

DATA-PAC

H 112 Series Instruction Manual

H 112 DIGITAL CONTROLLER

Central Processor Description

Volume II

Honeywell

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Honeywell Inc. Computer Control Division**

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LOGIC BLOCK DIAGRAMS

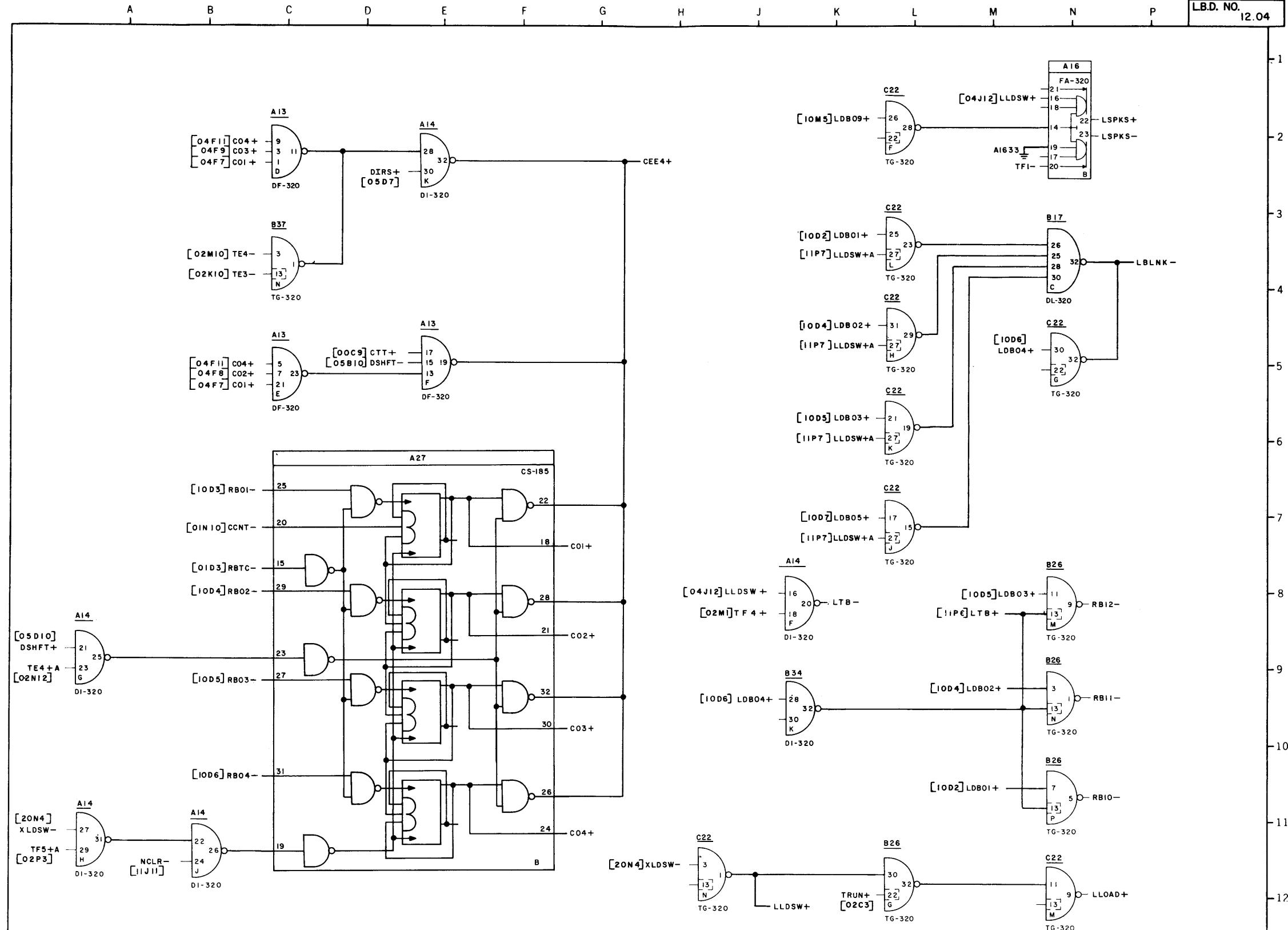
Register Control
LBD No. 12.00
Dwg. No. 70 026 909

Register Bus Control (RB)
LBD No. 12.01
Dwg. No. 70 026 910

Timer (T)
LBD No. 12.02
Dwg. No. 70 026 911

Adder and Interrupt (AD, INT)
LBD No. 12.03
Dwg. No. 70 026 912

Shift Counter and Memory Load (C,L)
LBD No. 12.04
Dwg. No. 70 026 913



NOTES:
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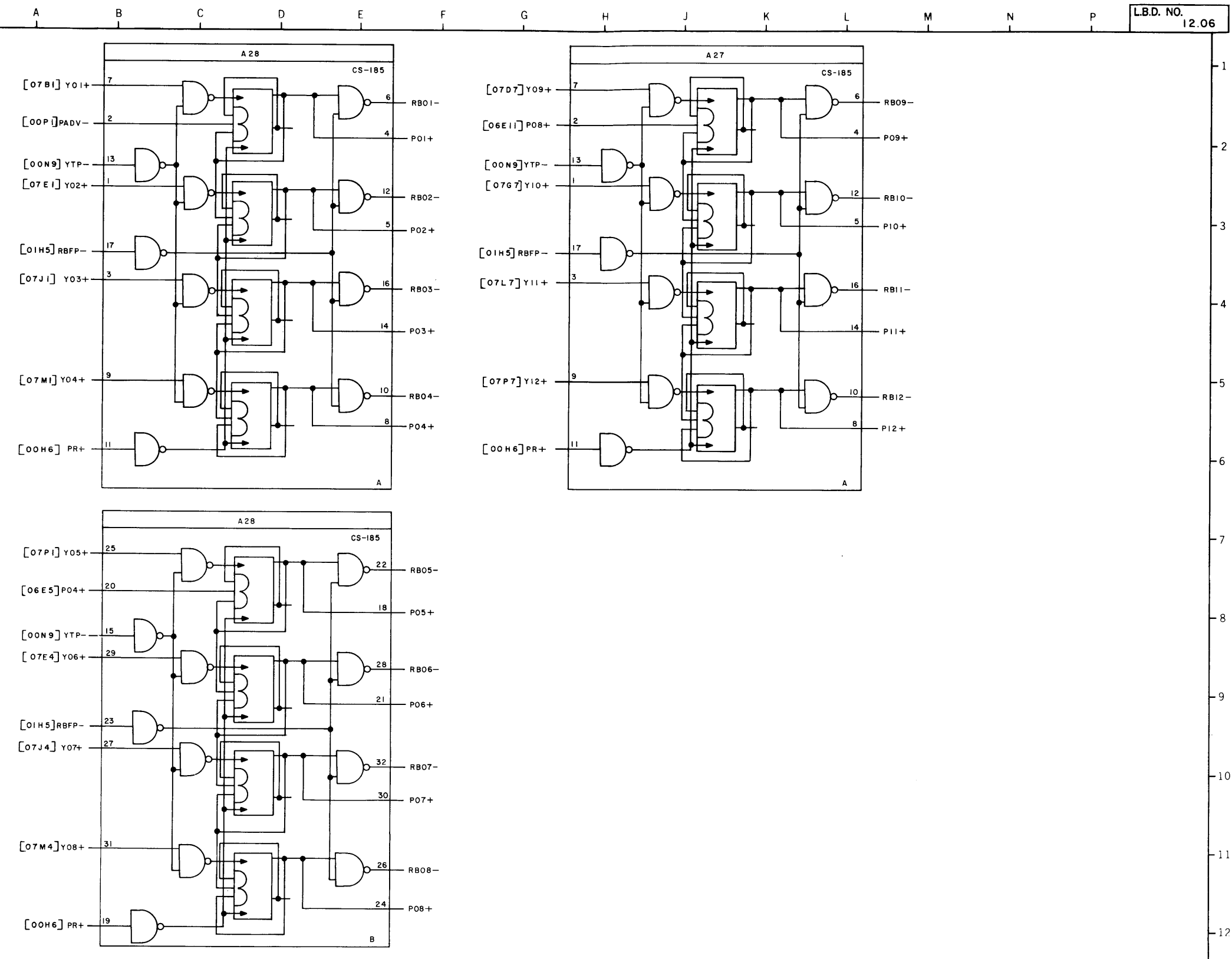
CHK	REVISIONS	REV.
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		G
		H
		J
		K
		L
		M
		N
		P

SR 54-4083

HONEYWELL		TITLE	
I N C.		SHIFT COUNTER (C)	
COMPUTER CONTROL DIVISION		MEMORY LOAD (L)	
Old Connecticut Path, Framingham, Mass.			
DR. D. HAMEL	DATE 6-30-69	SIZE	DWG NO.
ENG. B. GAYMAN	6/27/69	C	70026 913
APP. <i>[Signature]</i>	12-12-69	REV.	A
PROJECT NO. 59291			

Decoder (D)
LBD No. 12.05
Dwg. No. 70 026 914

Program Counter (P)
LBD No. 12.06
Dwg. No. 70 026 915

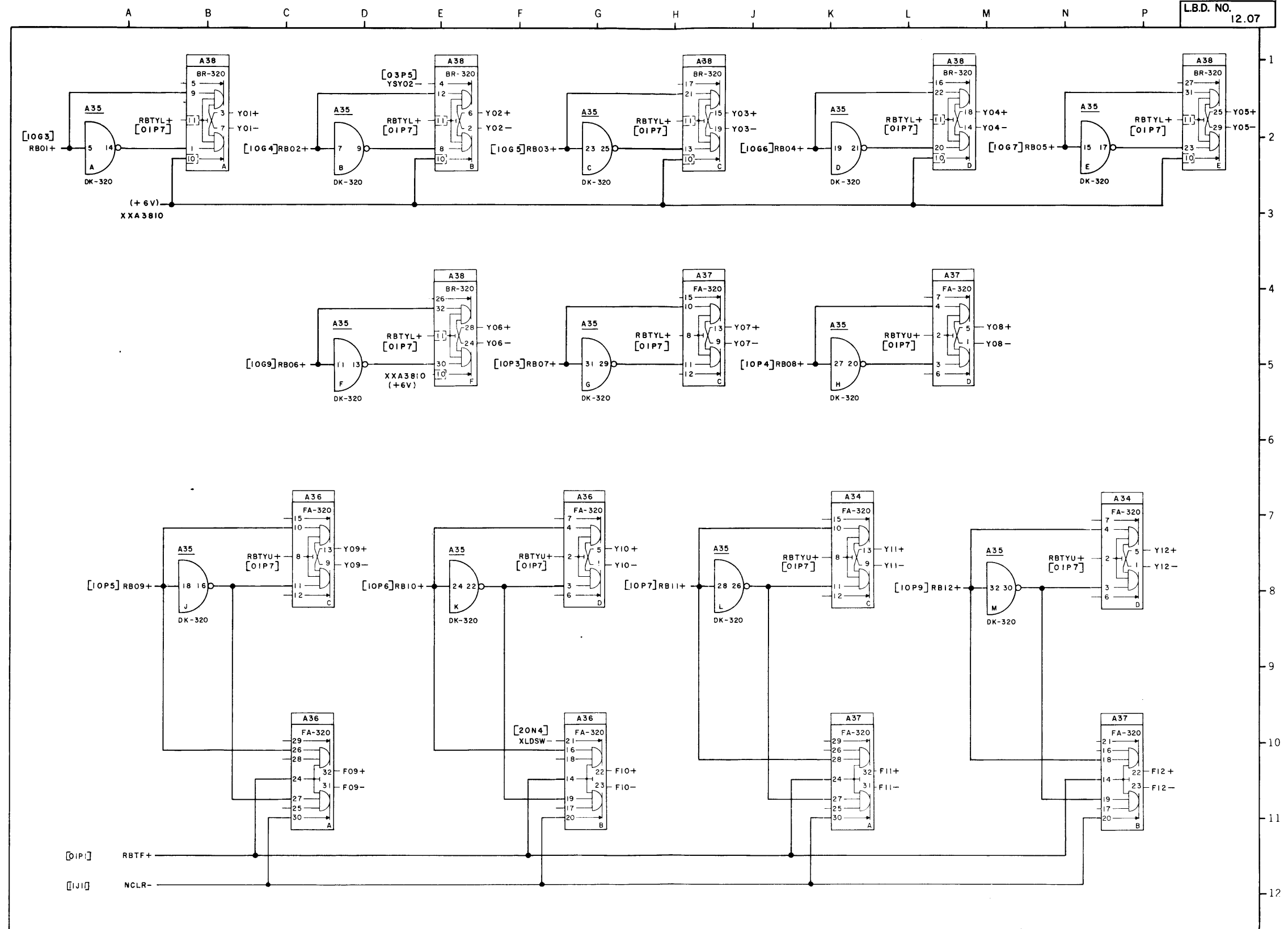


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HONEYWELL INC.		TITLE PROGRAM COUNTER (P)	
COMPUTER CONTROL DIVISION Old Connecticut Path, Framingham, Mass.			
DR. D. HAMEL	DATE 6-30-69	SIZE	DWG NO.
ENG. B. GAYMAN	6-25-69	C	70026 915
APP. <i>Ed. Hengel</i>	12-12-69	REV.	A
PROJECT NO. 59291			

Memory Address Register and Op Code Register (Y,F)
LBD No. 12.07
Dwg. No. 70 026 916



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SR 59-4083

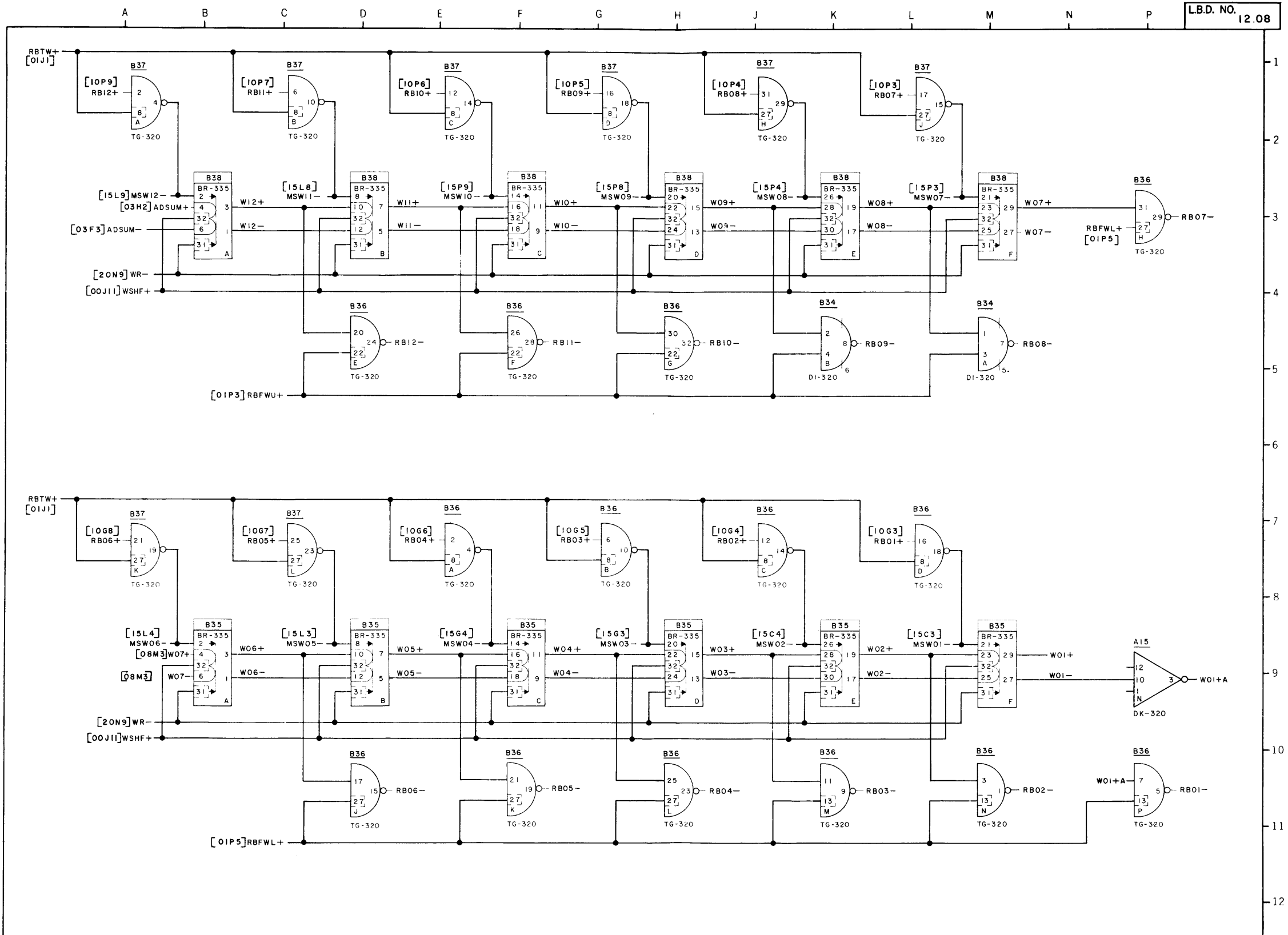
HONEYWELL
 IN C.
 COMPUTER CONTROL DIVISION
 Old Connecticut Path, Framingham, Mass.

DR. D. HAMEL DATE 6-30-69
 ENG. B. GAYMAN 7/2/69
 APP. [Signature] 12-12-69
 PROJECT NO. 59291

TITLE
 ADDRESS REG. (Y)
 OPCODE REG. (F)

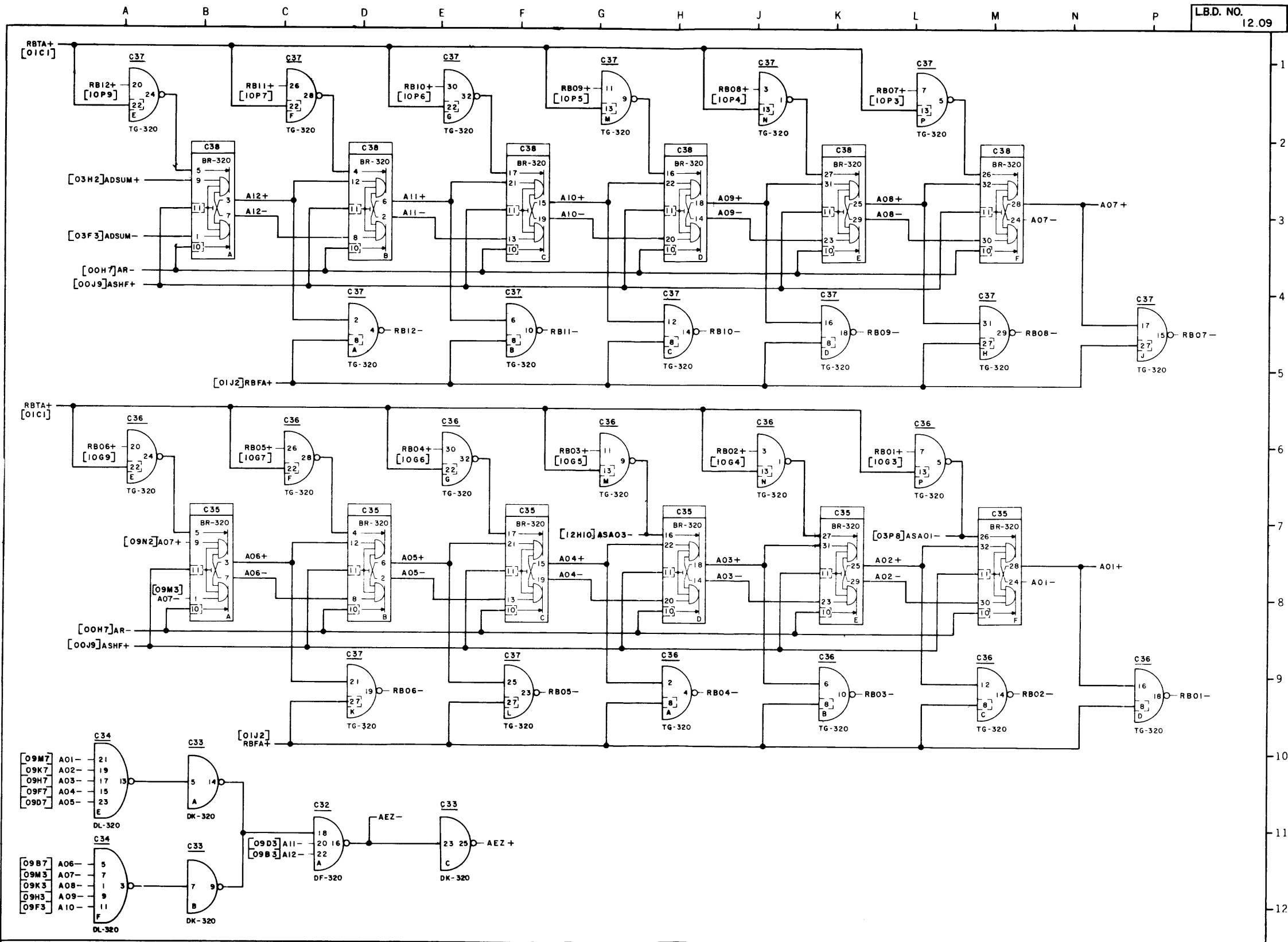
SIZE DWG NO. REV.
 C 70026 916 A

Working Register (W)
LBD No. 12.08
Dwg. No. 70 026 917



NOTES: △ △ △ △	REV	A	HONEYWELL I N C. COMPUTER CONTROL DIVISION Old Connecticut Path, Framingham, Mass. DR. D. HAMEL DATE 6-30-69 ENG. B. GAYMAN 7/2/69 APP. R. A. Heigel 12-12-69 PROJECT NO. 59291	TITLE	WORKING REGISTER (W)
	CHK	H		SIZE	DWG NO. 70026 917
	REVISIONS	SR 54-4083		REV.	A

Accumulator (A)
LBD No. 12.09
Dwg. No. 70 026 918

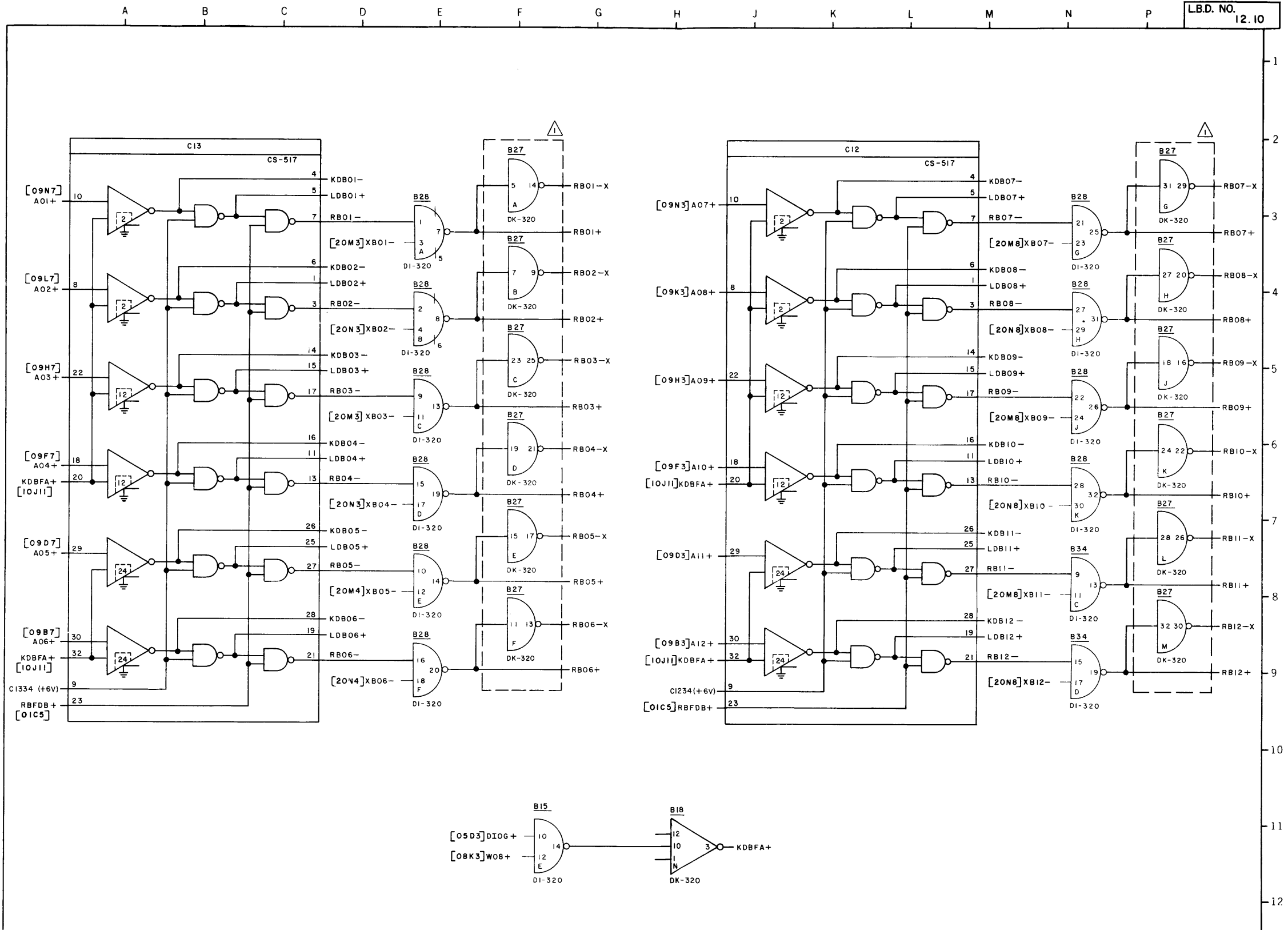


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HONEYWELL I N C.		TITLE ACCUMULATOR (A)	
<small>COMPUTER CONTROL DIVISION Old Connecticut Path, Framingham, Mass.</small>			
DR. D. HAMEL	DATE 6-30-69	SIZE	DWG NO.
ENG. B. GAYMAN	7/3/69	C	70026 918
APP. <i>Ed Hamel</i>	12-12-69	REV.	A
PROJECT NO. 99291			

Cable Data Bus and Register Transfer Bus (K,RB)
LBD No. 12.10
Dwg. No. 70 026 919

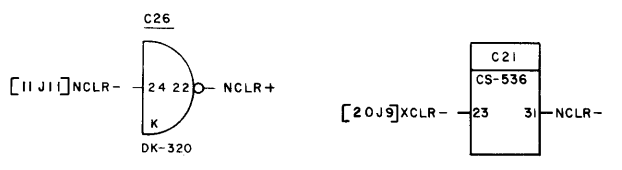
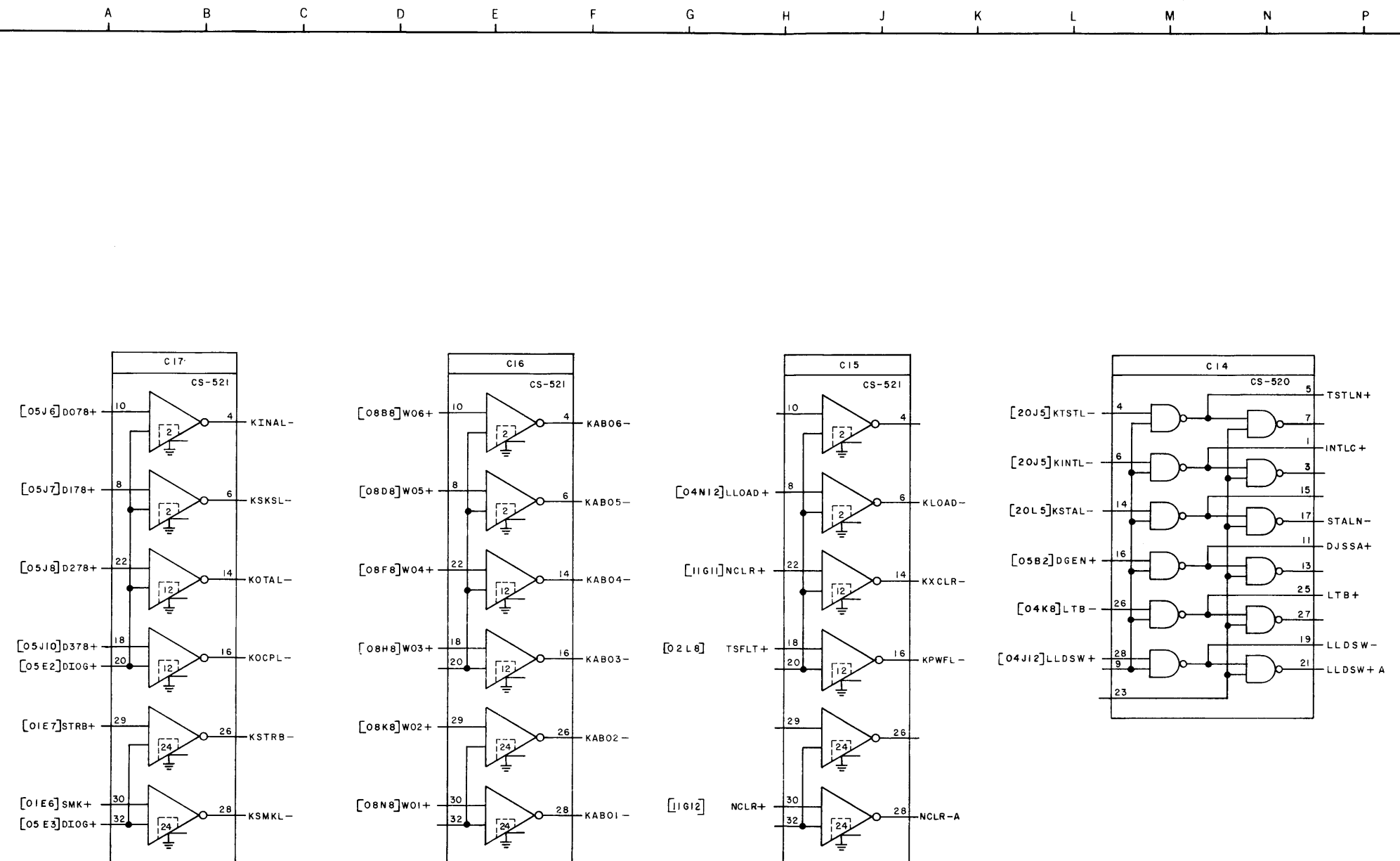


- NOTES:
- △ B27 OPTIONAL, USED WITH CONTROL PANEL.
 - △
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9	H
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12	H

HONEYWELL		TITLE	
I. N. C.		CABLE DATA BUS (K) &	
COMPUTER CONTROL DIVISION		REGISTER TRANSFER BUS (RB)	
Old Connecticut Path, Framingham, Mass.			
DR. D. HAMEL	DATE 6-30-69	SIZE	DWG NO.
ENG. B. GAYMAN	7/3/69	C	70026919
APP. <i>Pa. Hamel</i>	12-12-69	REV.	A
PROJECT NO. 59291			

**Cable Control Bus (K)
and System Normalizer (N)
LBD No. 12.11
Dwg. No. 70 026 920**

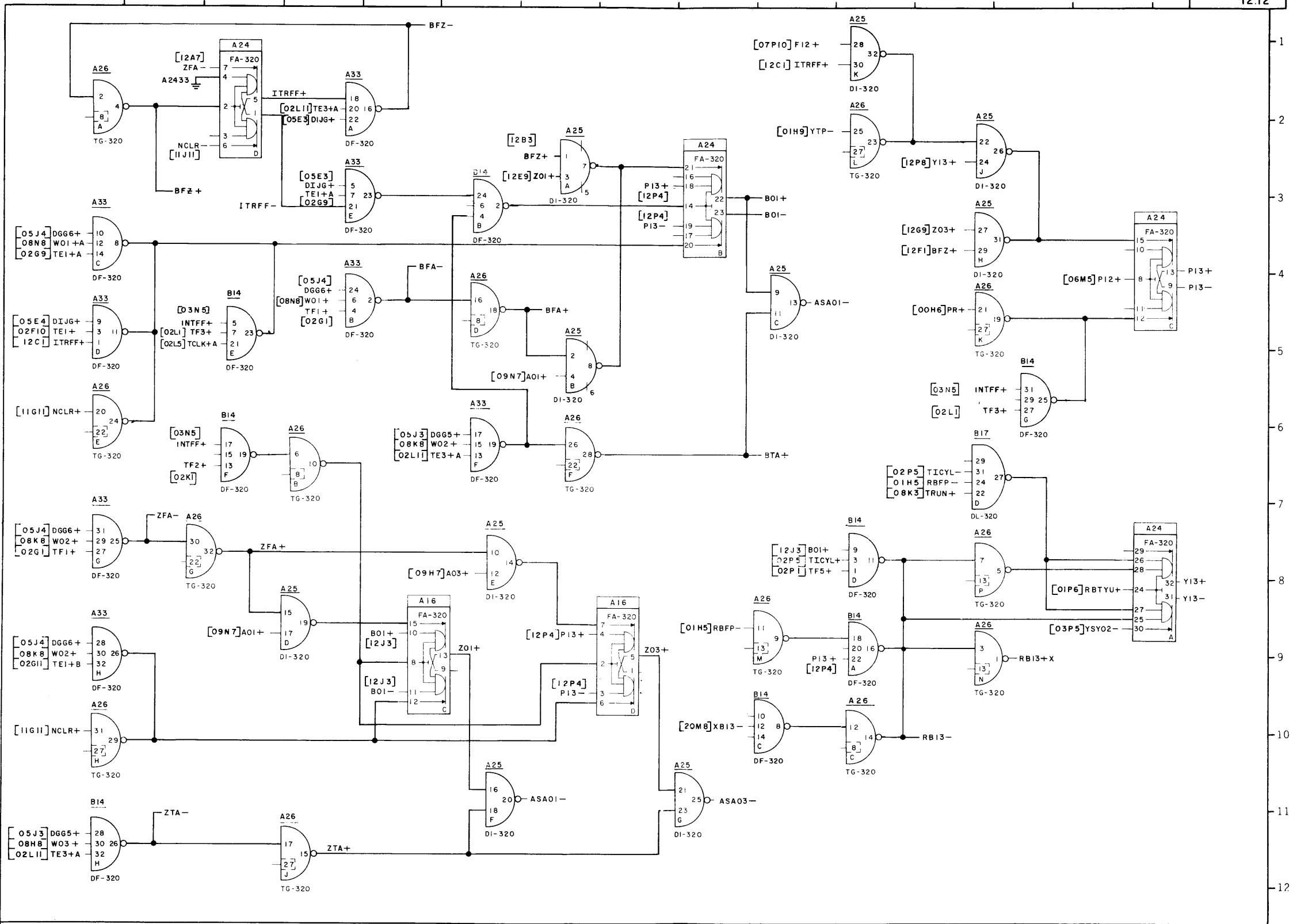


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HONEYWELL I N C.		TITLE CABLE CONTROL BUS (K) & SYSTEM NORMALIZER (N)	
<small>IBM</small> COMPUTER CONTROL DIVISION Old Connecticut Path, Framingham, Mass.			
DR. D. HAMEL	DATE 7-7-69	SIZE C	DWG NO. 70026920
ENG. B. GAYMAN	7/7/69	REV. A	
APP. <i>D. Hamel</i>	12-12-69		
PROJECT NO. 59291			

Expanded Address Option
LBD No. 12.12
Dwg. No. 70 026 921



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HONEYWELL I N C		TITLE EXPANDED ADDRESS OPTION	
COMPUTER CONTROL DIVISION Old Connecticut Path, Framingham, Mass.			
DR. D. HAMEL	DATE 6-30-69	SIZE	DWG NO.
ENG. B. GAYMAN	7/7/69	C	70026921
APP. <i>[Signature]</i>	12-12-69	REV.	A
PROJECT NO. 59291			

CSM-160 Timing and Control
LBD No. 12.13
Dwg. No. 70 026 922

A B C D E F G H J K L M N P

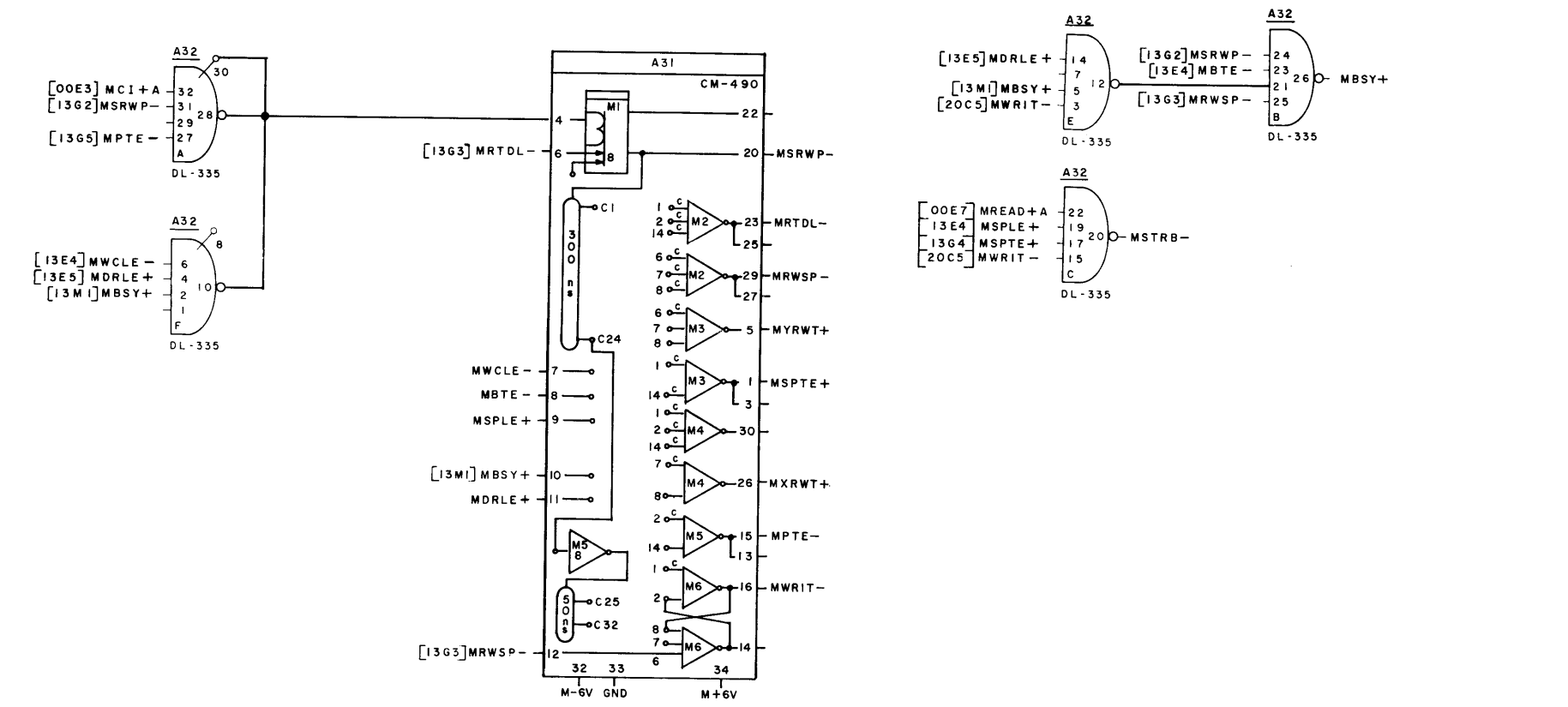


TABLE I

CM-490 JUMPERS	
FROM	TO
M2-1	C28, 29 OR 30 [△]
M2-2	22
M2-14, M3-8	4
M2-6	10
M2-7	C14
M2-8	C30
M3-6	C11
M3-1	C11
M3-7	C1
M4-1	12
M4-2	C18
M4-14	C30
M4-7	C11
M5-2	C25
M5-8	C24
M6-1	10
M6-2	14
8	C11
7	C20
9	C28
11	C32

- NOTES:
- [△] CORRECT TAP SELECTED TO SET THE WIDTH OF SIGNAL
 - [△] MXRWT+ AT 400 ± 10 NSEC
 - [△]
 - [△]
 - [△]

CHK	REV	DATE	BY	APP
	1	12-11-69	SR54-4083	

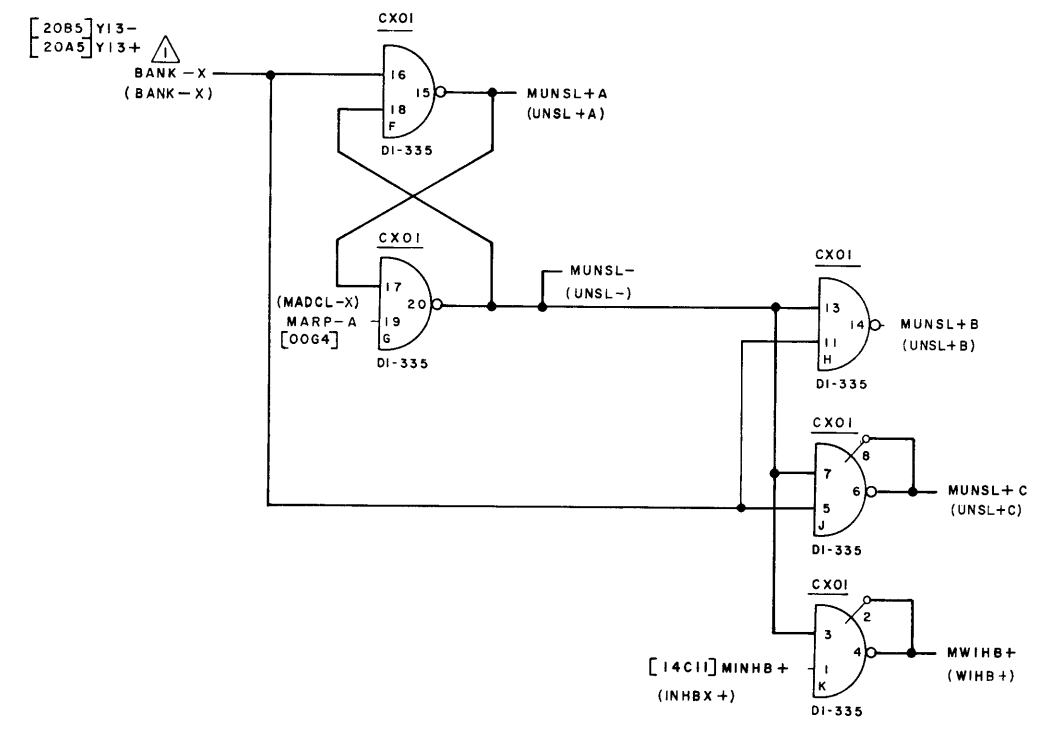
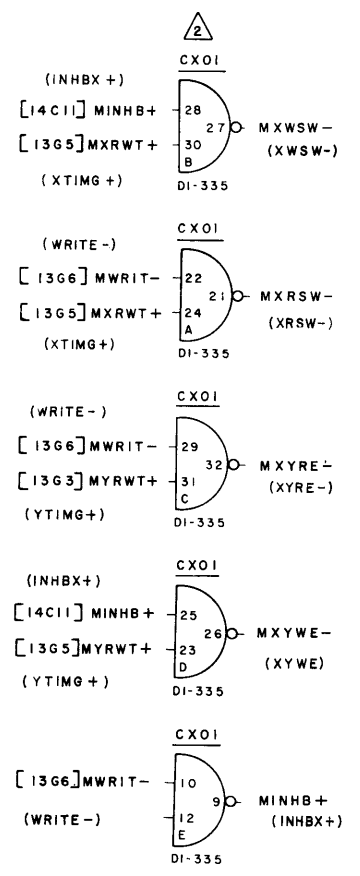
HONEYWELL
 IN C.
 COMPUTER CONTROL DIVISION
 Old Connecticut Path, Framingham, Mass.

DR. J. DOYLE (RAS) DATE 5-2-69
 ENG. R. HENZEL 5-2-69
 APP. *R. Henzel* 12-11-69
 PROJECT NO. 59291

TITLE
CSM-160
TIMING & CONTROL

SIZE DWG NO. REV.
C 70026922 A

CSM-160 Timing and Control
LBD No. 12.14
Dwg. No. 70 026 923



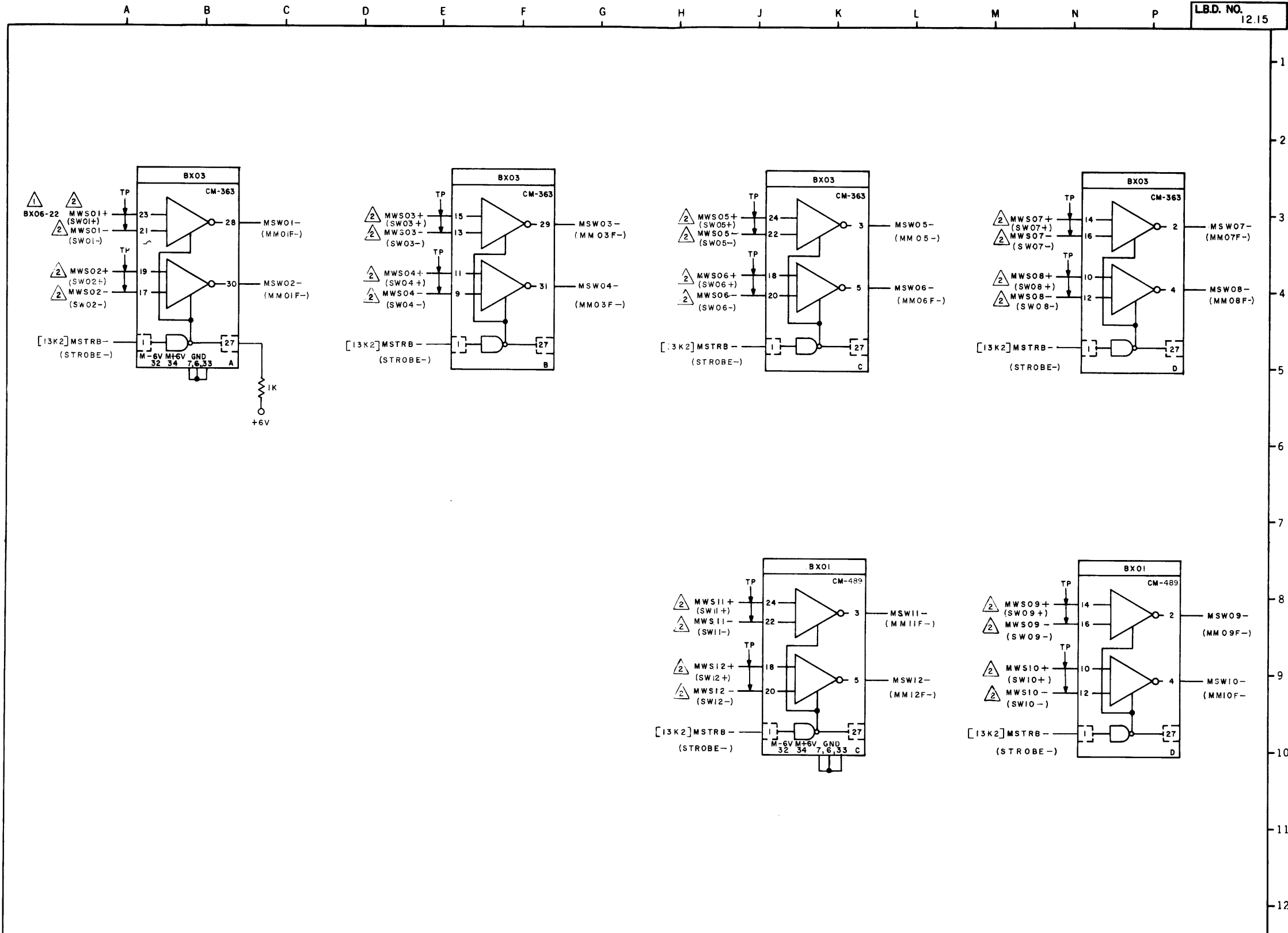
NOTES:

- △ FOR FIRST 4K MEMORY BANK-X IS Y13-, FOR SECOND 4K MEMORY BANK-X IS Y13+
- ② "X" DESIGNATES MODULE LOCATION
- ③ (XXXX) MNEMONIC USED ON WIRE LIST DOC# 7025588
- △

CHK	REV	REVISIONS
#	A	SK 54 4033

HONEYWELL		TITLE
INC.		CSM-160
COMPUTER CONTROL DIVISION Old Connecticut Path, Framingham, Mass.		TIMING & CONTROL
DR. J. DOYLE (RAS)	DATE 8-27-69	
ENG. R. HENZEL	8-27-69	
APP. <i>R. A. Henzel</i>	12-12-69	
PROJECT NO. 59291	SIZE C	DWG NO. 70 026923
		REV. A

CSM-160 Sense Amplifiers
LBD No. 12.15
Dwg. No. 70 026 924



- NOTES:**
- △ BX04 & BX06 ARE CORE STACK CONNECTOR LOCATIONS.
 - △ MWS01 — MWS12 INTERNAL CONNECTIONS ON CORE STACK.
 - △ (XXXX) MNEMONIC USED ON WIRE LIST DOC # 7025588

CHK	REVISIONS	REV.
		A
	TAKEN FROM 51254-9083	

HONEYWELL		TITLE	
I N C.		CSM-160	
COMPUTER CONTROL DIVISION		SENSE AMPLIFIERS	
Old Connecticut Path, Framingham, Mass.			
DR. D. HAMEL	DATE 1/27/69	SIZE	DWG NO.
ENG. R. G. ...	1-27-69	C	70026924
APP. ...	11-12-69		REV. A
PROJECT NO. 59291			

CSM-160 Inhibit Drivers
LBD No. 12.16
Dwg. No. 70 026 925

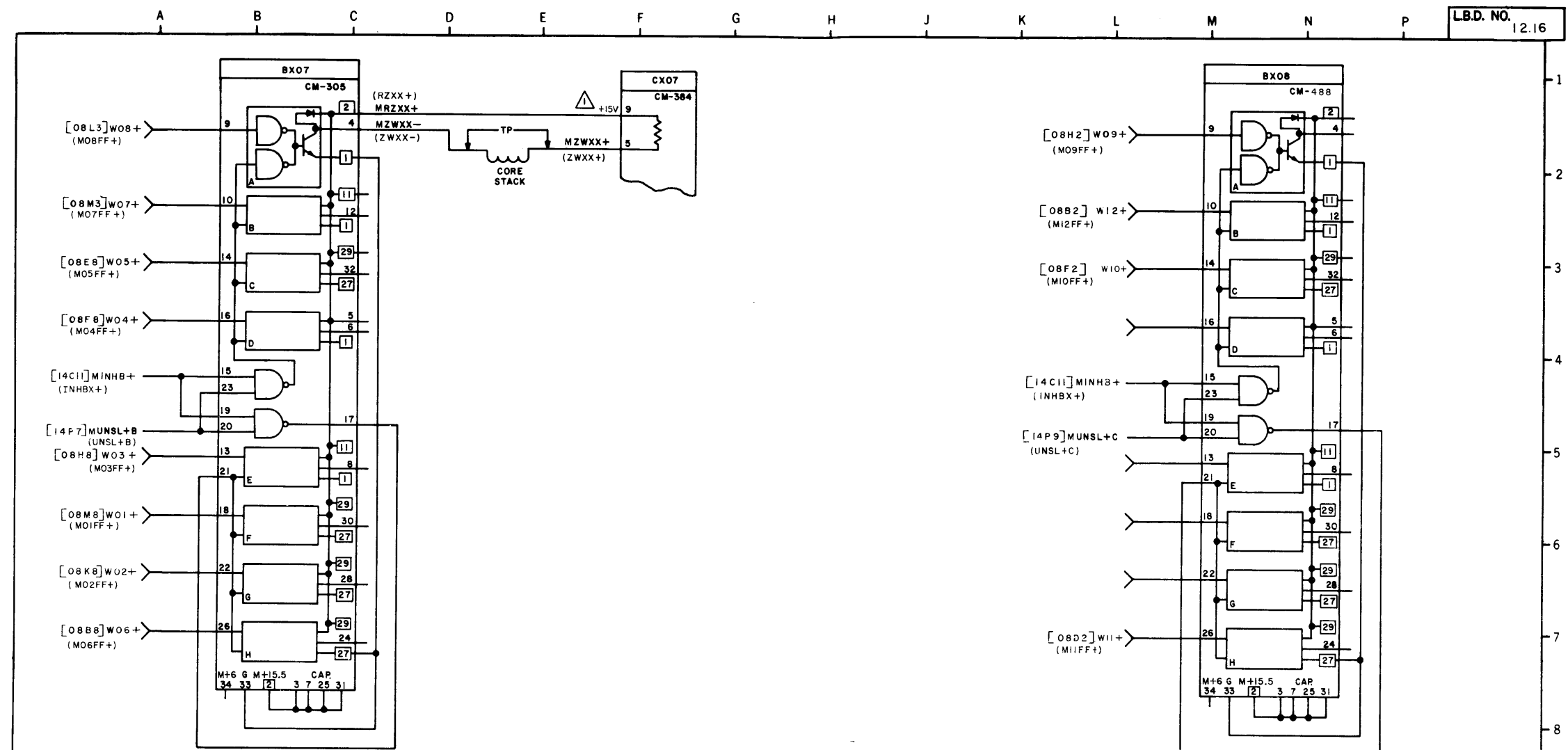


TABLE I

BIT XX	MRZXX+	MZWXX-		MZWXX+	
		CM-305	STACK	STACK	CM-384
01		BX07-30	CX06-01	CX06-03	CX08-05
02		28	BX06-31	BX06-32	03
03		08	BX06-02	BX06-01	19
04		06	AX06-29	AX06-31	02
05		32	CX04-04	CX04-02	07
06		24	BX04-31	BX04-32	01
07		12	BX04-02	BX04-01	04
08		BX07-04	AX04-32	AX04-30	06
09		BX08-04	CX04-08	CX04-06	30
10		32	AX04-28	AX04-26	31
11		24	CX06-05	CX06-07	27
12		BX08-12	AX06-25	AX06-27	CX08-21

NOTES:
 1 TYPICAL CONNECTIONS FOR INHIBIT DRIVERS.
 2 (XXXX) MNEMONIC USED ON WIRE LIST DOC # 7025588

CHK	REVISIONS	REV.
	A	
	TAKEN FROM SR 54-9083	

HONEYWELL
 I N C.
 COMPUTER CONTROL DIVISION
 Old Connecticut Path, Framingham, Mass.

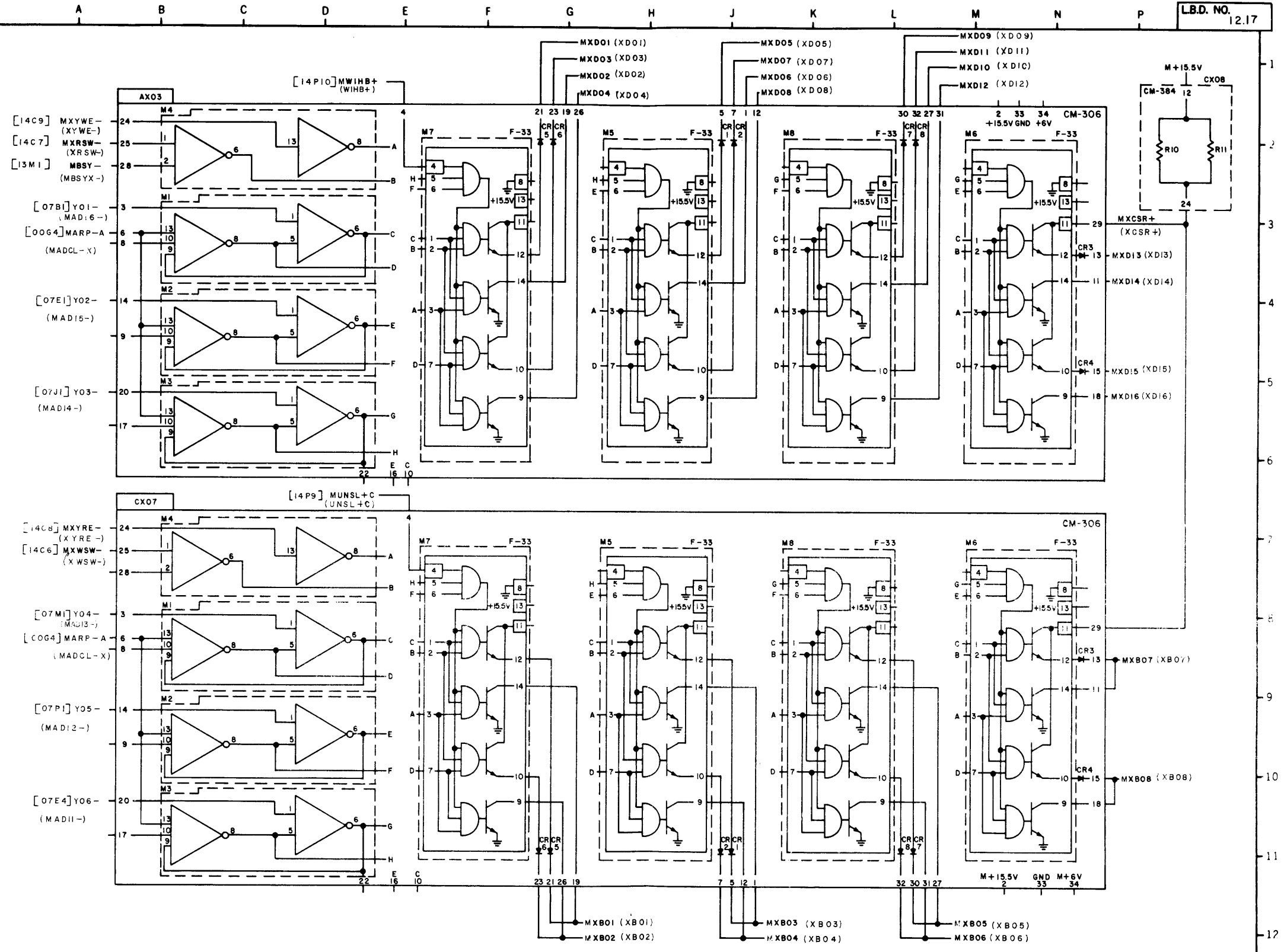
DR. D. HAMEL DATE 5/9/67
 ENG. D. DAVIES 1-30-1968
 APP. C. HARRIS 2-12-1969

PROJECT NO. 59291

TITLE
 ICM-160
 INHIBIT DRIVERS

SIZE DWG NO. 70026925 REV. A

CSM-160 X Selection Sinks and Switches
LBD No. 12.17
Dwg. No. 70 026 926

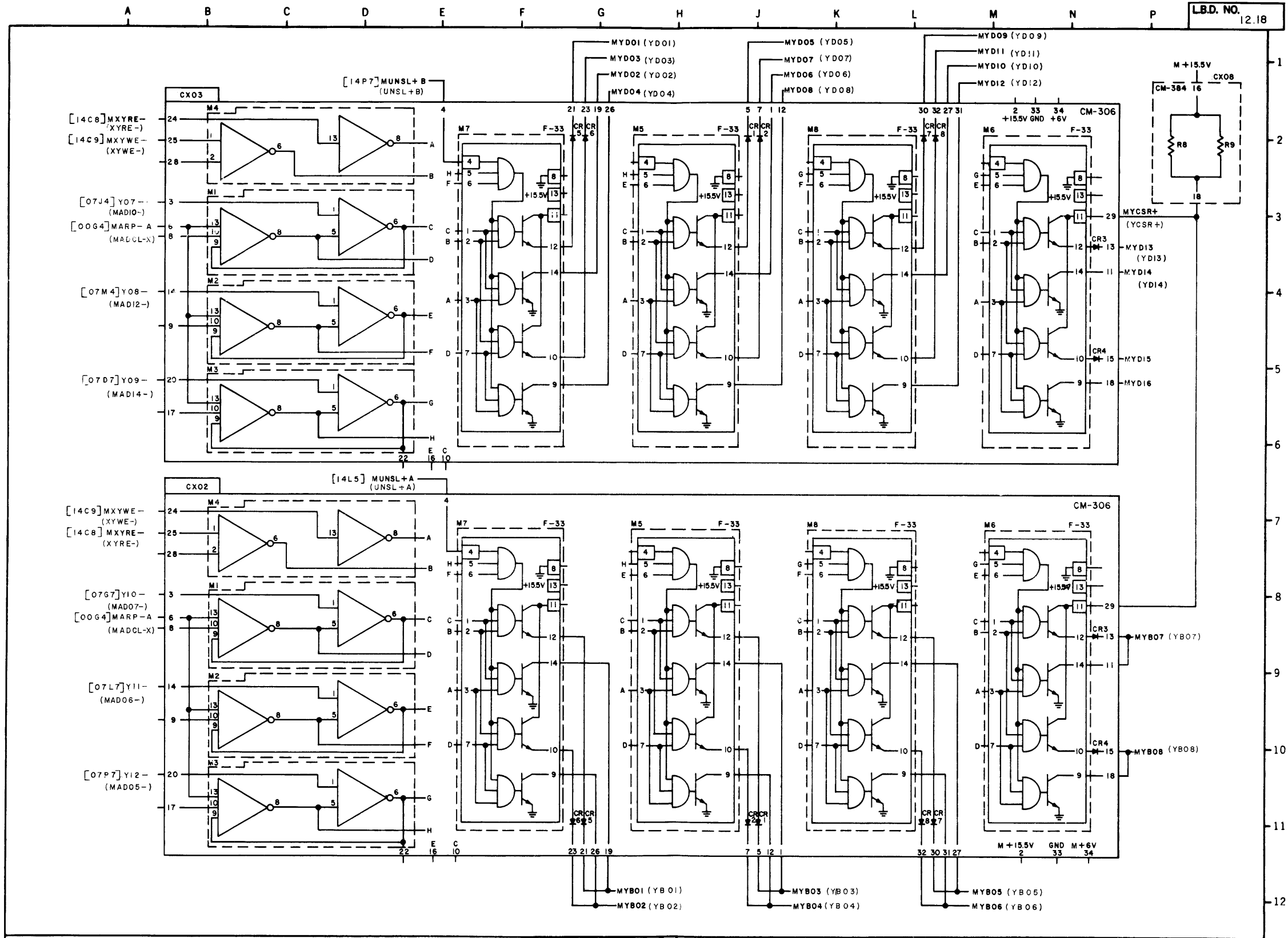


NOTES:
 △ (XXXX) MNEMONIC USED ON WIRE LIST DOC # 7025588
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CHK	REVISIONS	REV.
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	TAKEN FROM	
	SR 54-4083	

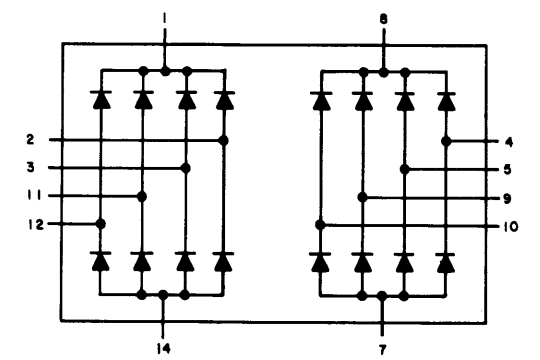
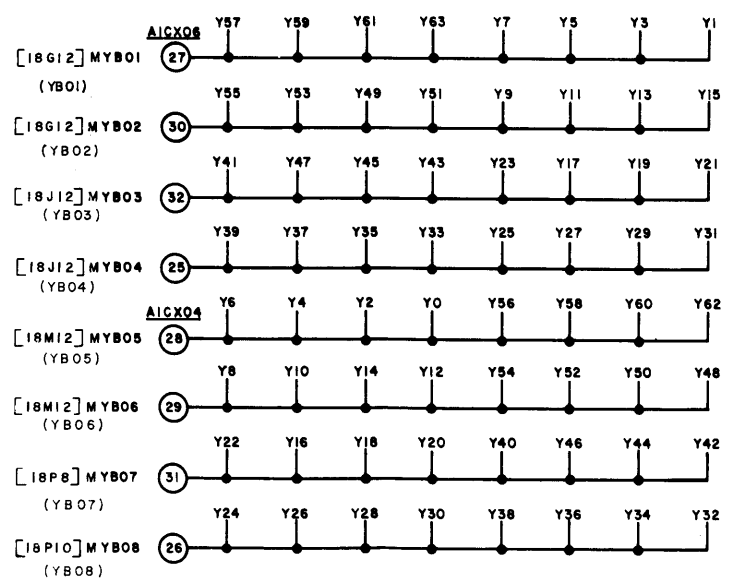
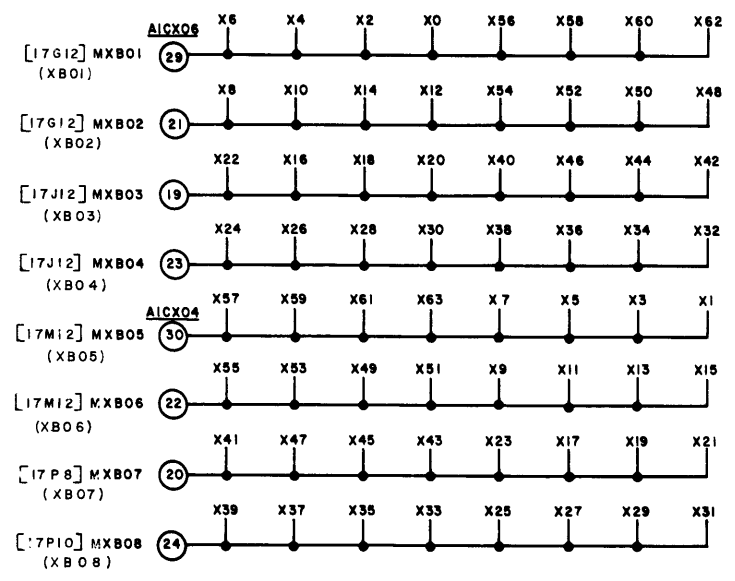
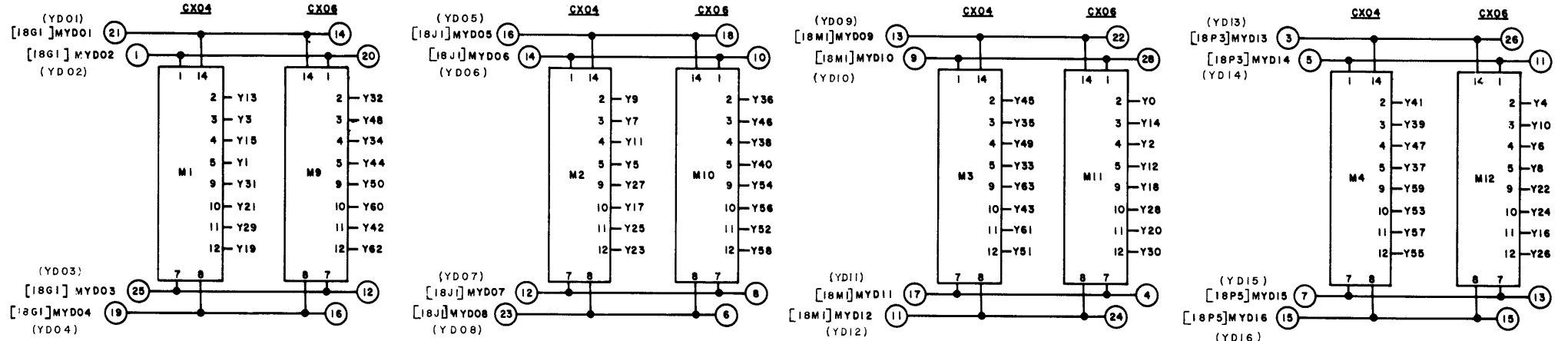
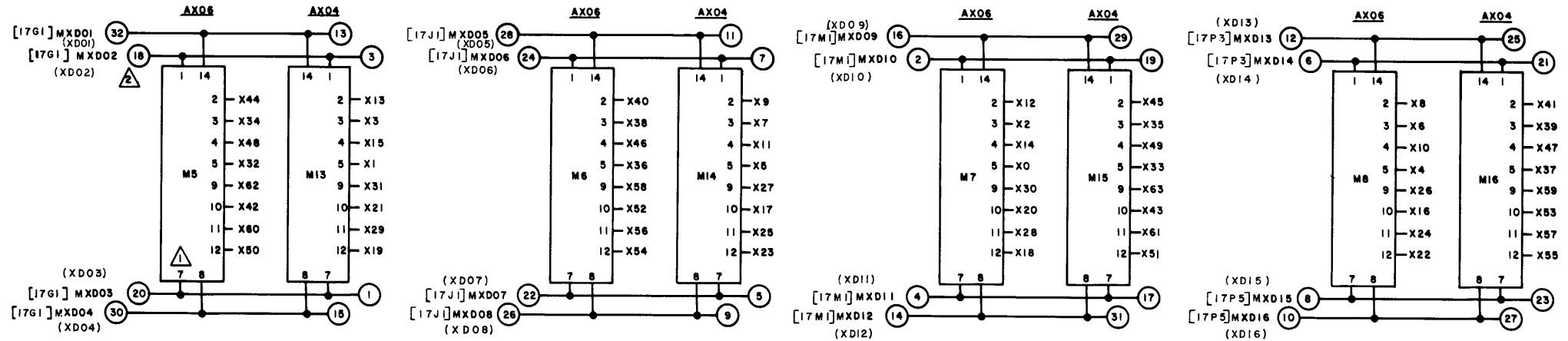
HONEYWELL I. N. C.		TITLE
COMPUTER CONTROL DIVISION Old Connecticut Path, Framingham, Mass.		CSM-160
DR. D. NAMEL		X SELECTION
DATE 1/27/69		SINKS & SWITCHES
ENG. B. GAYMAN		SIZE DWG. NO.
APP. [Signature]		C 70026926
PROJECT NO. 59291		REV.
		△

CSM-160 Y Selection Sinks and Switches
LBD No. 12.18
Dwg. No. 70 026 927



<p>NOTES:</p> <p>△ (XXXX) MNEMONIC USED ON WIRE LIST DOC # 7025588</p> <p>△</p> <p>△</p> <p>△</p>	<p>REV. A</p> <p>CHG. REVISIONS</p> <p>TAKEN FROM SR. 59291 9003</p>	<p>HONEYWELL</p> <p>I. N. C.</p> <p>COMPUTER CONTROL DIVISION</p> <p>Old Connecticut Path, Framingham, Mass.</p>	<p>TITLE</p> <p>CSM-160</p> <p>Y SELECTION</p> <p>SINKS & SWITCHES</p>	
	<p>DR. D. HAMEL</p> <p>ENG. E. GAYMAN</p> <p>APP. R. B. [Signature]</p> <p>PROJECT NO. 59291</p>	<p>DATE 1/27/69</p> <p>DATE 12-12-69</p>	<p>SIZE C</p> <p>DWG NO. 70 026927</p>	<p>REV. A</p>
	<p>DATE 1/27/69</p>			<p>DATE 12-12-69</p>
	<p>DATE 12-12-69</p>			<p>DATE 12-12-69</p>

CSM-160 X and Y Selection Diode Matrix
LBD No. 12.19
Dwg. No. 70 026 928



NOTES:

- 7 | PIN No OF FLAT PAC (F-08)
- 18 | PIN No OF STACK CONNECTOR.
- (XXXX) MNEMONIC USED ON WIRE LIST DOC# 7025588

CHK	REVISIONS	REV.	A
	TAKEN FROM		

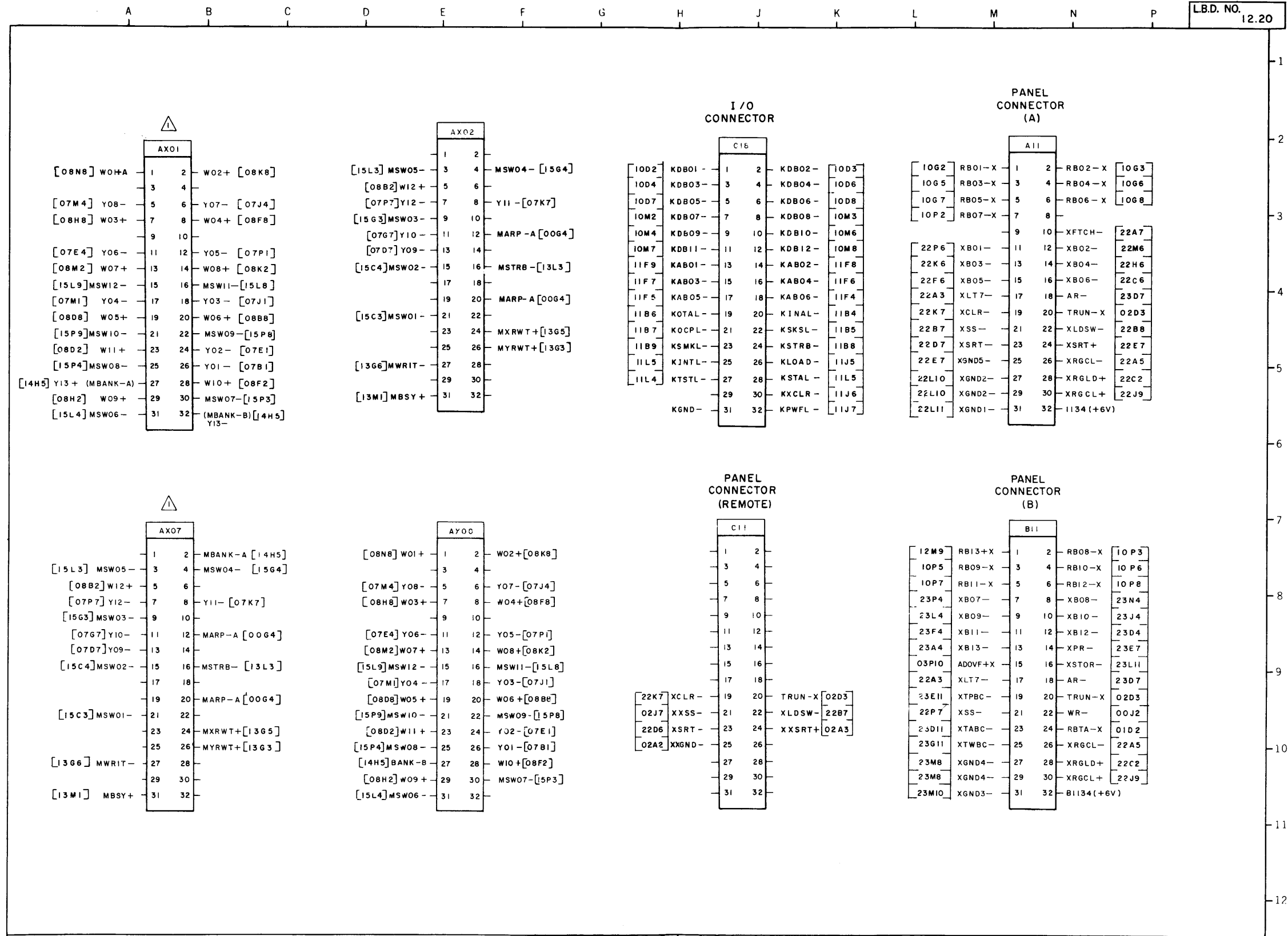
HONEYWELL
i n c.
COMPUTER CONTROL DIVISION
Old Connecticut Path, Framingham, Mass.

DR. D.HAMEL DATE 2/1/69
ENG. S.GAYMAN 1-25-69
APP. 12-12-69
PROJECT NO. 99291

TITLE
CSM-160
X & Y SELECTION
DIODE MATRIX

SIZE DWG NO. C 70 026928
REV. A

Cable Chart
LBD No. 12.20
Dwg. No. 70 026 929



NOTES:
 1 MEMORY INTER-MODULE CONNECTORS
 2 IN 4K EXPANSION MEMORY MODULE AX0127 IS MBANK-B
 3
 4

CHK	REV	REVISIONS
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	B	
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HONEYWELL
 IN C
 COMPUTER CONTROL DIVISION
 Old Connecticut Path, Framingham, Mass.

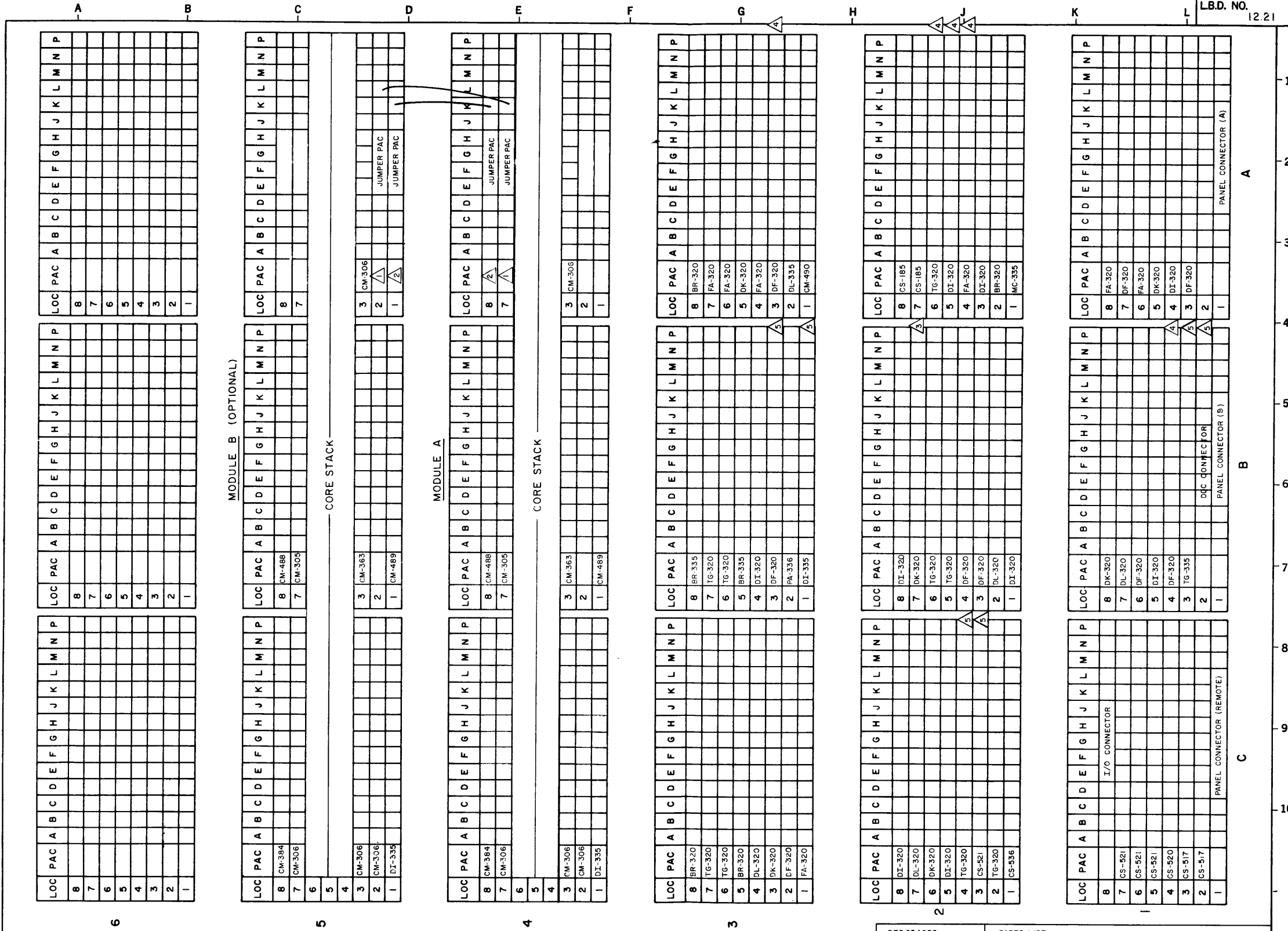
DR. D. HAMEL DATE 7-8-69
 ENG. B. GAYMAN 7/8/69
 APP. *Bill Henry* 12-12-69
 PROJECT NO. 59291

TITLE
 CABLE CHART

SIZE DWG NO. REV.
 C 70 026929 A

SR 51-4063

PAC Complement/Allocation
LBD No. 12.21
Dwg. No. 70 024 852



NOTES:

- ⚠ JUMPER PAC A014998701
- ⚠ JUMPER PAC A014998702
- ⚠ CONTROL PANEL OPTION
- ⚠ EXPANDED ADDRESSING OPTION
- ⚠ DDC OPTION

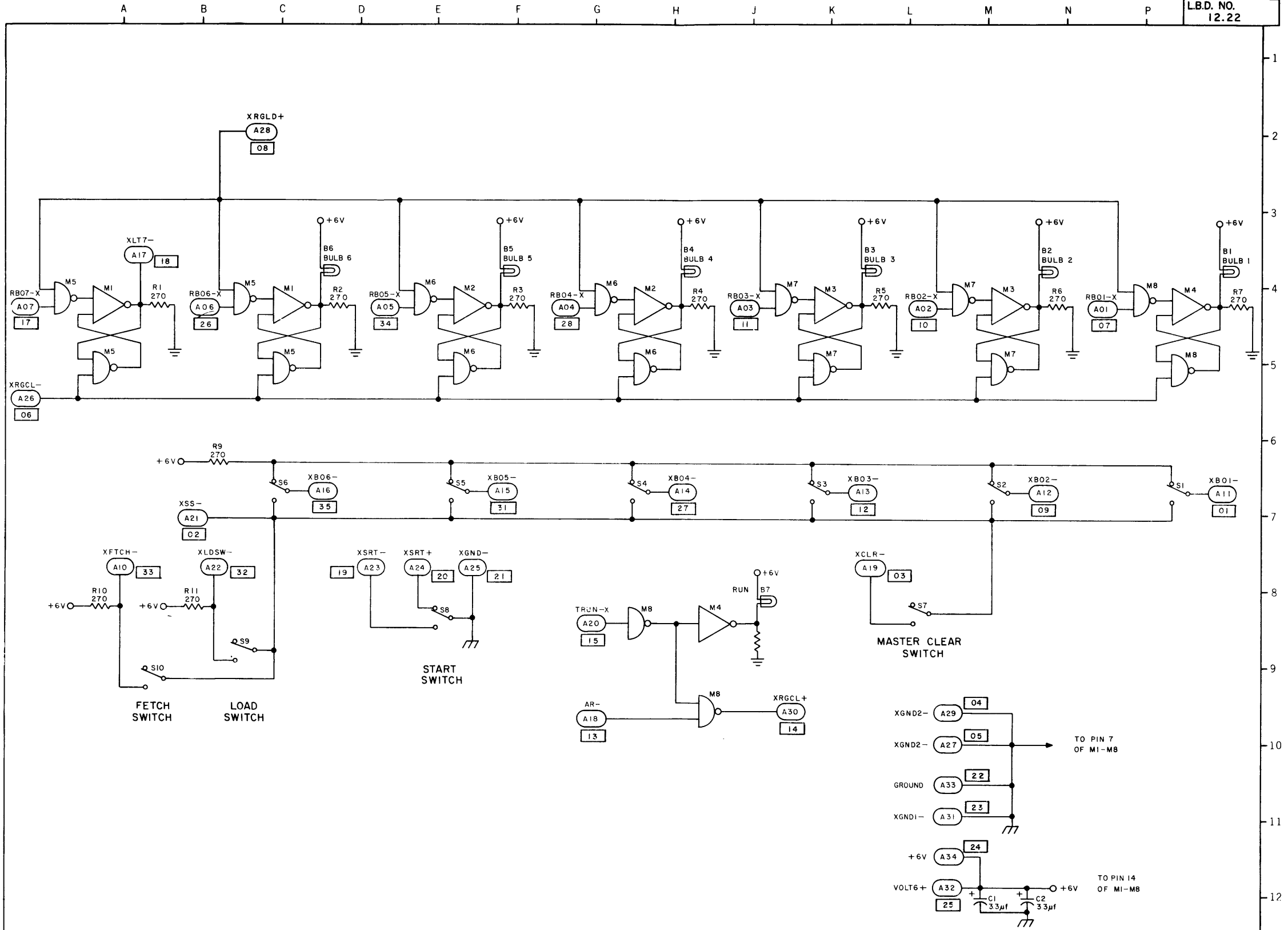
USED FOR MULTI-MODULE CONNECTIONS

CHK. REVISIONS REV.

PER SR 54-3906

P70 024852		PARTS LIST	
HONEYWELL		TITLE	
COMPUTER CONTROL DIVISION		PAC COMP / ALLOC	
Old Connecticut Path, Framingham, Mass.		MAIN FRAME	
DR. D. HAMEL	DATE	SIZE	DWG NO.
ENG. B. GAYMAN	7/8/69	C	70024852
APP. RA Hamel	10/24/69		
PROJECT NO. 59291			REV. A

Control Panel Circuit Board A
LBD No. 12.22
Dwg. No. 70 026 930

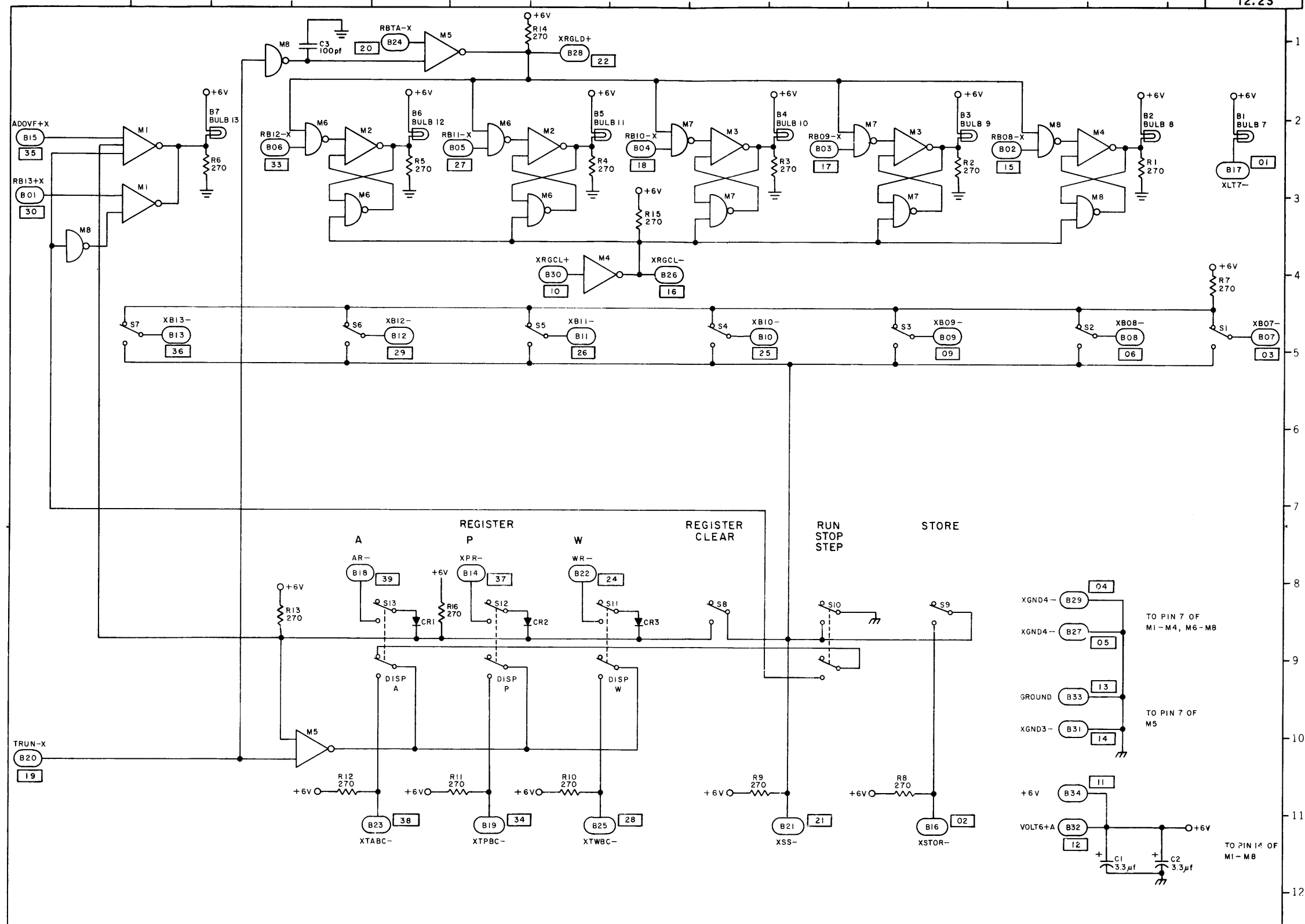


- NOTES:
- 1 ALL RESISTORS 1/4 W, 5%; VALUES IN OHMS
 - 2 CABLE PAC PIN NUMBERS ARE INDICATED (XXX)
 - 3 CIRCUIT BOARD PIN NUMBERS INDICATED (XX)

CHK	REVISIONS	REV
		A
		B
		C
		D
		E
		F
		G
		H
		J
		K
		L
		M
		N
		P

HONEYWELL I. N. C.		TITLE CONTROLLER PANEL	
COMPUTER CONTROL DIVISION <small>Old Connecticut Path Framingham Mass</small>		CIRCUIT BOARD A	
DR. D HAMEL	DATE 7-10-69	SIZE	DWG NO.
ENG. R HENZEL	7/10/69	C	70 026 930
APP. <i>[Signature]</i>	12-12-69	REV.	A
PROJECT NO. 59291			

Control Panel Circuit Board B
LBD No. 12.23
Dwg. No. 70 026 931



NOTES:
 1 ALL RESISTORS 1/4 W, 5%, VALUES IN OHMS
 2 CABLE PAC PIN NUMBERS ARE INDICATED (XXX)
 3 CIRCUIT BOARD PIN NUMBERS INDICATED (XX)

CHK	REVISIONS	REV
	1	1
	2	2
	3	3
	4	4
	5	5
	6	6
	7	7
	8	8
	9	9
	10	10
	11	11
	12	12

SR54-4093

HONEYWELL
 I N C.
 COMPUTER CONTROL DIVISION
 Old Connecticut Path, Framingham, Mass.

DR. D. HAMEL DATE 7-9-69
 ENC. R. HENZEL 7/9/69
 APP. R. C. HENZEL 12-12-69
 PROJECT NO. 59291

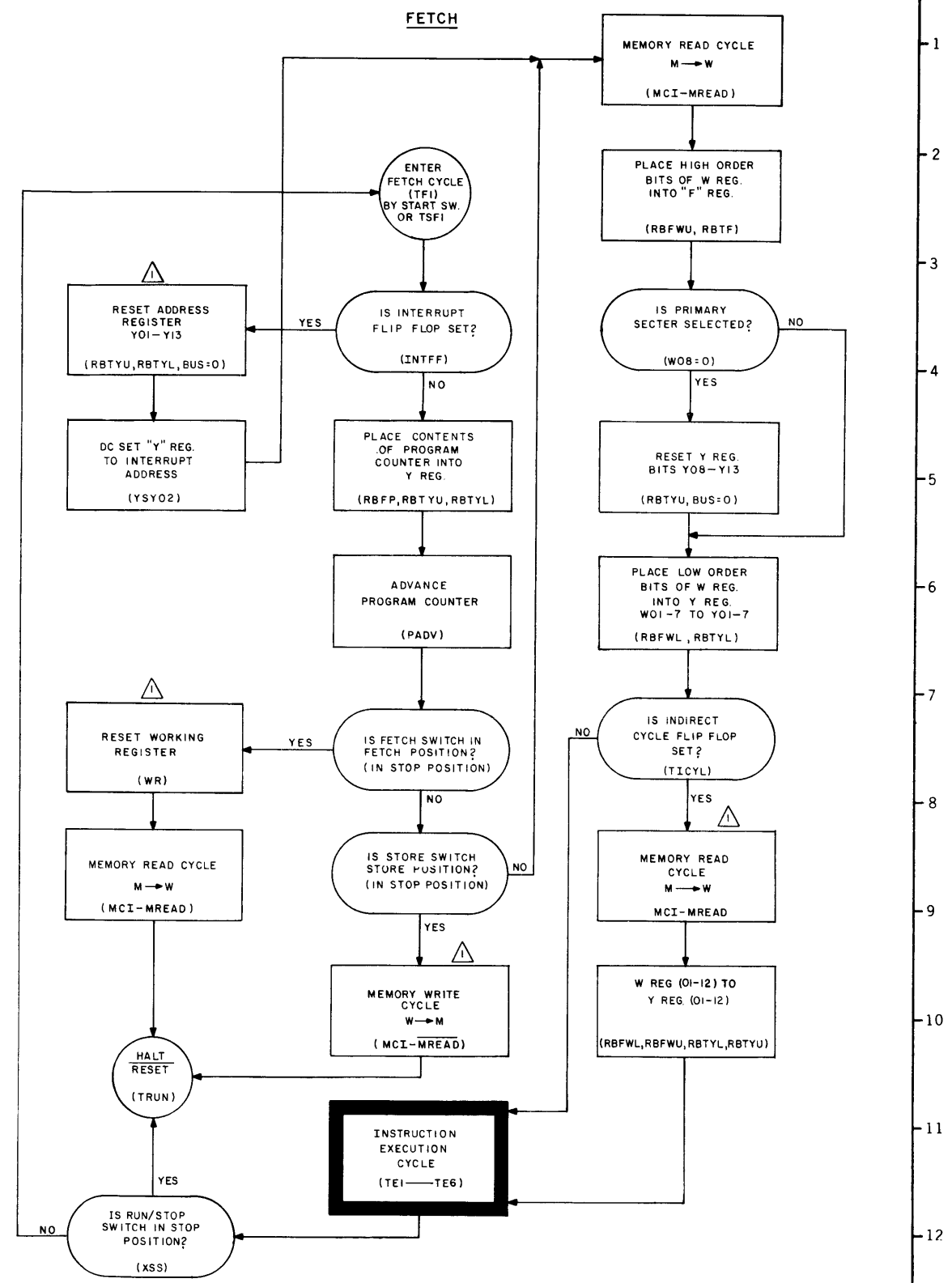
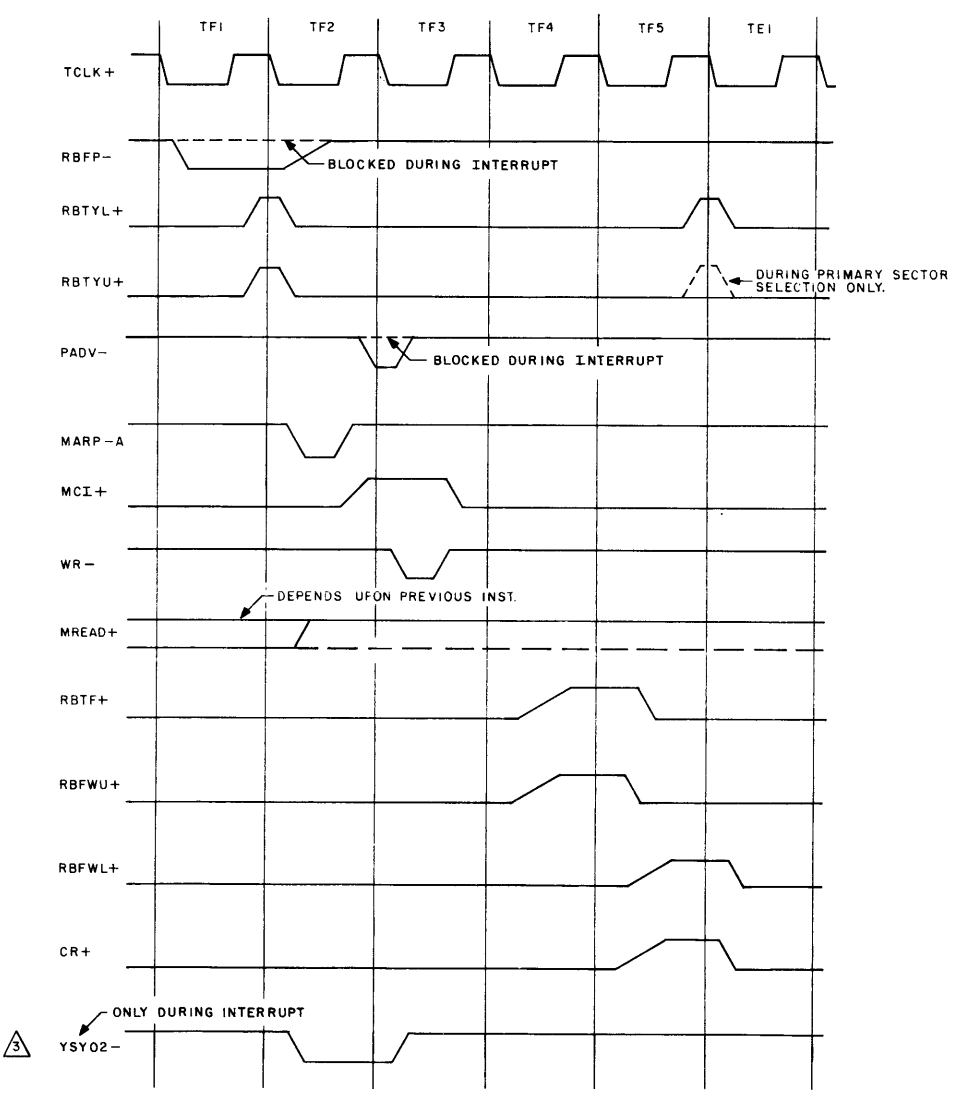
TITLE
 CONTROL PANEL
 CIRCUIT BOARD B

SIZE DWG NO. REV.
 C 70 026931 A

FLOW AND TIMING DIAGRAMS

Fetch, Flow and Timing
FTD No. 12.75
Dwg. No. 70 027 847

2 NORMAL INSTRUCTION FETCH SHOWING INTERRUPT MODIFICATIONS



- NOTES:
- △ SEE FTD 12.76 FOR TIMING OF INDIRECT FETCH, INTERRUPTED FETCH, PANEL FETCH/STORE.
 - △ THE NORMAL INSTRUCTION FETCH IS MODIFIED IF THE INTERRUPT FLIP FLOP IS SET WHEN ENTERING THE FETCH CYCLE.
 - △ THE INTERRUPT FETCH CYCLE FORCES AN INSTRUCTION FETCH FROM LOCATION 2 OF THE FIRST 4K MEMORY.
 - △

CHK	REVISIONS	REV.

HONEYWELL
 I N C.
 COMPUTER CONTROL DIVISION
 Old Connecticut Path, Framingham, Mass

DR. D. HAMEL DATE
 ENG. C. LONG 12/1/69

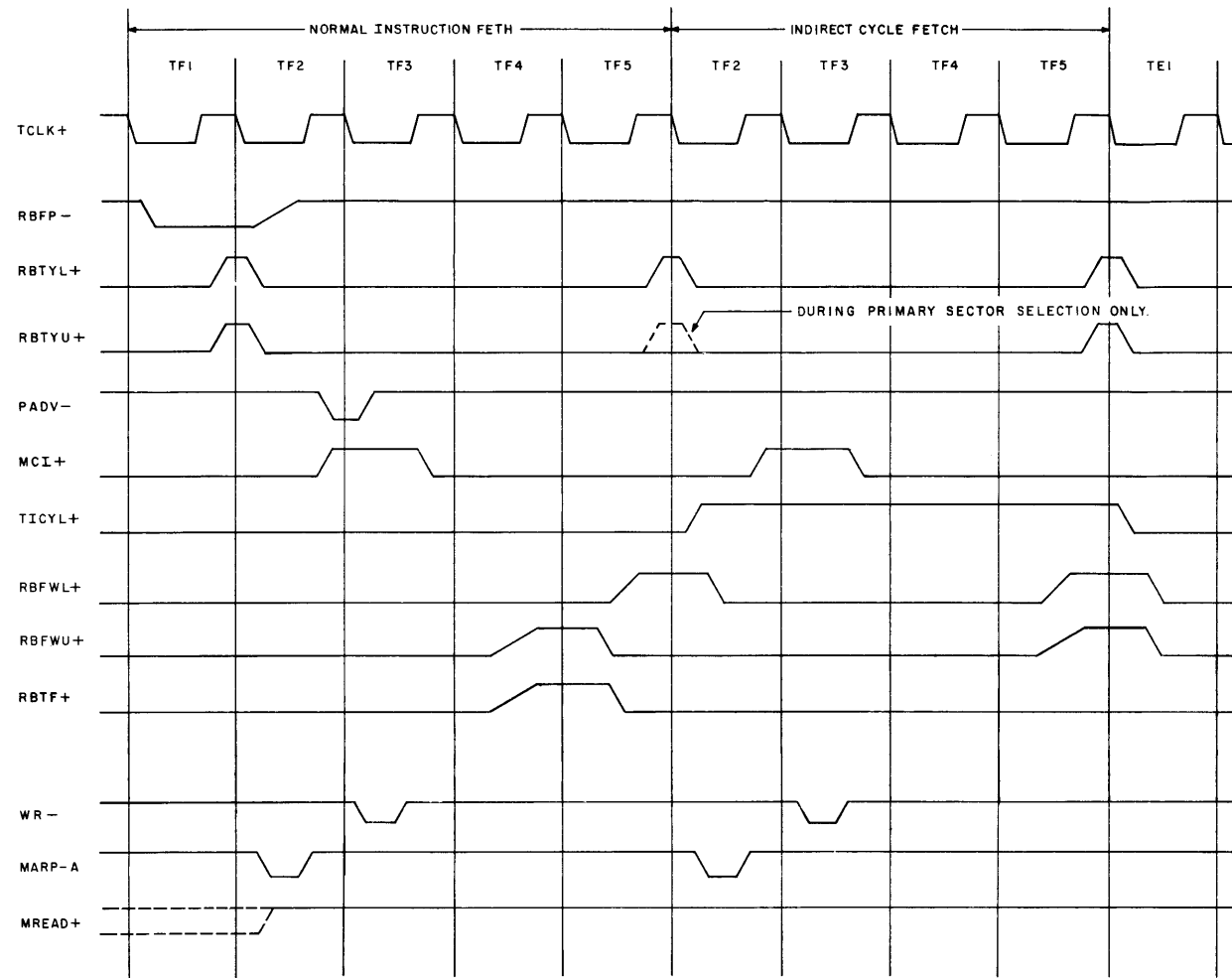
APP. PROJECT NO. 59291

TITLE
 FETCH
 FLOW AND TIMING

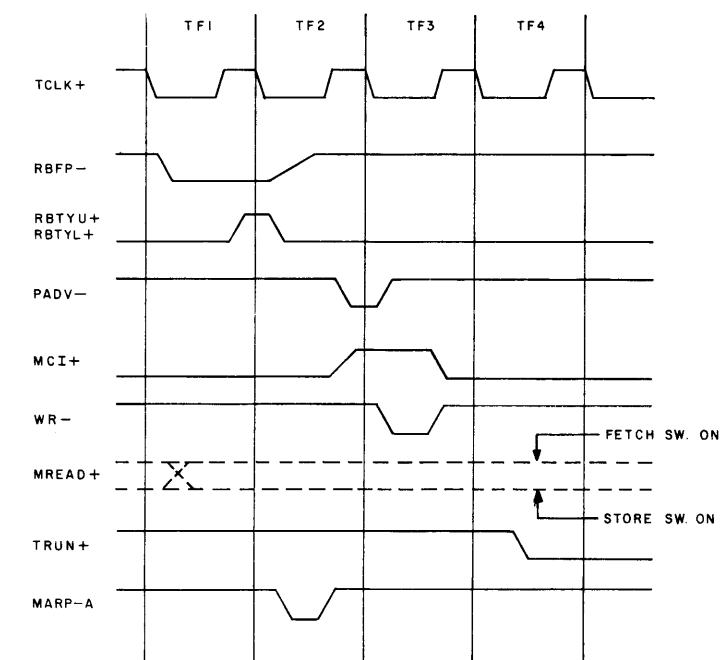
SIZE DWG NO. **70027847** REV.

**Indirect Fetch, Panel Fetch/Store,
Flow and Timing
FTD No. 12.76
Dwg. No. 70 027 848**

FETCH CYCLE WITH NORMAL INSTRUCTION FETCH CYCLE



FETCH OR STORE FROM PANEL



NOTES:

- △
- △
- △
- △

CHK	REVISIONS	REV.

HONEYWELL
I N C.
COMPUTER CONTROL DIVISION
Old Connecticut Path, Framingham, Mass.

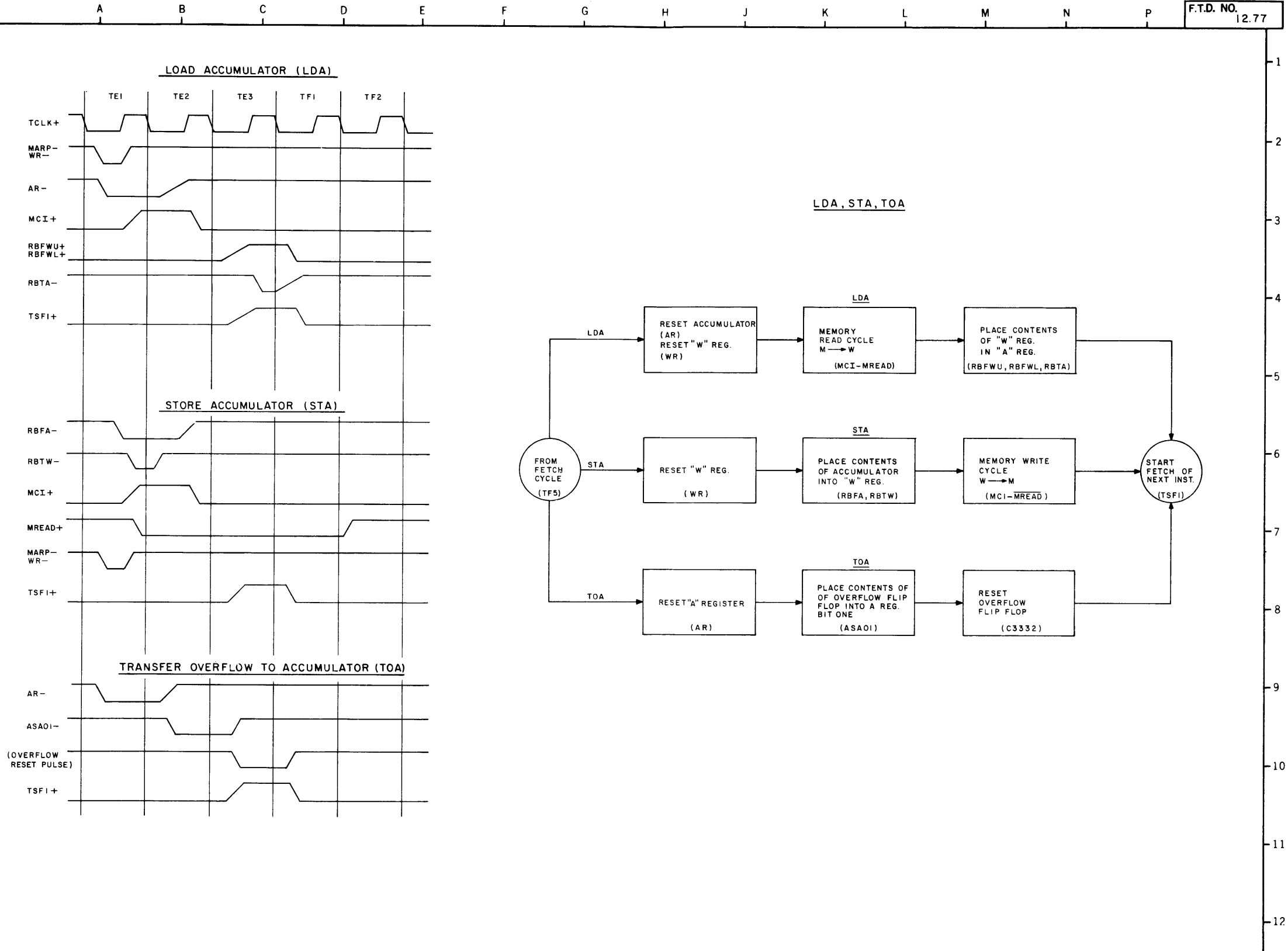
DR. D. HAMEL	DATE
ENG. C. LONG	12/4/69
APP.	

PROJECT NO. 59291

SIZE C	DWG NO. 70027848	REV.
--------	------------------	------

TITLE
INDIRECT FETCH
PANEL FETCH/STORE
FLOW AND TIMING

LDA, STA, TOA, Flow and Timing
FTD No. 12.77
Dwg. No. 70 027 849



NOTES:
 ▲
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REV.	REV.	REV.	REV.	REV.	REV.	REV.	REV.	REV.	REV.
CHK									

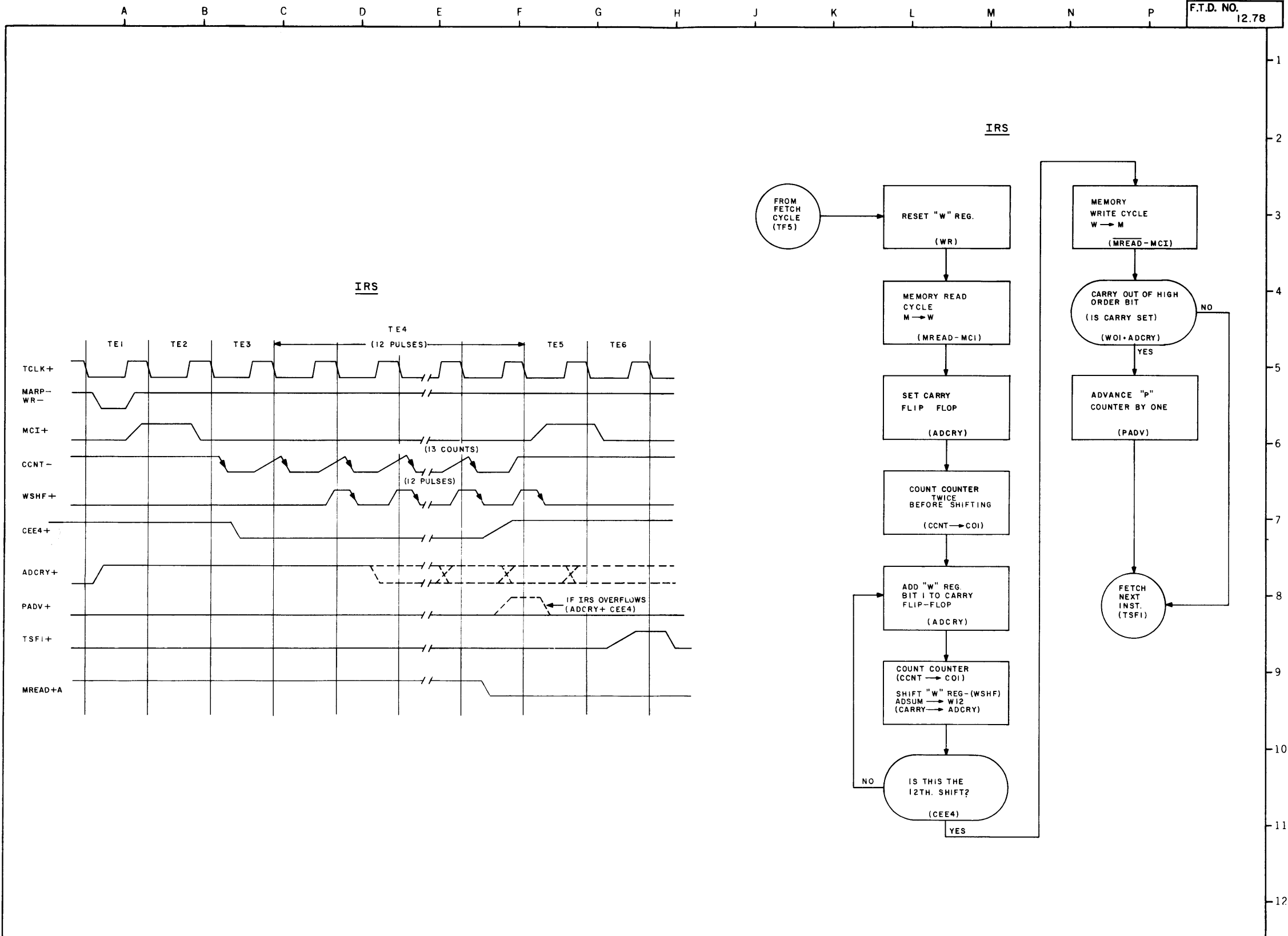
HONEYWELL
 I N C.
 COMPUTER CONTROL DIVISION
 Old Connecticut Path, Framingham, Mass.

DR. D. HAMEL	DATE
ENG. C. LONG	12/4/69
APP.	
PROJECT NO. 59291	

TITLE
 LDA, STA, TOA
 FLOW AND TIMING

SIZE	DWG NO.	REV.
C	70027849	

IRS, Flow and Timing
FTD No. 12.78
Dwg. No. 70 027 850



NOTES:
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REV.	REV.	REV.	REV.	REV.	REV.	REV.	REV.	REV.	REV.	REV.	REV.
CHK											

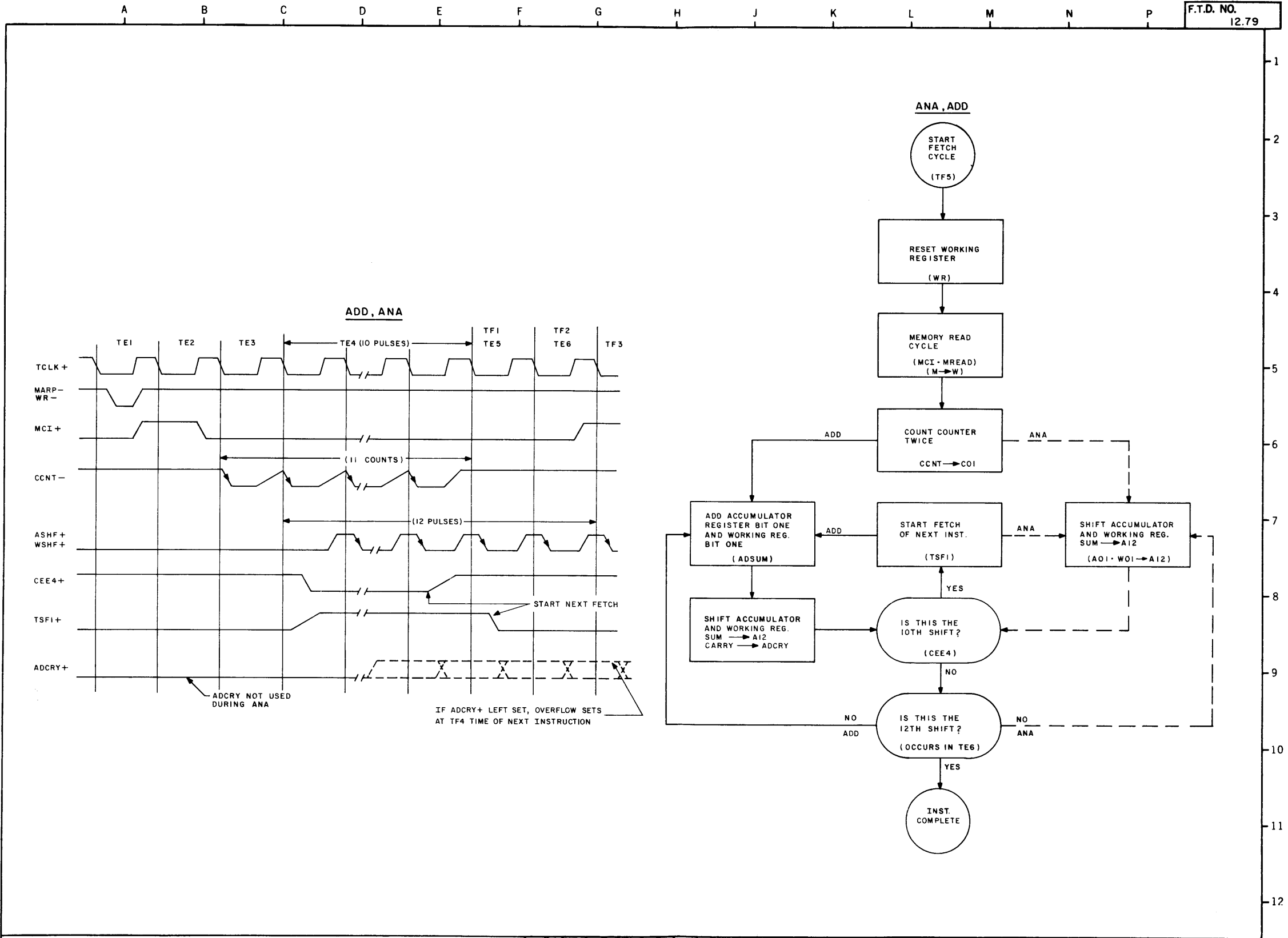
HONEYWELL
 I N C.
 COMPUTER CONTROL DIVISION
 Old Connecticut Path, Framingham, Mass.

DR. D. HAMEL DATE
 ENG. C. LONG 12/3/69
 APP.
 PROJECT NO. 5929 I

TITLE
 IRS
 FLOW AND TIMING

SIZE DWG NO. REV.
 C 70027850

ADD and ANA, Flow and Timing
FTD No. 12.79
Dwg. No. 70 027 851



NOTES:
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REV.	REV.	REV.	REV.	REV.	REV.	REV.	REV.	REV.	REV.
CHK									

HONEYWELL
 I N C.
 COMPUTER CONTROL DIVISION
 Old Connecticut Path, Framingham, Mass.

DR. D. HAMEL	DATE
ENG. C. LONG	12/4/69
APP.	

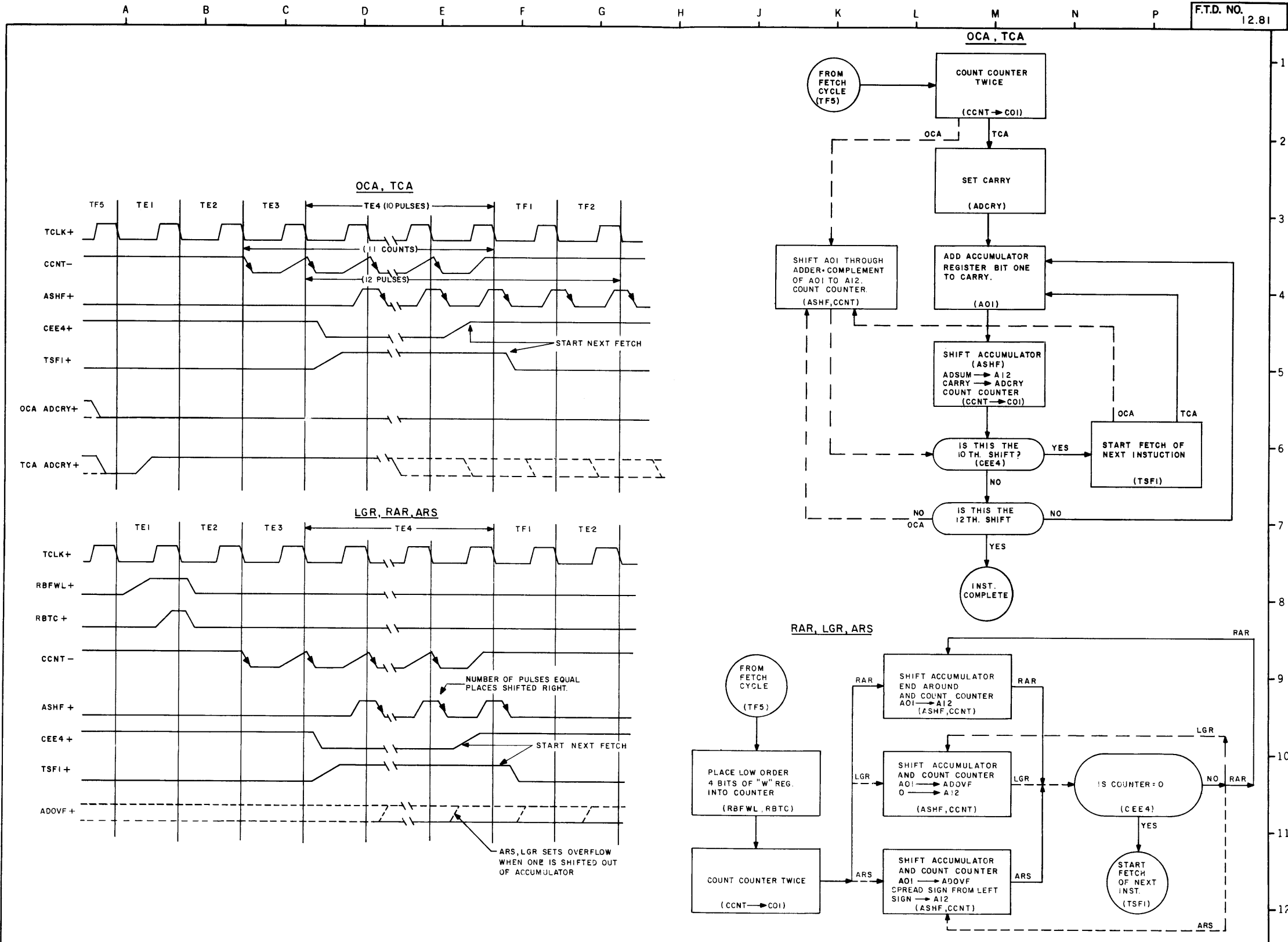
PROJECT NO. 59291

TITLE
 ADD AND ANA
 FLOW AND TIMING

SIZE	DWG NO.	REV.
C	70027851	

JMP, JST, Flow and Timing
FTD No. 12.80
Dwg. No. 70 027 852

OCA, TCA, RAR, LGR, ARS, Flow and Timing
FTD No. 12.81
Dwg. No. 70 027 853



NOTES:

- △
- △
- △
- △

CHK	REVISONS	REV.

HONEYWELL
I N C.
COMPUTER CONTROL DIVISION
Old Connecticut Path, Framingham, Mass

DR. D. HAMEL DATE
ENG. C. LONG 12-5-69
APP.
PROJECT NO. 59291

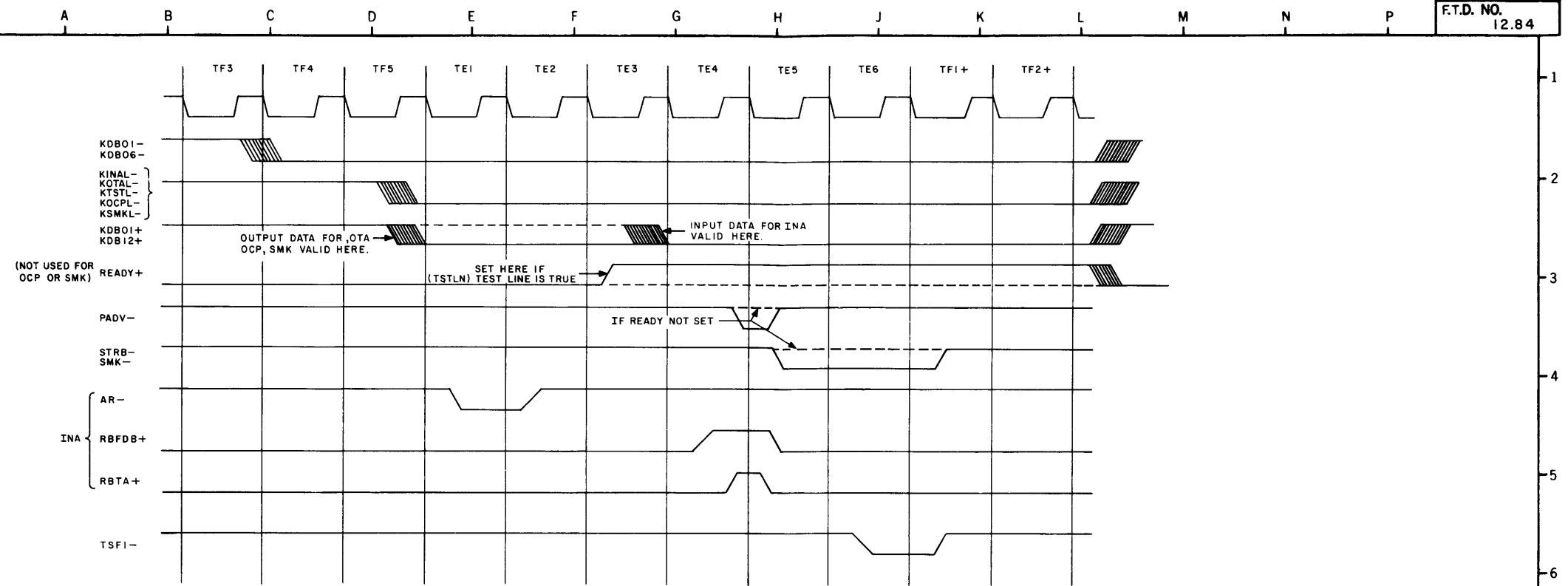
TITLE
OCA, TCA, RAR, LGR, ARS
FLOW AND TIMING

SIZE DWG NO. REV.
C 70027853

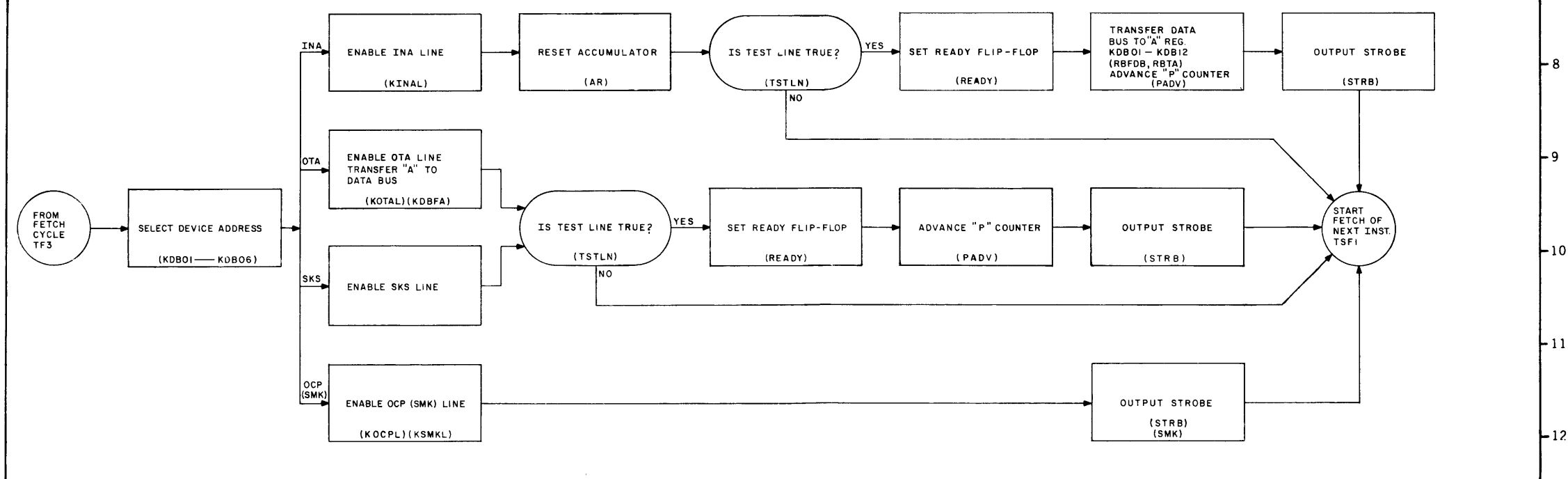
**INH, TAB, ITR, HLT, ENB, CRA, TBA, ITS, Flow
and Timing
FTD No. 12.82
Dwg. No. 70 027 854**

NOP, SMZ, SZE, SNZ, SMI, SPL, SOV, SNO, SKP,
SPN, STL, Flow and Timing
FTD No. 12.83
Dwg. No. 70 027 855

INA, OTA, SKS, OCP, SMK, Flow and Timing
FTD No. 12.84
Dwg. No. 70 027 856



CABLE DELAY IS NOT INCLUDED



- NOTES:
- △
 - △
 - △
 - △

CHK	REVISIONS	REV.

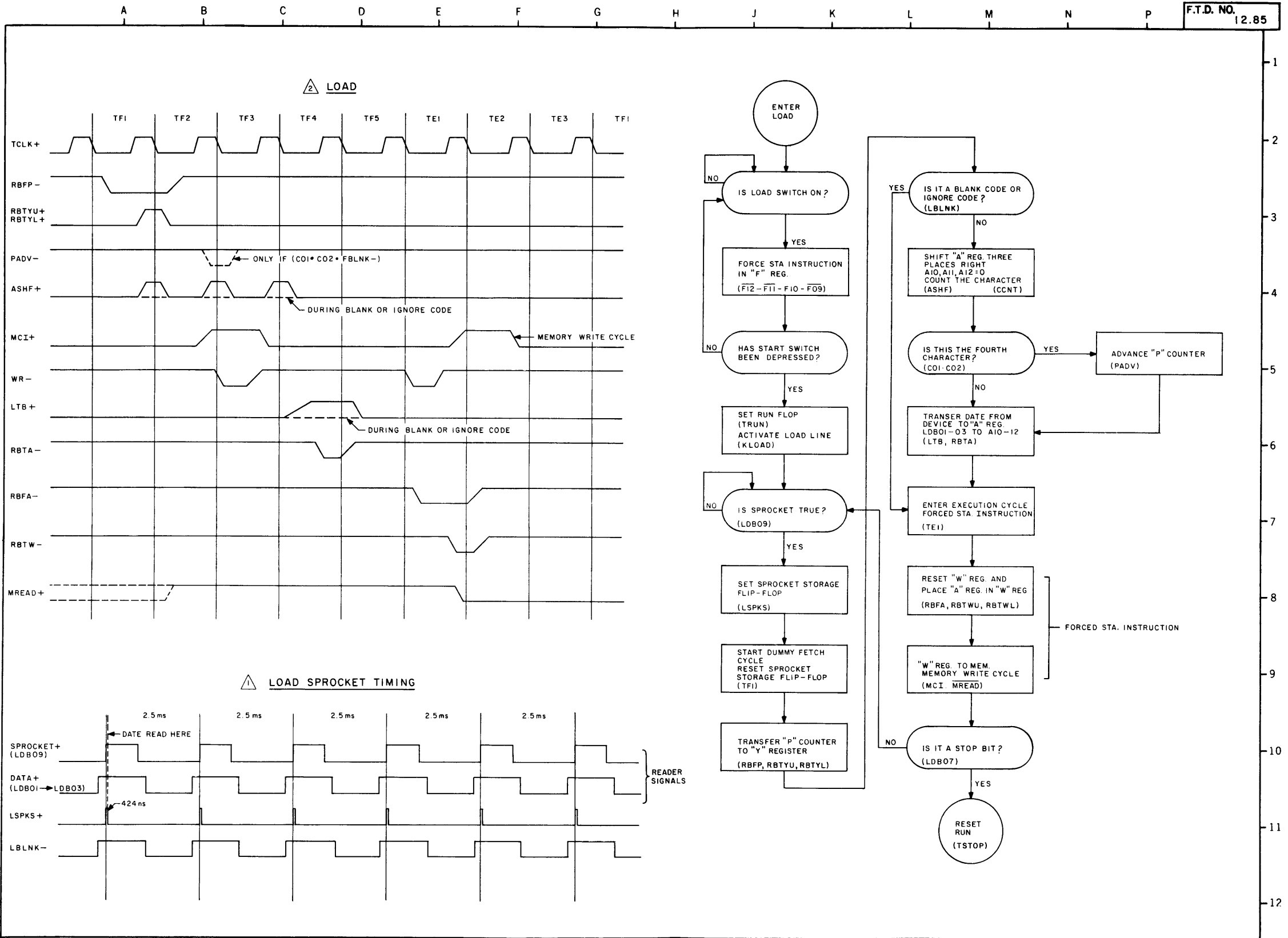
HONEYWELL
 I N C.
 COMPUTER CONTROL DIVISION
 Old Connecticut Path, Framingham, Mass.

DR. D. HAMEL _____ DATE _____
 ENG. C. LONG _____ 12/9/69
 APP. _____
 PROJECT NO. 59291

TITLE
 INA, OTA, SKS, OCP, SMK
 FLOW AND TIMING

SIZE DWG NO. **C** 70027856 REV. _____

Load, Flow and Timing
FTD No. 12.85
Dwg. No. 70 027 857



NOTES:

- △ TIMING SHOWN FOR A 400 CHARACTER PER SECOND, PAPER TAPE READER. SEE INTERFACE MANUAL FOR LOAD MODE TIMING
- △ TIMING SHOWN FOR 1 CHARACTER. THE SEQUENCE REPEATS 3 ADDITIONAL TIMES TO FORM A WORD. THE FORMING OF WORDS CONTINUES UNTIL A STOP CODE IS ENCOUNTERED.
- △
- △

CHK	REV	REV	REV	REV	REV	REV	REV	REV	REV	REV	REV

HONEYWELL
I N C.
COMPUTER CONTROL DIVISION
Old Connecticut Path, Framingham, Mass

DR. D. HAMEL	DATE
ENG. C. LONG	12/1/69
APP.	

PROJECT NO. 59291

TITLE
LOAD
FLOW AND TIMING

SIZE DWG NO. 70027857 REV.

Honeywell COMPUTER CONTROL DIVISION, FRAMINGHAM, MASS. 01701

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