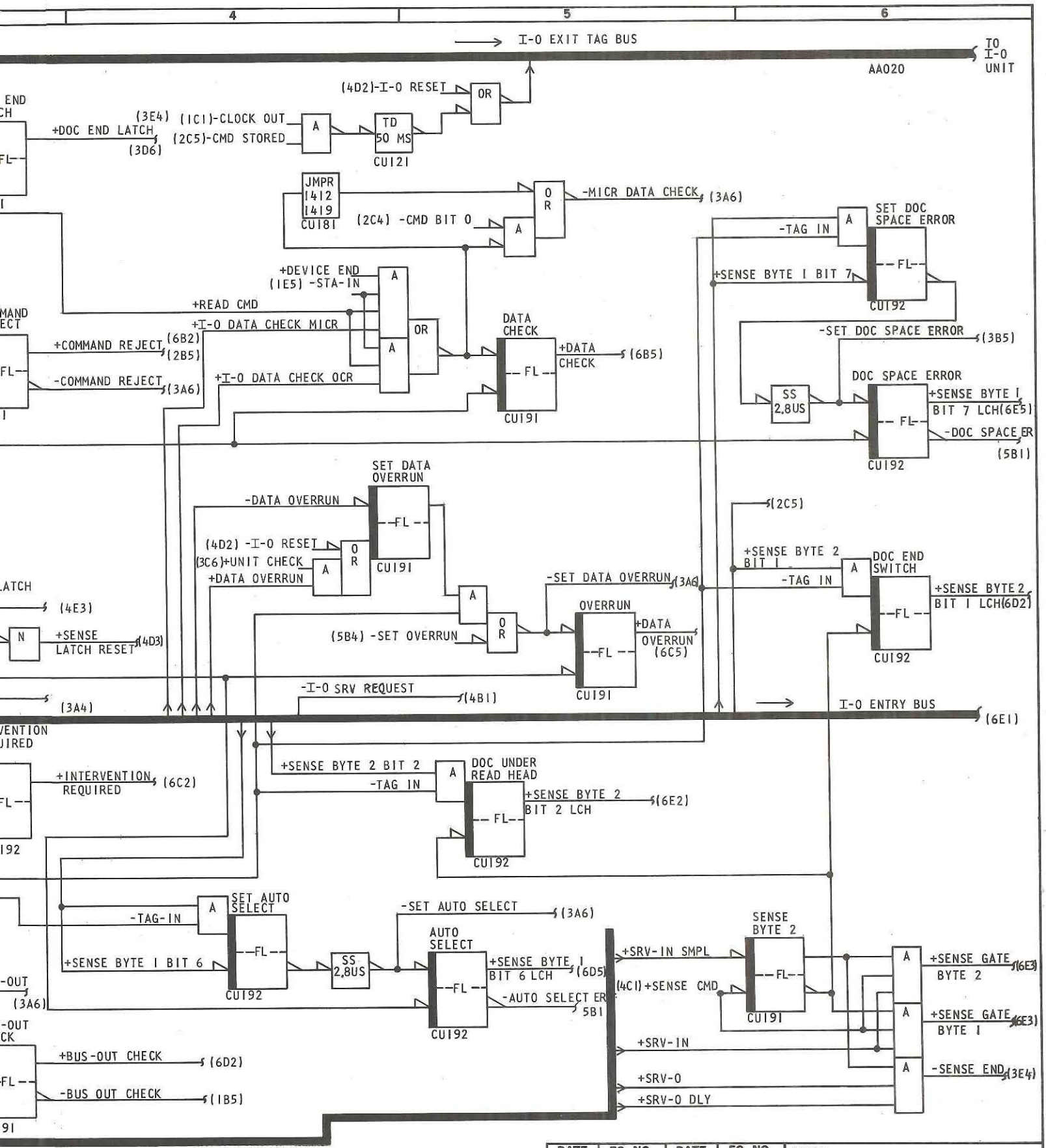

1
2
3
A
B
C
D
E
CHNL TAGS AND CONTROL SIG BUS
(2C6) -CMD STORED
+STA-IN DLY
+CMD-0
(3C3) +UNIT READY & NOT BUSY
-OP- IN
QUEUED
+QUEUED
(1C4) (1C3)
-QUEUED
(1C1) (1D2)
-ADR- IN
(4D2) -I-O RESET
CU081
+BUSY
+STA- IN
-INTERRUPTION
(4E2)-TEST I-O
+CHNL REQUEST
CU061
-CHNL REQUEST
(3C5) +DEVICE END
+NOT STA-IN SMPL
(2C5) +CMD STORED
-CHNL REQUEST
(3E3) +ENGAGE
BUSY
CU081
(3B4) +BUSY
+SRV-0
(6B6) +BUS-IN BIT 5
+STA-IN DLY
-BUSY LATCH RESET
(1C6)
-OP- IN
UNIT READY
(4D3) -UNIT READY
+UNIT READY
(3B4) -BUSY
UNIT READY & NOT BUSY
+UNIT READY & NOT BUSY
(3A1)
-RESET UNIT READY TR
CU091
CU101
-UNIT READY & NOT BUSY
-CHNL REQUEST
-STATUS LATCH RESET
+SRV-0
+STA-IN
(1C2)- STA INHIBIT
CU091
(1A5) BUS-0 SIG BUS
(2A5) +CTRL GATE SMPL
+BUS-0 BIT 0
+BUS-0 BIT 1
+BUS-0 BIT 2
-BUS-0 BIT 3
+BUS-0 BIT 4
ENGAGE
+ ENGAGE
(3B3)
- ENGAGE
(3B4)
CU091
(4B3) -DIAG MODE

*REFERS TO MFI MICR MACHINES

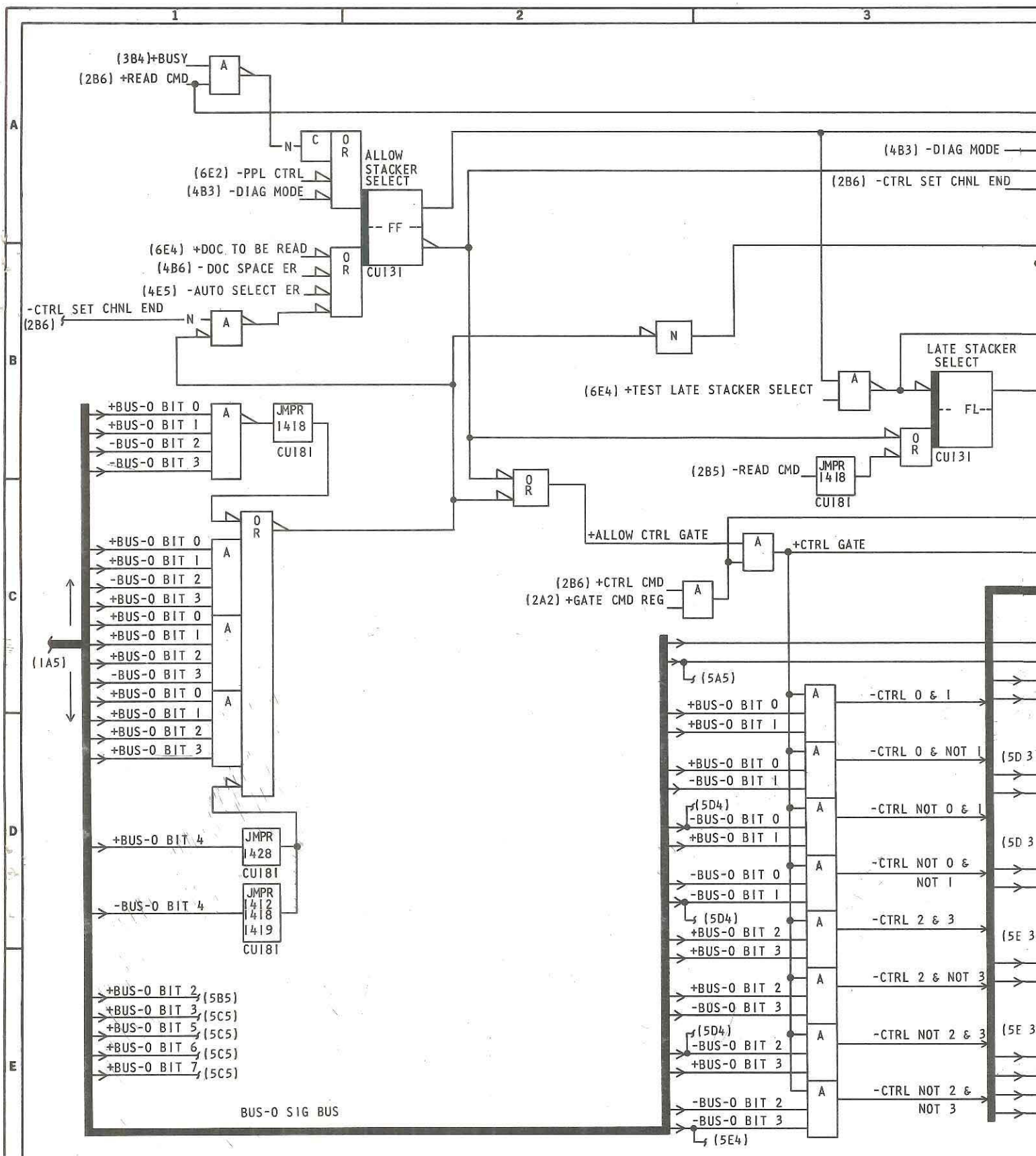


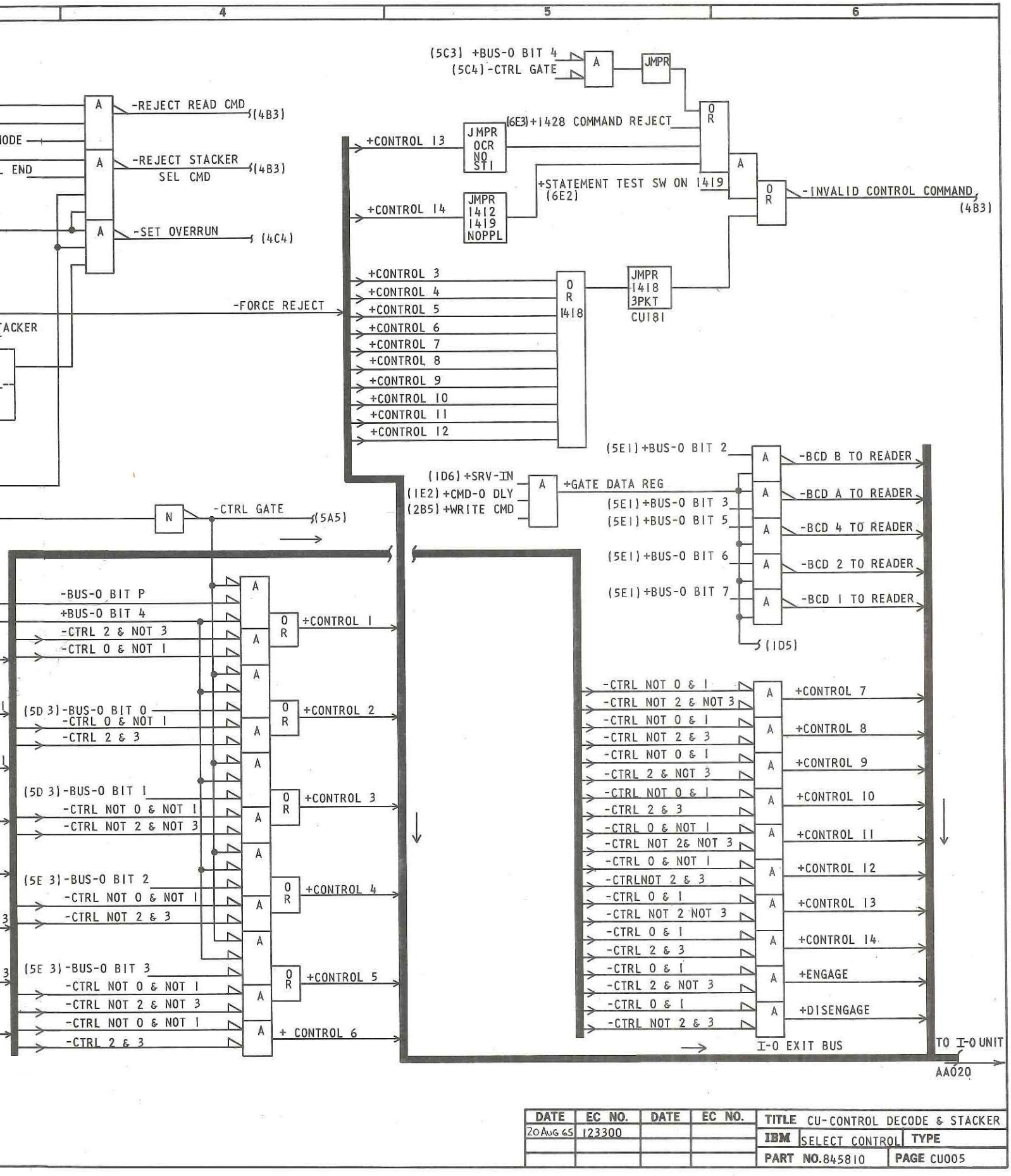
DATE	EC NO.	DATE	EC NO.	TITLE CU STATUS LATCHES	
20AUG65	123300			IBM	TYPE
				PART NO. 845808	PAGE CU003


COMMAND BUS
2A6
+READ CMD
+WRITE CMD
+READ CMD
(1D1) +SRV-0
+SRV-INDLY
(1B6)
(1E2) +SRV-0 DLY
+WRITE CMD
(4D4) -I-O SRV REQUEST
SERVICE RESPONSE
FL
CU261
-SERVICE RESPONSE
+READ CMD
-CONTROL CMD
-SENSE CMD
+SERVICE REQUEST
(1D2),(1C5)
-SERVICE REQUEST
(1D5)
-READ CMD
-WRITE CMD
(3E5) +CHNL END
-I-O DISCONNECT
(3E6) -TERMINATE READ
(3B4) +BUSY
+READ CMD
-I-O READ CALL
(4E5) +SENSE CMD
+CHNL END
-I-O RESET REG SCAN LATCH
+WRITE CMD
+WR OR CTRL CMD
(4E3)
-I-O WRITE CALL
ON LINE
-ON LINE
(3B4) +BUSY
+ON LINE
(1A4),(4D2)
CU261
FROM I/O UNIT
I-O ENTRY BUS
BUS-0 SIG BUS
(1A5)
-BUS-0 BIT 0
-BUS-0 BIT 1
-BUS-0 BIT 2
-BUS-0 BIT 3
-BUS-0 BIT 4
-BUS-0 BIT 5
-BUS-0 BIT 6
-BUS-0 BIT 7
+CHNL REQUEST
+CMD-0 DLY
-READ CMD
-POWER ON RST
(4D2) +ON LINE
(1D2) +CLEAR CU
(4E2) -OP-0
CU061
-I-O RESET
(1A2),(1B4)
(1C1),(1E3)
(3B1),(4C4)
(4A5)
+TEST I-O OR RD
(3B6)
TEST I-O
FF
-TEST I-O
(3A3),(1B5)
+STA-IN SMPL
-I-O RESET
CU031
(1E6)
CHNL TAGS & CONTROL SIG BUS
-OP-0
(4D2)
-END OF DOCUMENT
SS 2.8US
DOC END LATCH
FL
CU081
+WRITE CMD
(1E2) +CMD-0 DLY
-DIAGNOSTIC MODE
(5A6) -INVALID CONTROL COMAND
(5A4) -REJECT READ CMD
(5A4) -REJECT STACKER SEL CMD
COMMAND REJECT
CU191
-DIAG MODE
(3A4),(5A1),(5A3),(3D3)
-SENSE CMD
-NOP CMD
(3C6)-UNIT CHECK
+CHNL REQUEST
-CMD-0 SMPL
-I-O RESET
-SENSE LATCH RESET
-UNIT READY
(3C1)
+SEPARATOR OFF
INTERVENTION REQUIRED
-UNIT READY
-TAG-IN
+UNIT READY
(4C3) +SENSE LATCH RESET
CU192
+ADR-IN
+CMD-0 DLY
(3B4) -BUSY
-CHNL REQUEST
(1A4)-ODD PARITY OUT
(4D1)+WR OR CTRL CMD
+SRV-0 DLY
+SRV-IN DLY
-SET BUS-OUT CHECK
(3A6)
BUS-OUT CHECK
(4C3) -SENSE LATCH RESET
CU191

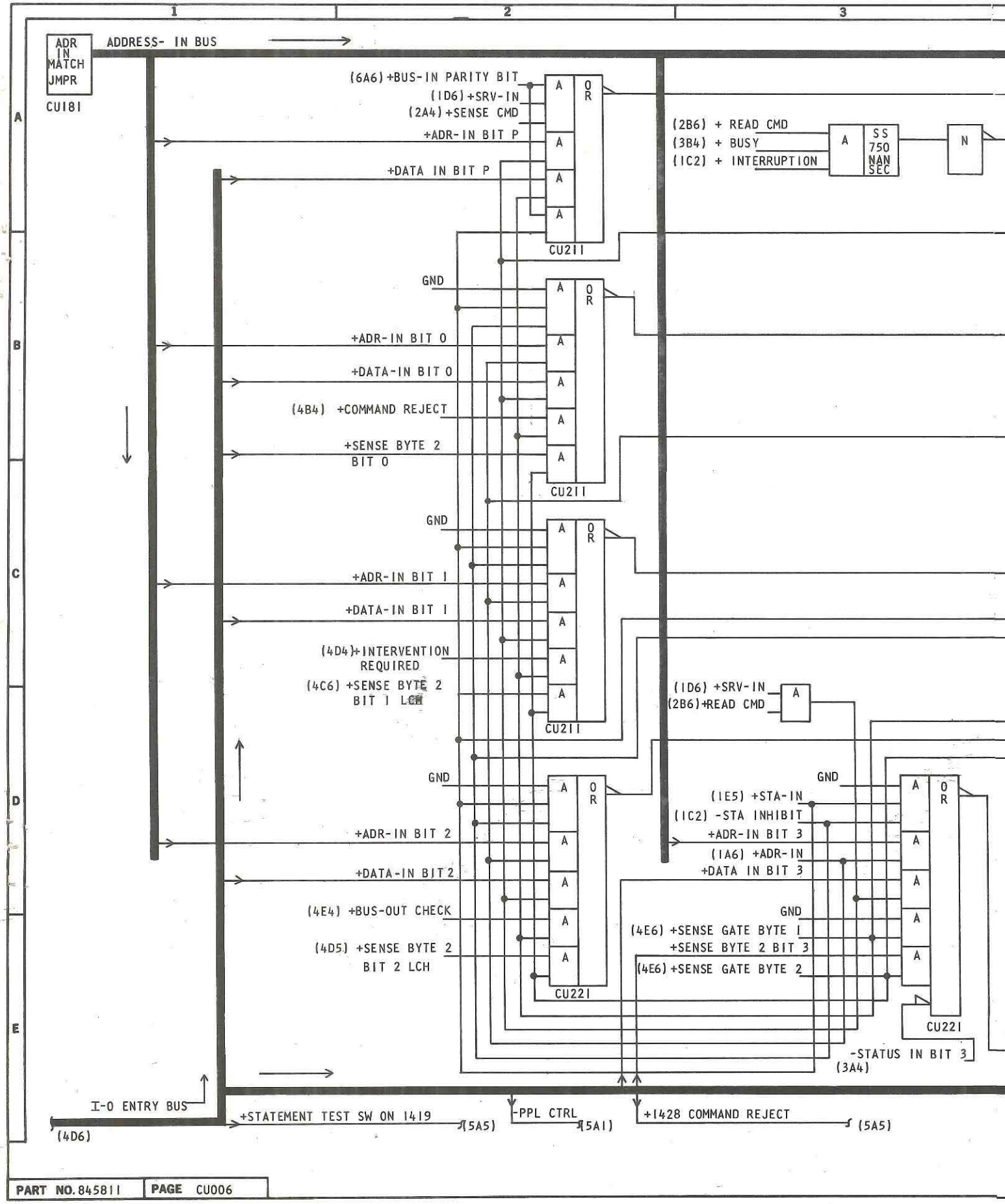


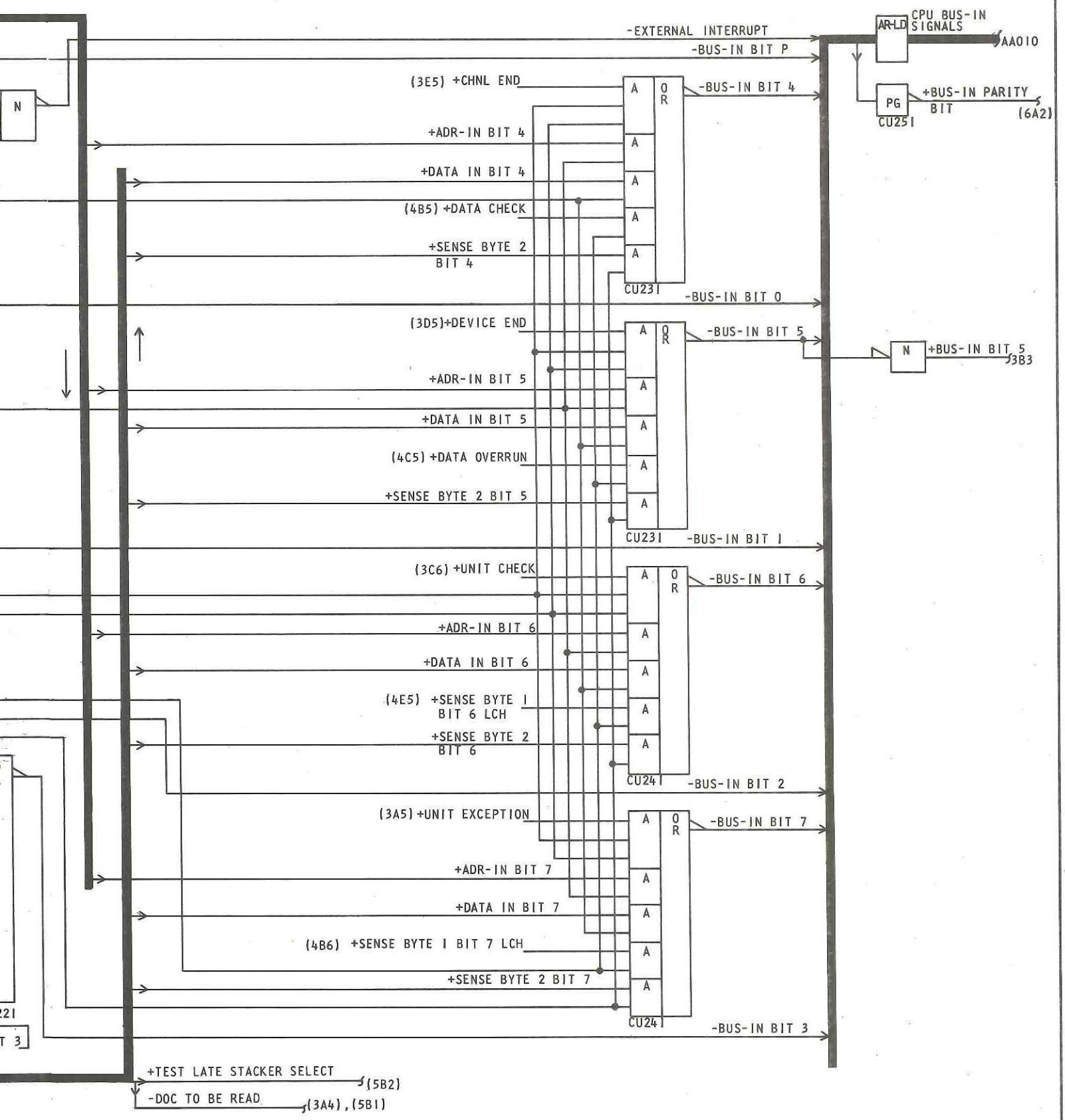
DATE	EC NO.	DATE	EC NO.	TITLE CU-SENSE DATA LATCHES	
20AUG65	123300			IBM	TYPE
				PART NO. 845809	PAGE CU004


1
2
3
A
B
C
D
E
(3B4)+BUSY
(2B6) +READ CMD
A
N
C
OR
ALLOW STACKER SELECT
(6E2) -PPL CTRL
(4B3) -DIAG MODE
FF
CU131
(6E4) +DOC TO BE READ
(4B6) - DOC SPACE ER
(4E5) -AUTO SELECT ER
-CTRL SET CHNL END
(2B6)
(4B3) -DIAG MODE
(2B6) -CTRL SET CHNL END
LATE STACKER SELECT
(6E4) +TEST LATE STACKER SELECT
FL
(2B5) -READ CMD
JMPR 1418
CU181
+BUS-0 BIT 0
+BUS-0 BIT 1
-BUS-0 BIT 2
-BUS-0 BIT 3
+ALLOW CTRL GATE
+CTRL GATE
(2B6) +CTRL CMD
(2A2) +GATE CMD REG
(1A5)
(5A5)
(5D4)
(5B5)
(5C5)
+BUS-0 BIT 4
-BUS-0 BIT 4
JMPR 1428
JMPR 1412 1418 1419
+BUS-0 BIT 5
+BUS-0 BIT 6
+BUS-0 BIT 7
BUS-0 SIG BUS
-CTRL 0 & 1
-CTRL 0 & NOT 1
-CTRL NOT 0 & 1
-CTRL NOT 0 & NOT 1
-CTRL 2 & 3
-CTRL 2 & NOT 3
-CTRL NOT 2 & 3
-CTRL NOT 2 & NOT 3
(5D 3
(5E 3
(5E4)



DATE	EC NO.	DATE	EC NO.	TITLE CU-CONTROL DECODE & STACKER
20 AUG 65	123300			IBM SELECT CONTROL TYPE
				PART NO. 845810 PAGE CU005


1
2
3
A
B
C
D
E
ADR IN MATCH JMPR
CU181
ADDRESS- IN BUS
(6A6) +BUS-IN PARITY BIT
(1D6) +SRV-IN
(2A4) +SENSE CMD
+ADR-IN BIT P
+DATA IN BIT P
A
A
A
A
OR
CU211
(2B6) + READ CMD
(3B4) + BUSY
(1C2) + INTERRUPTION
A
SS 750 NAN SEC
N
GND
+ADR-IN BIT 0
+DATA-IN BIT 0
(4B4) +COMMAND REJECT
+SENSE BYTE 2 BIT 0
CU211
GND
+ADR-IN BIT 1
+DATA-IN BIT 1
(4D4)+INTERVENTION REQUIRED
(4C6) +SENSE BYTE 2 BIT 1 LCH
CU211
(1D6) +SRV-IN
(2B6)+READ CMD
GND
+ADR-IN BIT 2
+DATA-IN BIT 2
(4E4) +BUS-OUT CHECK
(4D5) +SENSE BYTE 2 BIT 2 LCH
CU221
GND
(1E5) +STA-IN
(1C2) -STA INHIBIT
+ADR-IN BIT 3
(1A6) +ADR-IN
+DATA IN BIT 3
GND
(4E6) +SENSE GATE BYTE 1
+SENSE BYTE 2 BIT 3
(4E6) +SENSE GATE BYTE 2
CU221
-STATUS IN BIT 3
(3A4)
I-O ENTRY BUS
(4D6)
+STATEMENT TEST SW ON 1419
(5A5)
-PPL CTRL
(5A1)
+1428 COMMAND REJECT
(5A5)



DATE	EC NO.	DATE	EC NO.	TITLE CU- BUS-IN ASSEMBLY	
20 AUG 65	123300			IBM	TYPE
				PART NO. 845811	PAGE CU006

R25-5166-0

System/360 Model 30 Attachment Feature, 1419/1412 Reader/Sorter Printed in U.S.A. R25-5166-0

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