BiSON Birmingham Solar-Oscillations Network

TECHNICAL REPORT NO. 184

Mark I Scaler System

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2002 July 10

This technical report series is published by:

THE UNIVERSITY OF BIRMINGHAM

High-Resolution Optical-Spectroscopy Group

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Abstract

Drawings of the Mark I scaler system in Izaña are presented.

Way back in 1970, the first HiROS resonance-scattering spectrometer was built [1]. It eventually found a home in Izaña, Tenerife and was called "Mark I". The system was computerized in 1984 and has been running on a BBC ever since. A failure in the GPS, and later a mistake that wiped out the Archimedes computer that was translating the data, led us to consider replacing the computer system with a more-modern PC-based system. In order to do this, it was necessary to find the documentation for the Mark I scaler system.

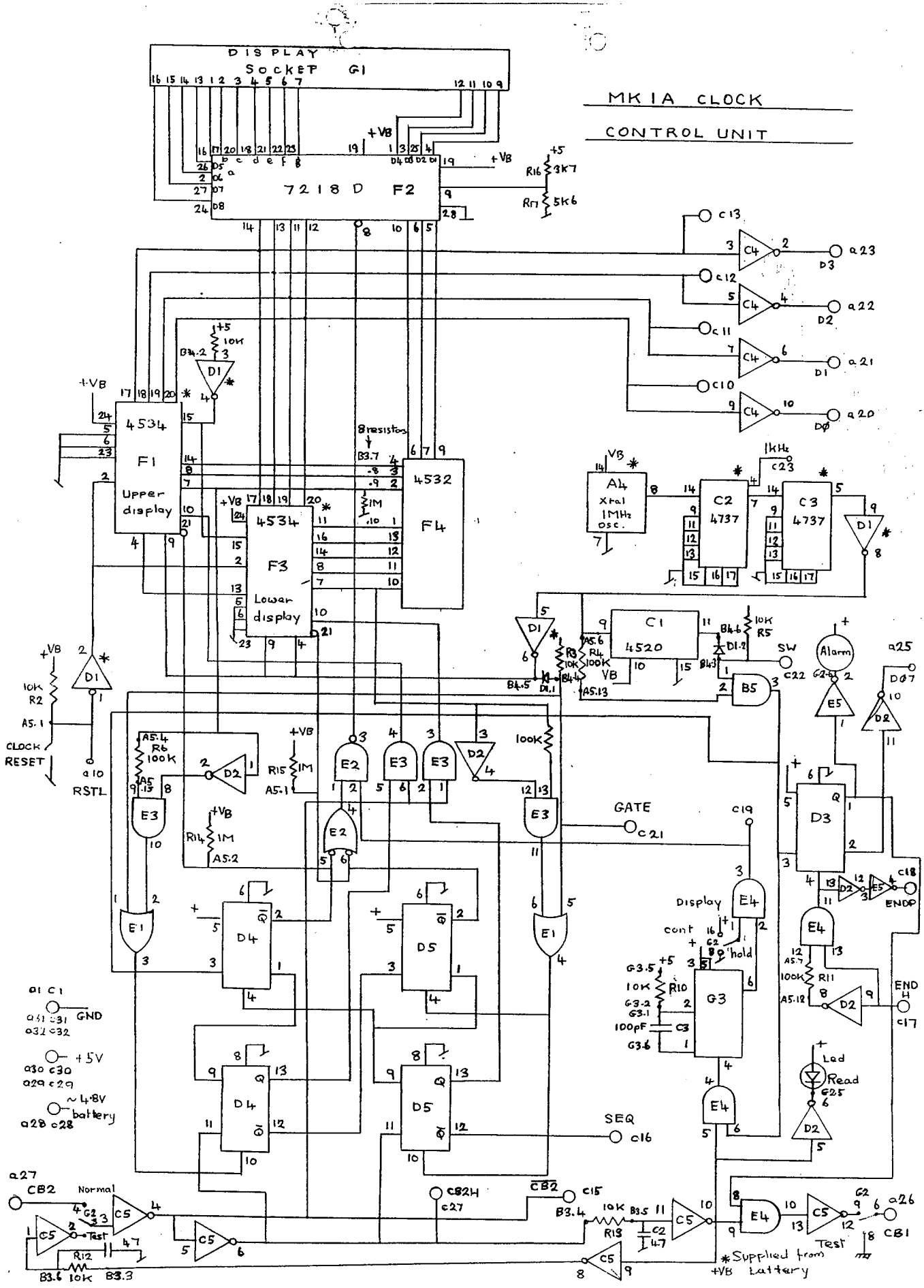
There once was a green folder labelled "Mk I Scalers" which contained the relavant drawings. It was hidden away in Poynting T2, the little room at the back of T1. Eventually, the green folder was located. And it was found to contain many, many drawings. And many of these drawings were copies of each other with various marks and notes carefully written on them.

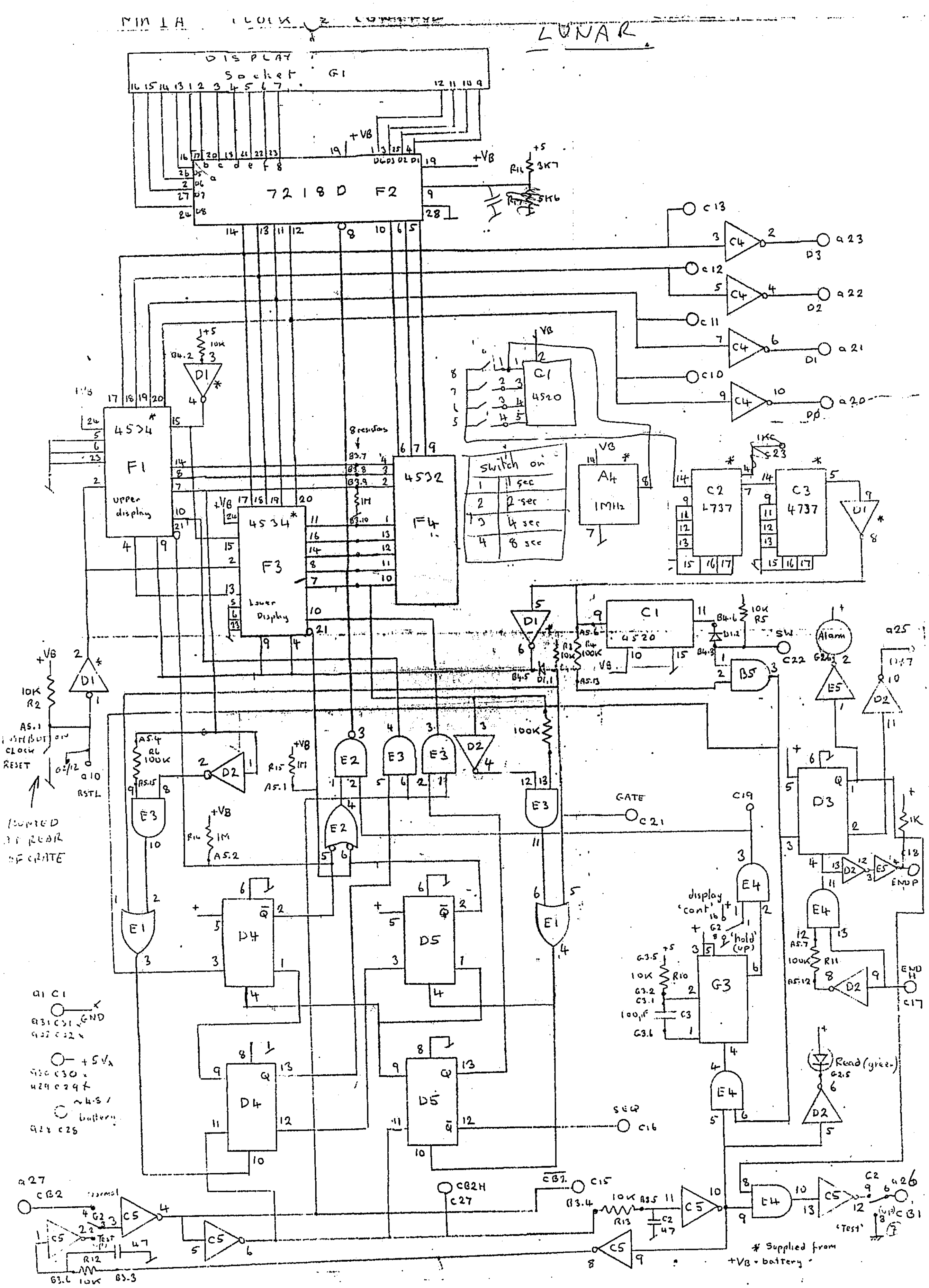
This report contains the most important of these drawings. They have been rendered in the clearest, most readable, form that is possible from a photocopier. This report does not describe how the scaler system works. For that, you should read the scaler manual [2].

References

[1] Brek A. Miller. BiSON resonance-scattering spectrometers. *BISON Technical Report Series,* Number 67, High-Resolution Optical-Spectroscopy Group, Birmingham, United Kingdom, February 1998.

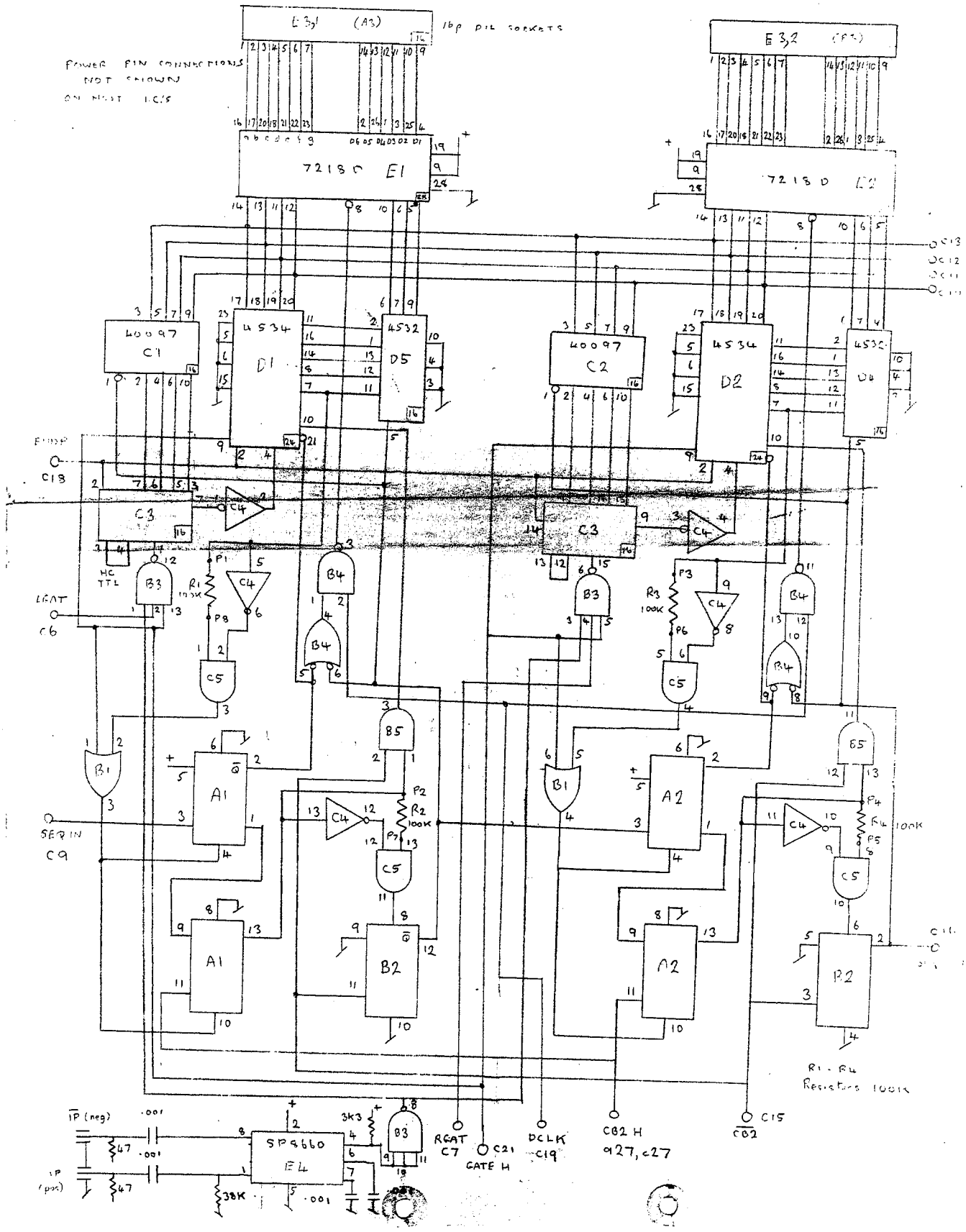
[2] Clive P. McLeod. BiSON scaler/control crate notes—Mount Wilson installation 1996. *BISON Technical Report Series,* Number 173, High-Resolution Optical-Spectroscopy Group, Birmingham, United Kingdom, June 2001.


MK IA CLOCK
CONTROL UNIT
DISPLAY
Socket G1
7218 D F2
+VB
+5
R16 3K7
R17 5K6
4534
F1
Upper display
F3
Lower display
4532
F4
8 resistors
1M
10K
B3.7
B3.2
D1
A4
Xtal
1MHz
osc.
C2
4737
C3
4737
1kHz
C23
C1
4520
R3 10K
R4 100K
R5 10K
B4.6
D1.2
B4.3
B4.5
D1.1
A5.6
A5.13
SW
C22
B5
Alarm
G2.4
E5
a25
D07
D2
R2 10K
A5.1
CLOCK
RESET
a10
RSTL
R6 100K
A5.4
A5
R15 1M
A5.1
R14 1M
A5.2
E1
E2
E3
100K
GATE
C21
C19
D3
Q
E4
Display
cont
G2
hold
C18
ENDD
R10 10K
G3.5
G3.2
G3.1
100pF
C3
G3.6
G3
R11 100K
A5.12
A5.7
END
C17
Led
Read
G25
SEQ
C16
D4
D5
Q̄
a1 C1
a31 c31 GND
a32 c32
+5V
a30 c30
a29 c29
~4.8V battery
a28 c28
a27
CB2
Normal
G2
Test
R12
B3.6 10K B3.3
C5
CB2H
C27
CB2
C15
B3.4
10K
B3.5
R13
C2 4.7
a26
CB1
*Supplied from +VB battery

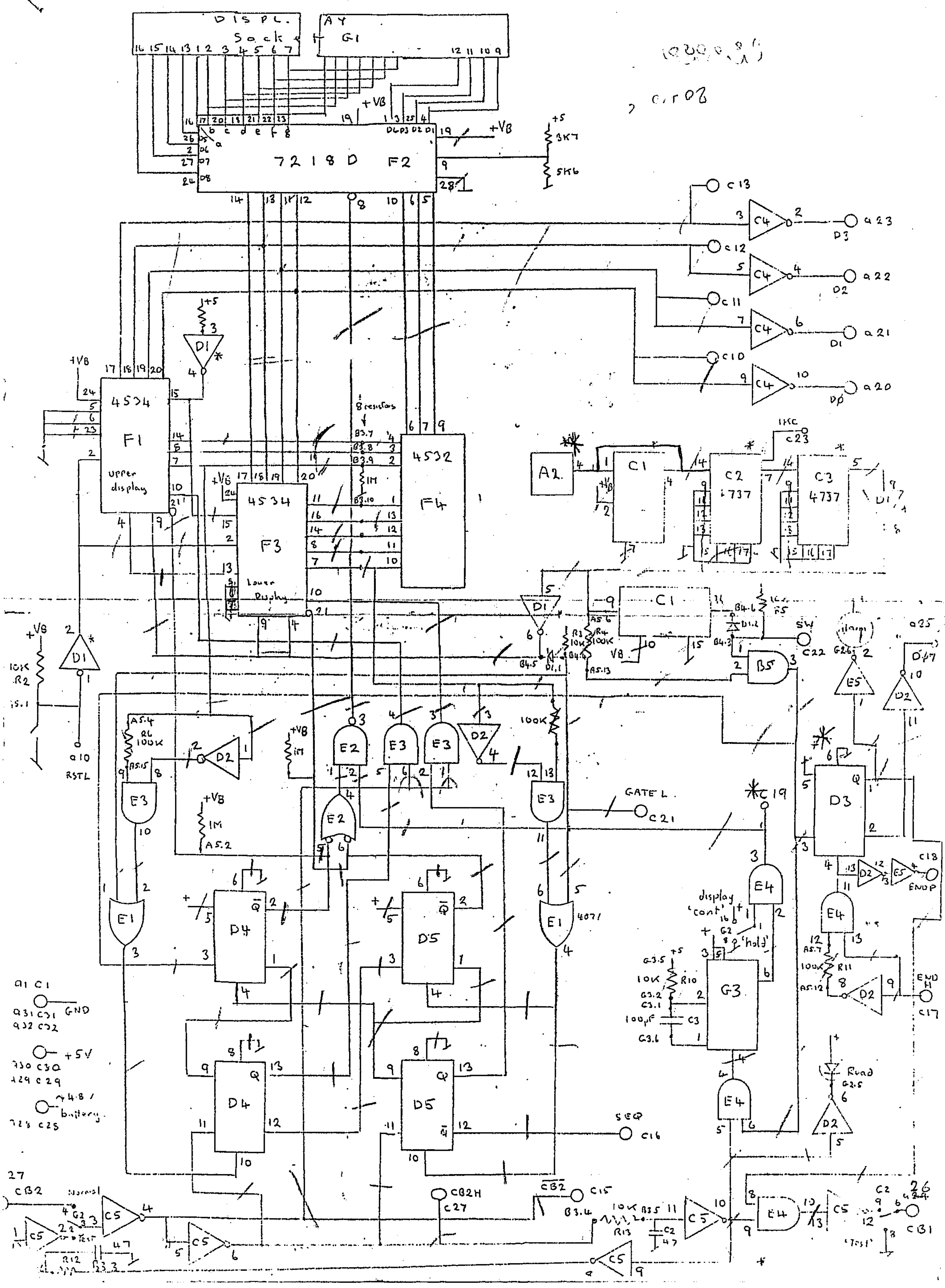


LUNAR
DISPLAY Socket G1
7218D F2
4534 F1 upper display
4534 F3 Lower Display
4532 F4
C1 4520
A4 1MHz
C2 4737
C3 4737
switch on
1 | 1 sec
2 | 2 sec
3 | 4 sec
4 | 8 sec
8 resistors
GATE C21
SEQ C16
Alarm
SW C22
END P
END H C17
Read (green)
display 'cont'
'hold' (up)
'Test'
* Supplied from +VB battery.

MK1A SCALERS BOARD C.P.M. Lead Feb 1974

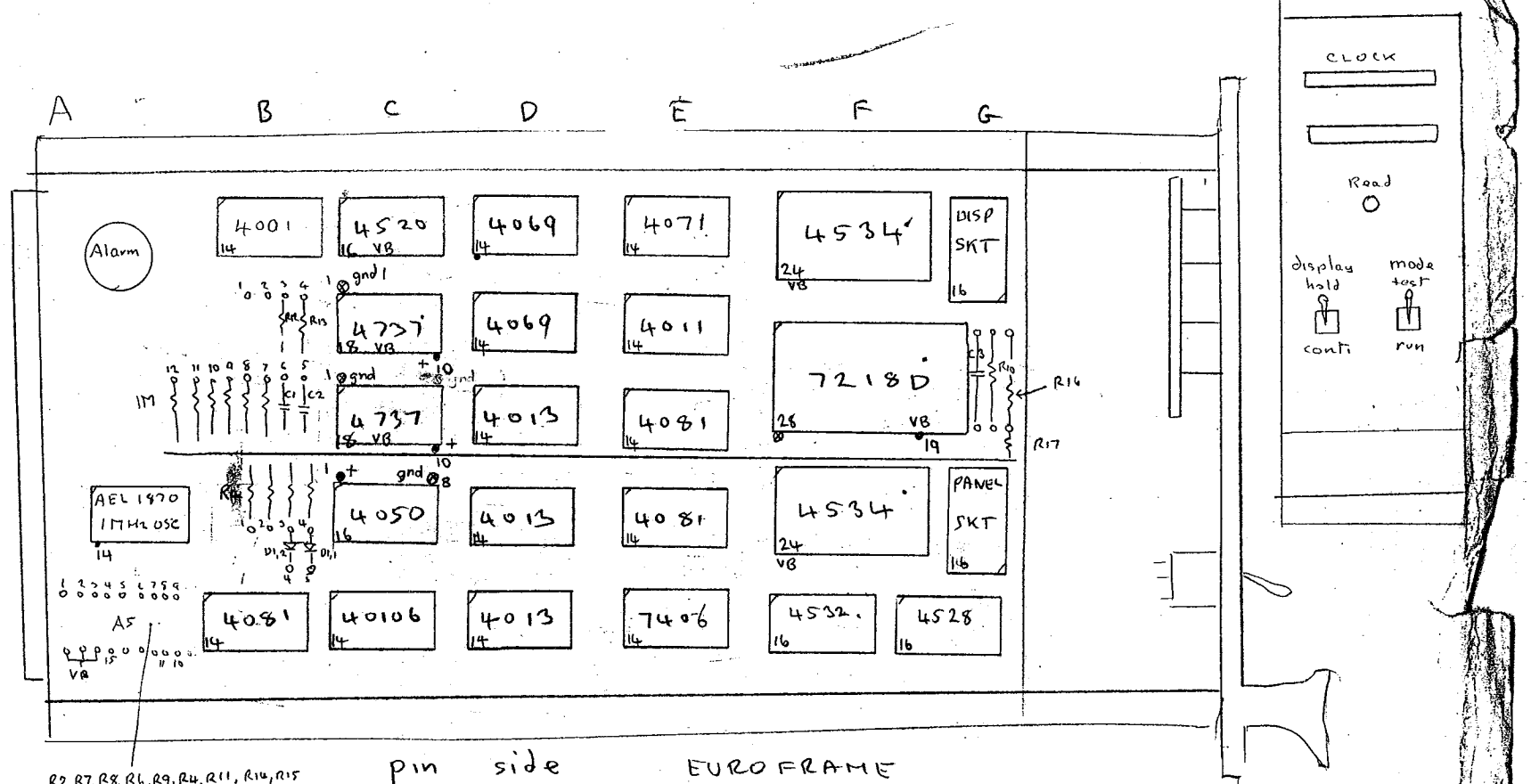


FMLA CLOCK & CONTROL C.P.McLeod Jan 1984



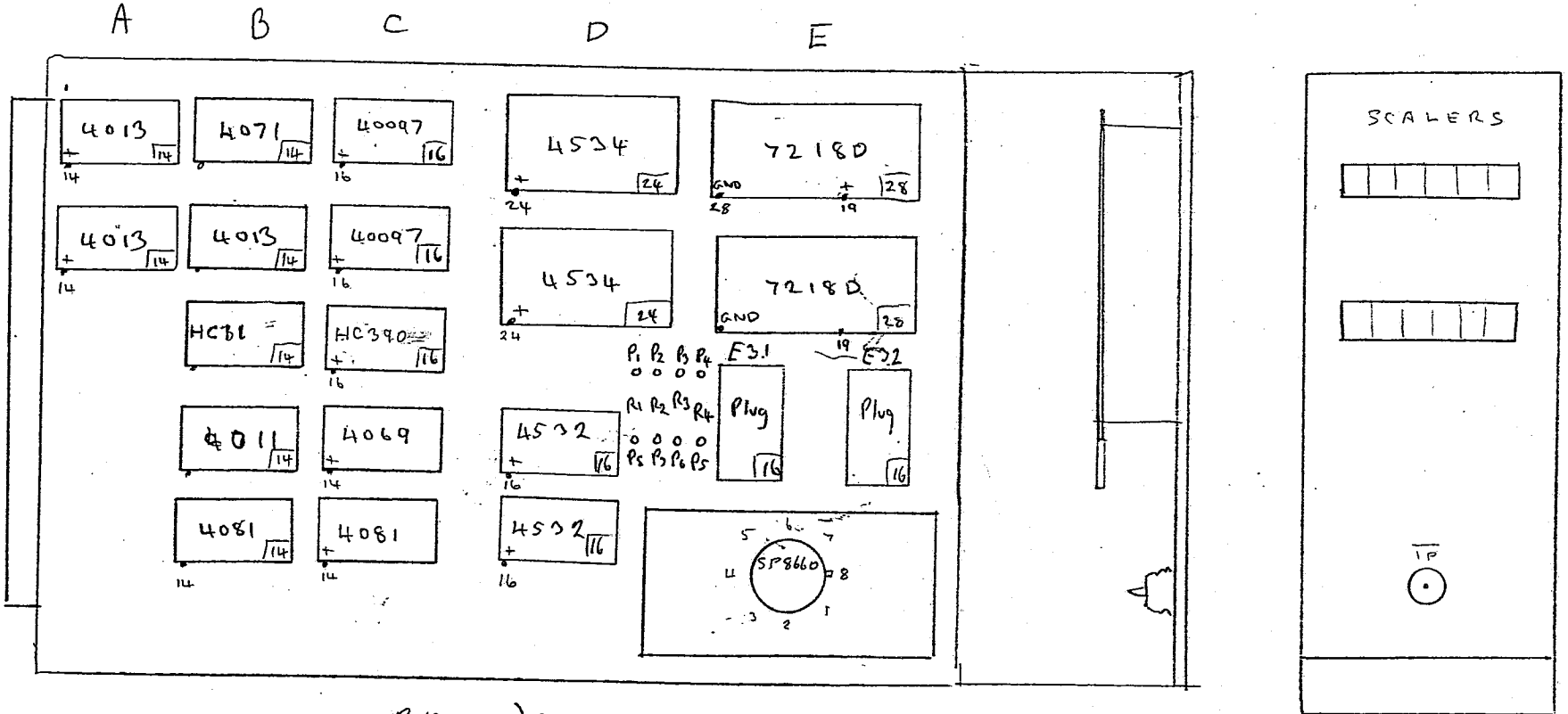
MK 1A CLOCK + CONTROL LAYOUT

C. McLeod Jan 1984



MK1A SCALER BOARD LAYOUT

checked Jan 1984



pin side view

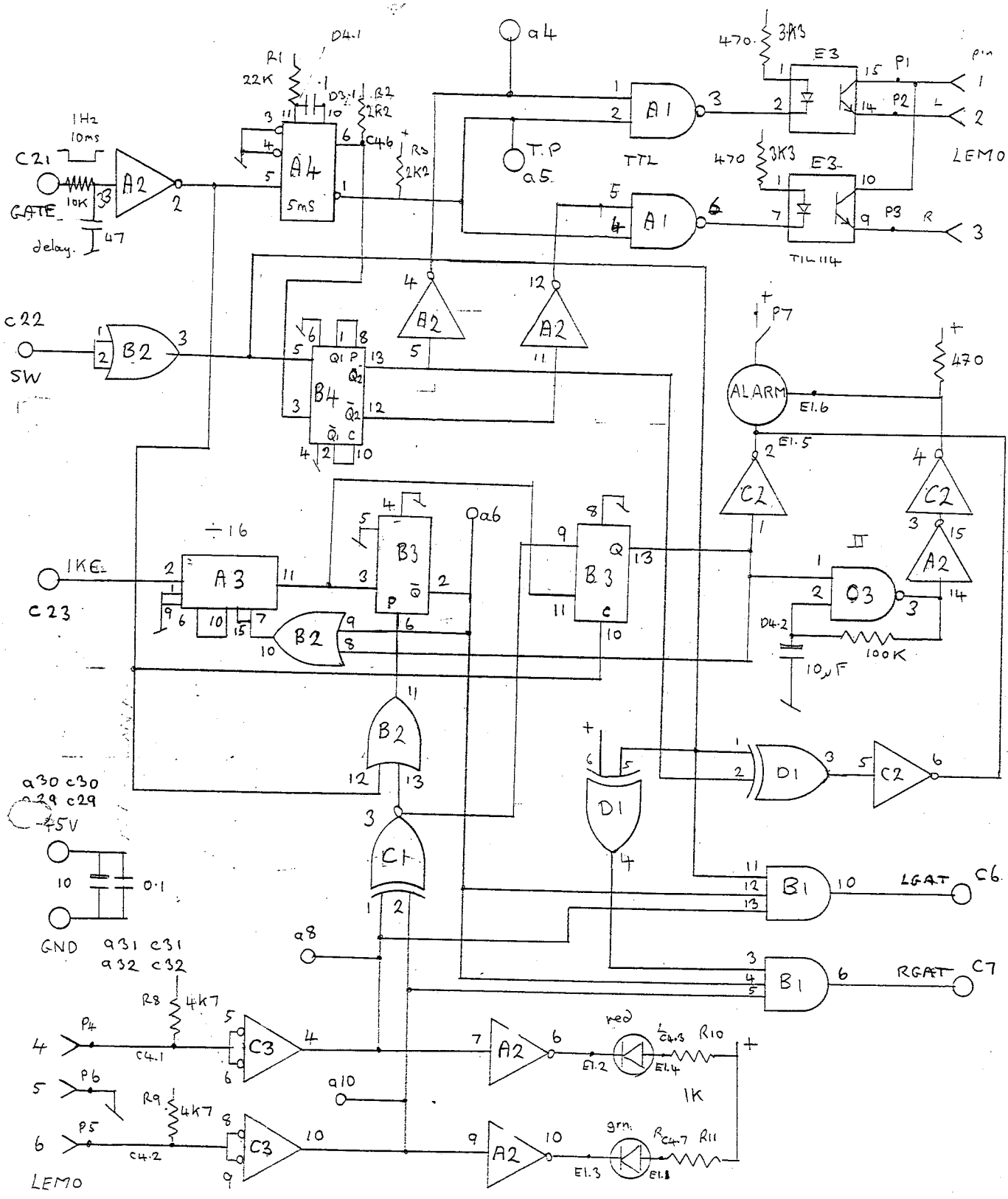
Power pins +5V. shown (VCC)
GND not shown except for 7218

denotes 16p DIL

NOTE MODULES MODIFIED TO CONTAIN WIRE WRAP BOARD. 2 EXTRA HOLES IN FRONT PANEL, MOD TO REAR FRAME.

MK 1A EOLM SWITCH CONTROL

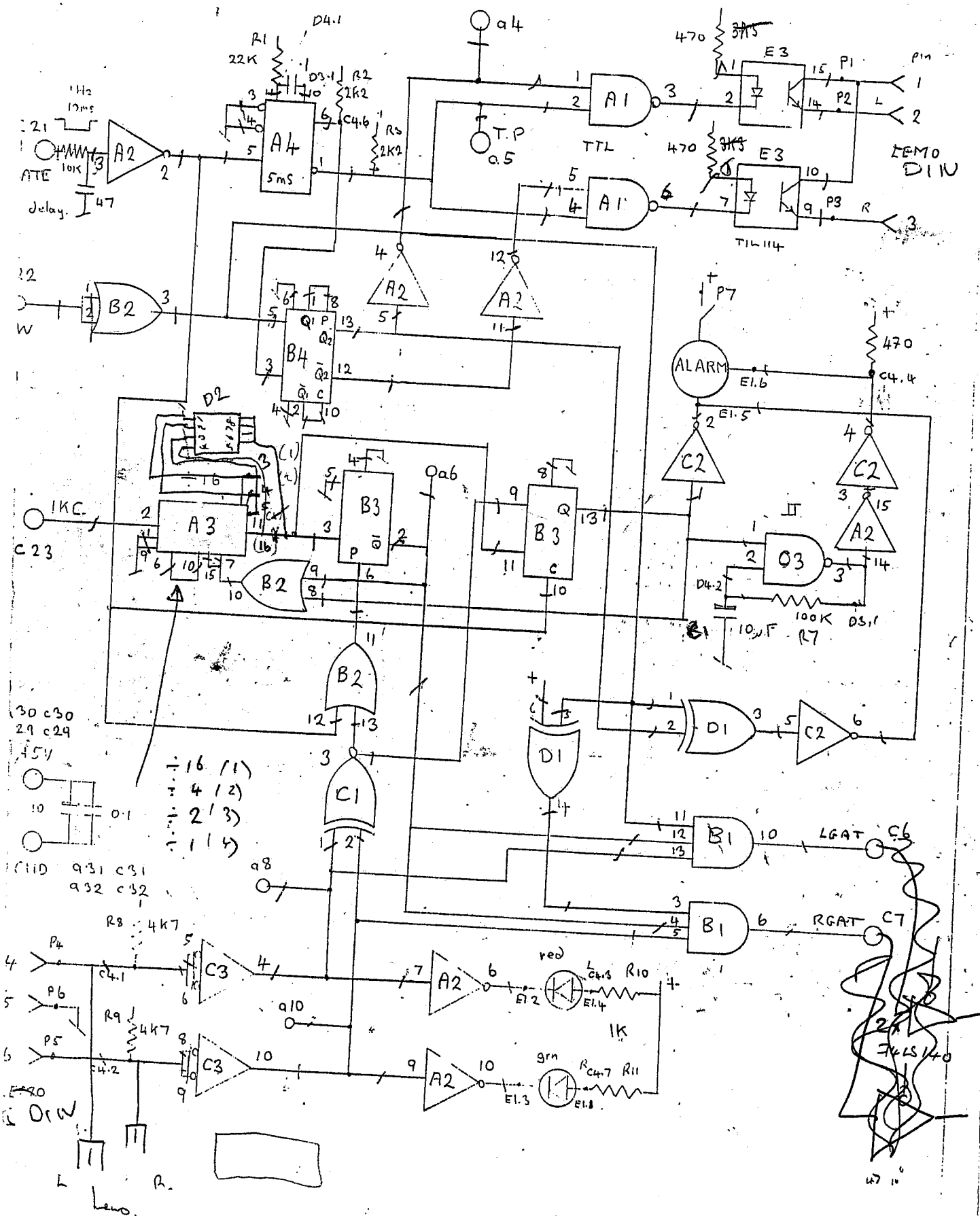
C.P. McLeod Jan 1984



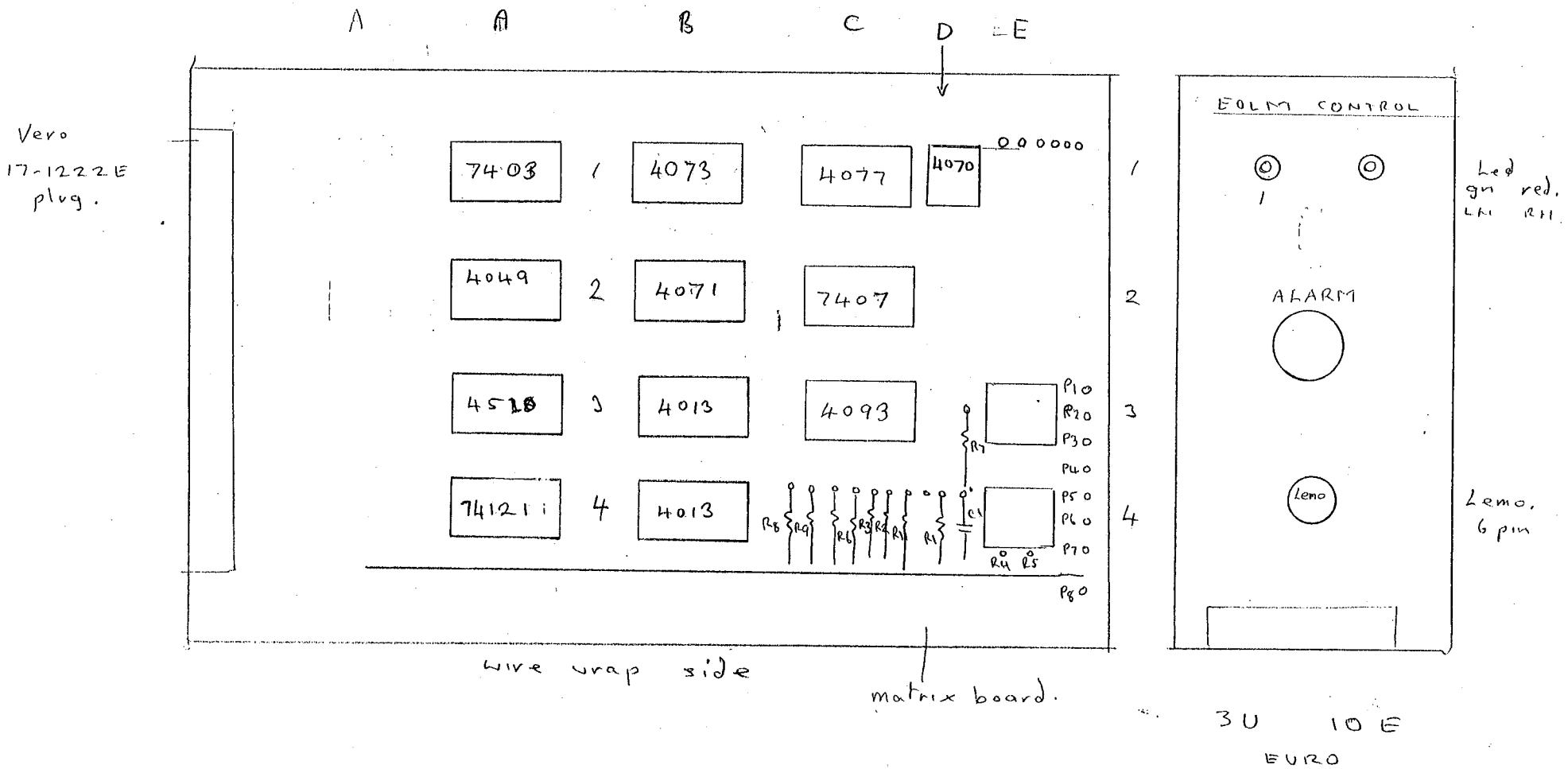
RCAT ON WHEN SW IS H.

MK 1A — EOLM SWITCH CONTROL

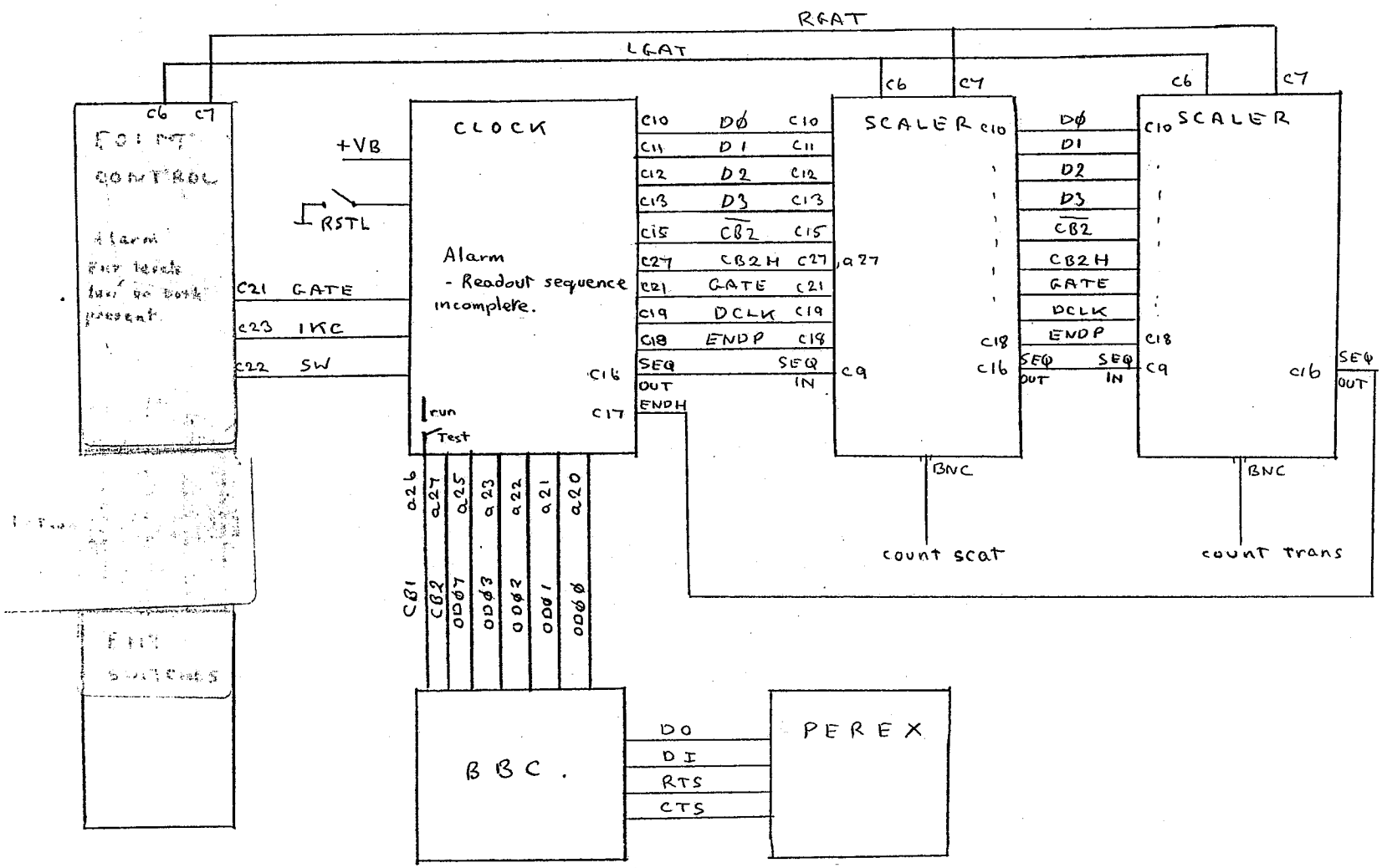
C.P. McLeod Jan 1984



MK 1A EOLM SWITCH CONTROL MODULE



MK I A INTERCONNECTIONS



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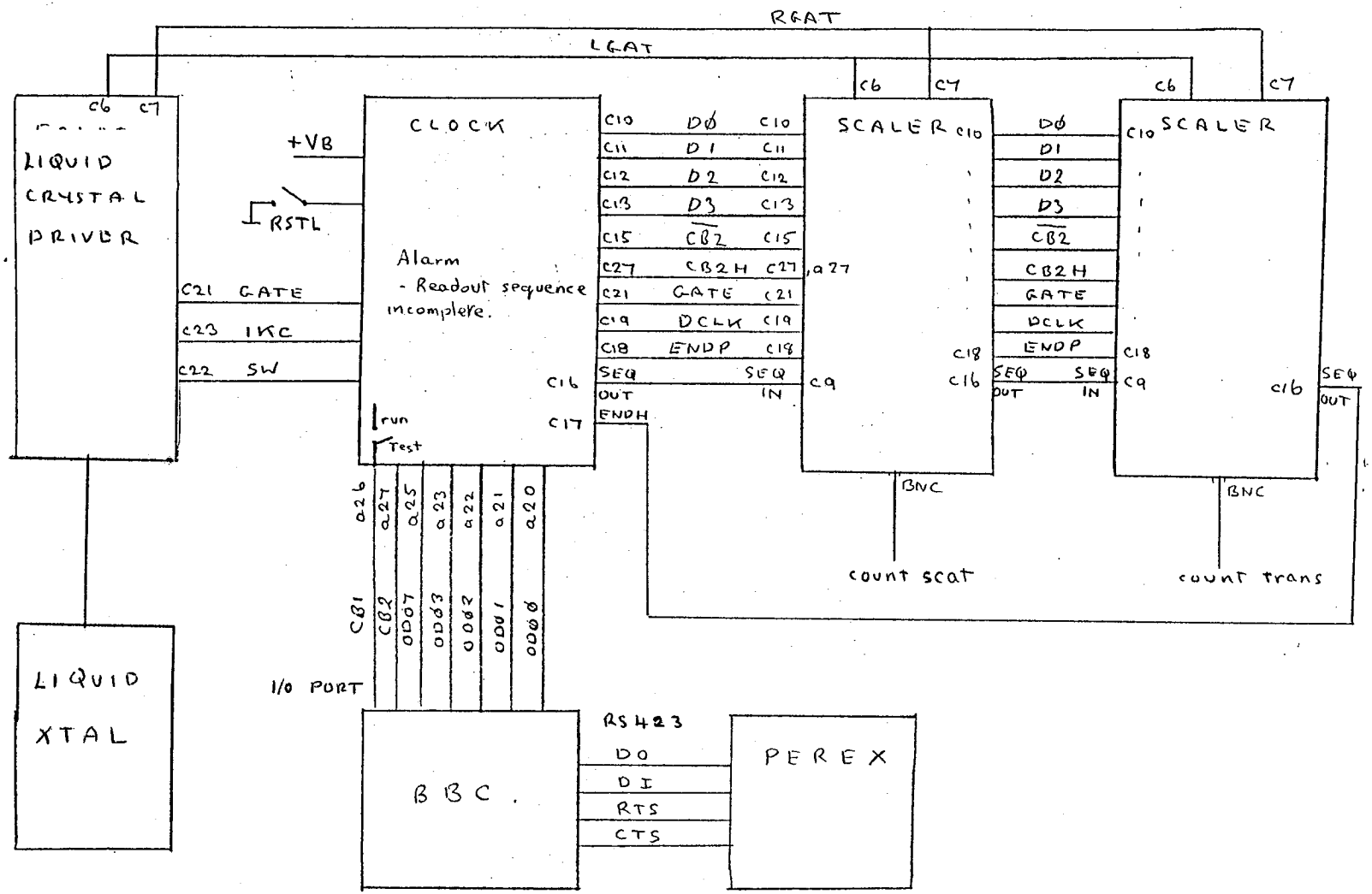
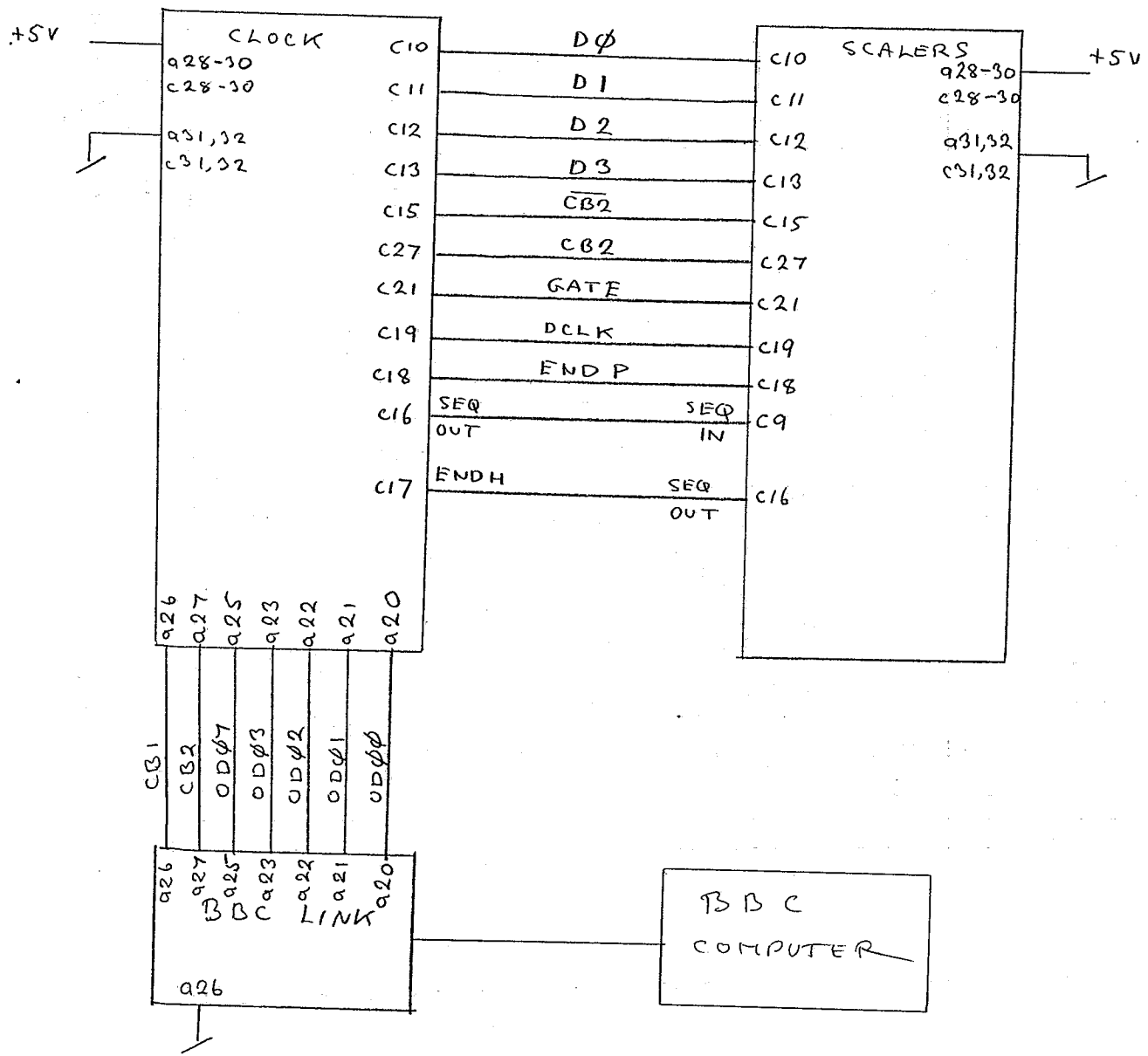
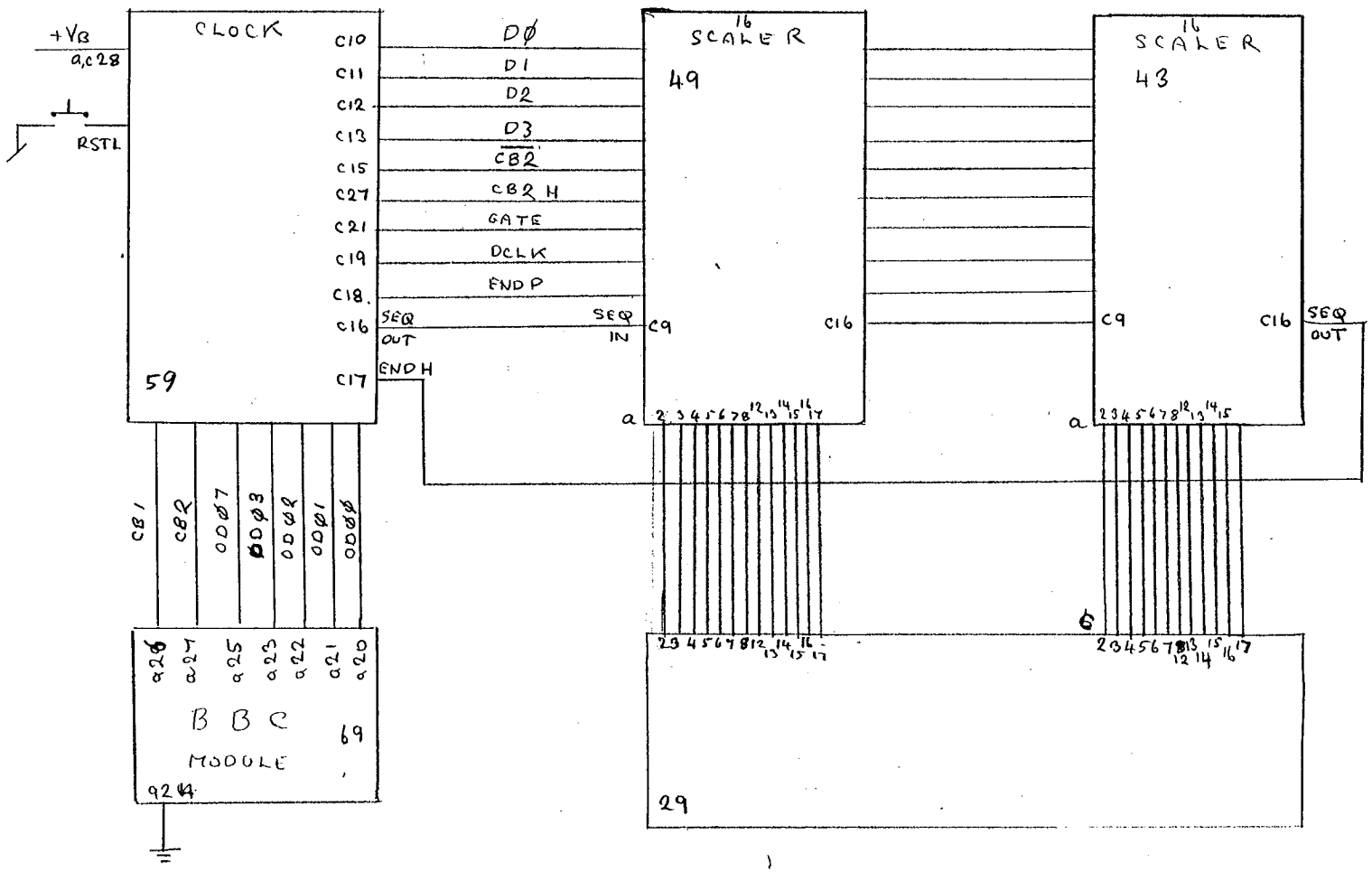
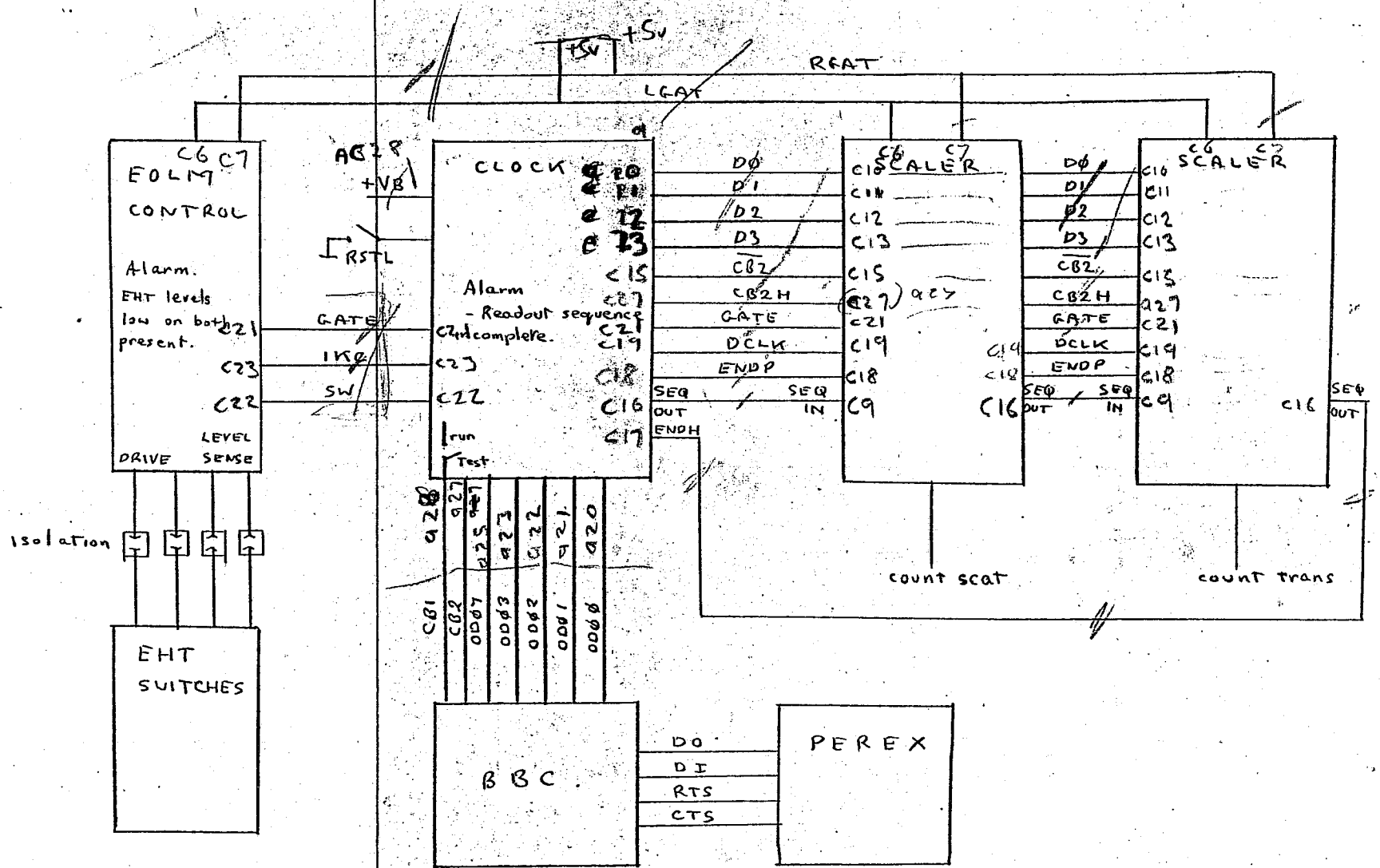


BBC SCALER - REAR PLANE CONN'S

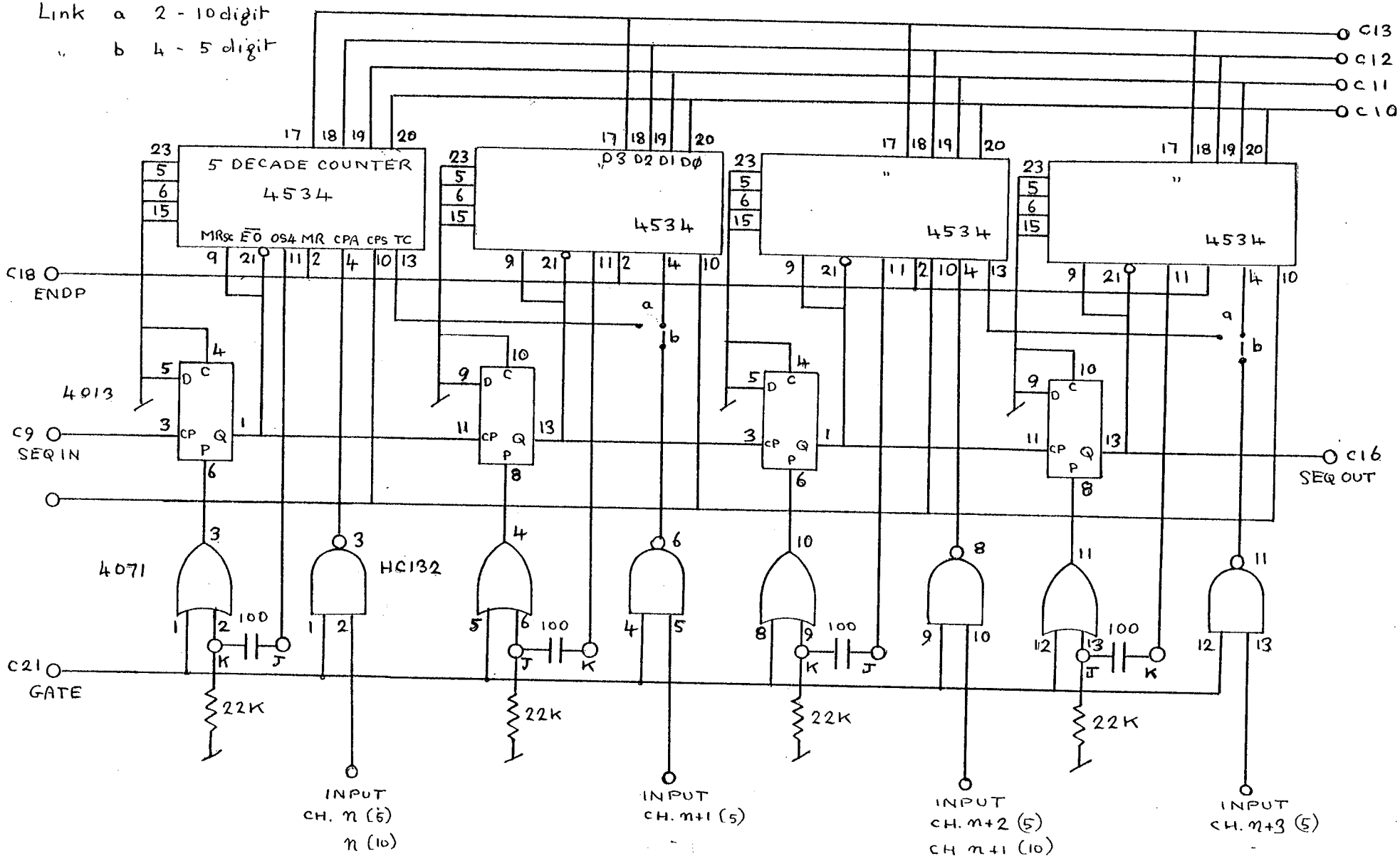



+VB
a,c28
RSTL
CLOCK
59
C10
C11
C12
C13
C15
C27
C21
C19
C18
C16
C17
SEQ OUT
END H
D0
D1
D2
D3
CB2
CB2 H
GATE
DCLK
END P
SEQ IN
16
SCALER
49
C9
C16
16
SCALER
43
C9
C16
SEQ OUT
CB1
CB2
0007
0003
0002
0001
0000
BBC
MODULE
69
29
6

MK1A INTERCONNECTIONS

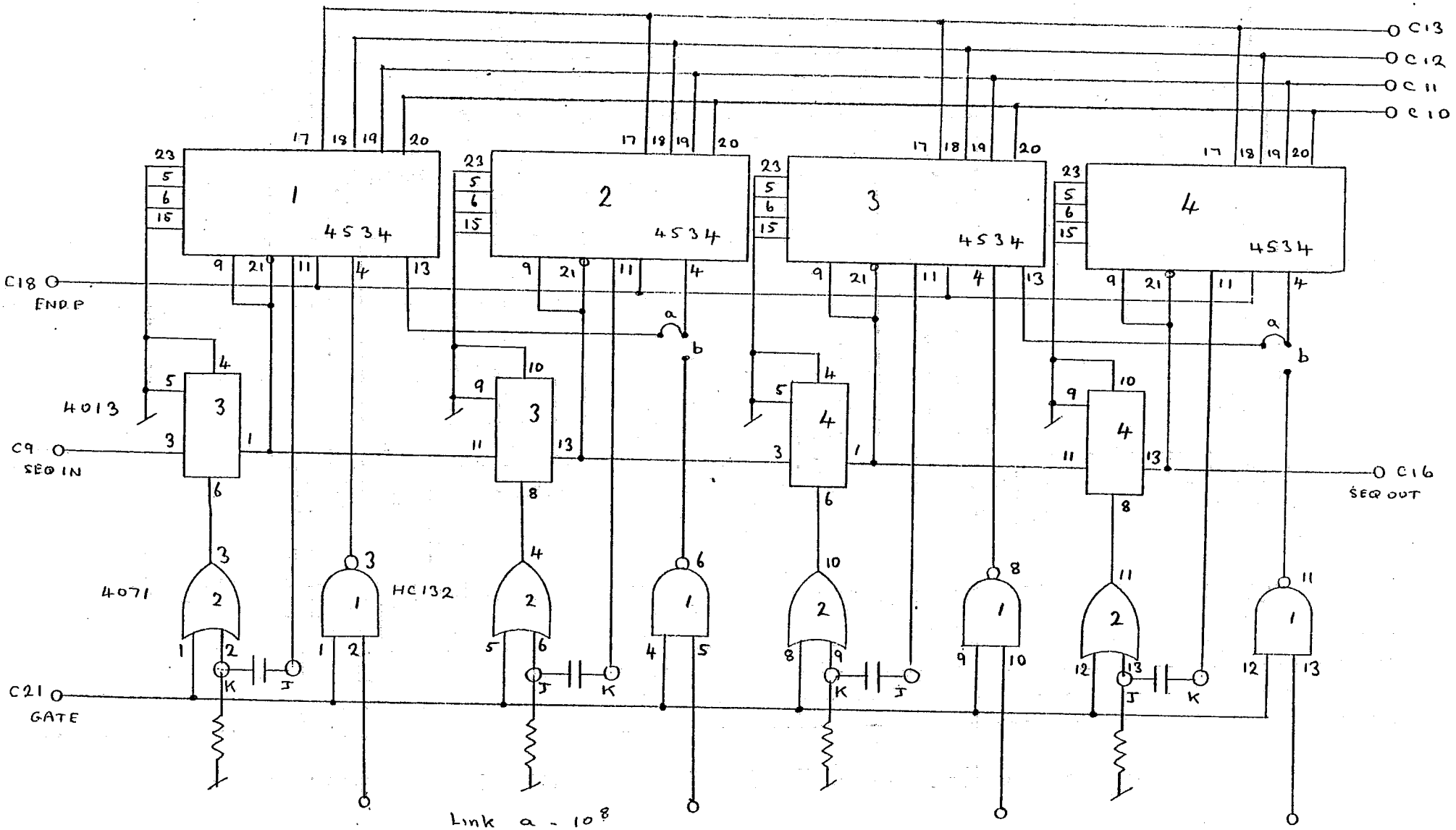


HIGH DENSITY SCALERS - 4 - 5 DIGIT SHOWN : REPEAT FOR 8. etc.



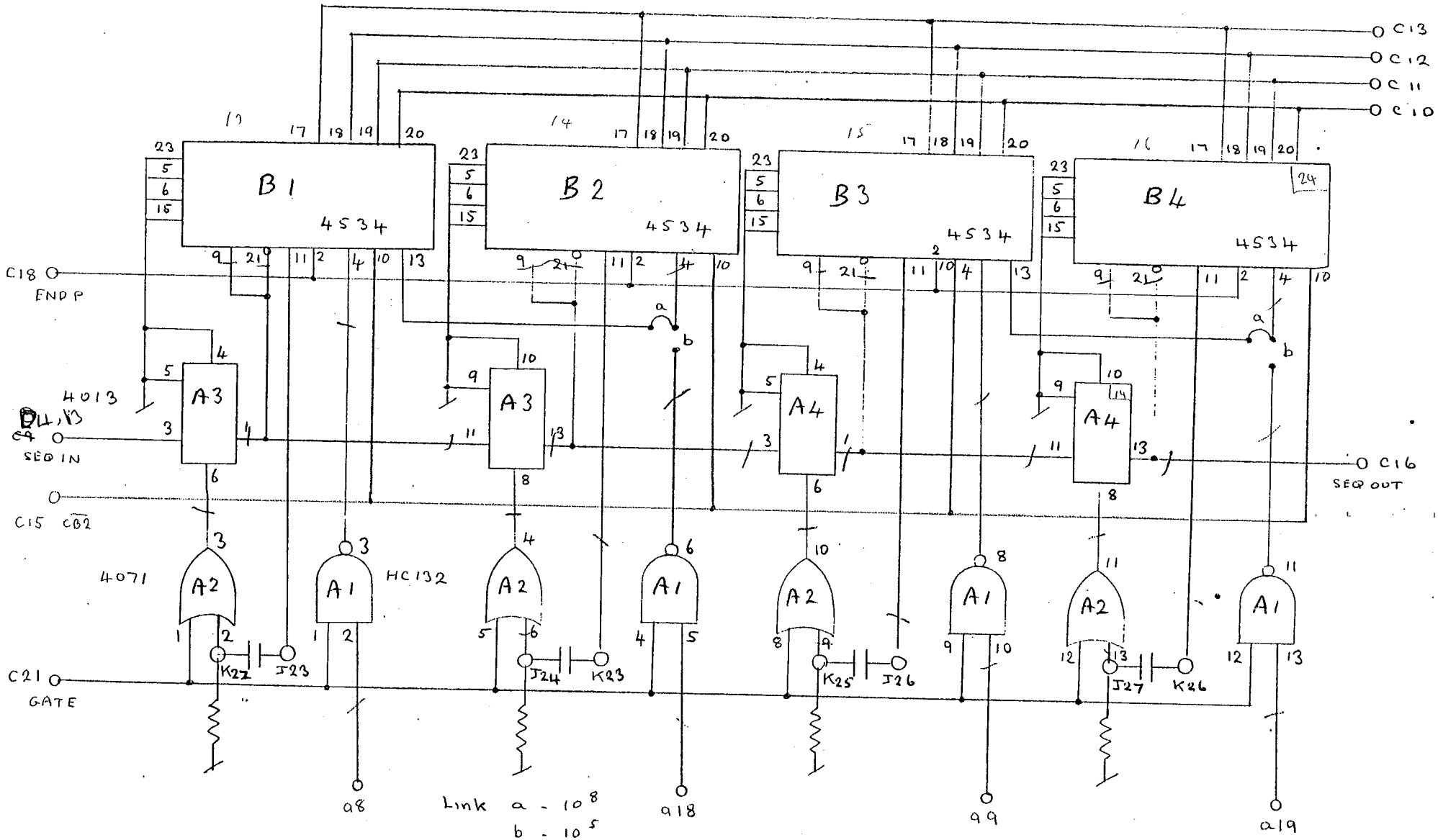
HIGH DENSITY SCALERS 16 SCALERS/BOARD - 4 SHOWN

C.McLEOD
OCT 85



HIGH DENSITY SCALERS 16 SCALERS/BOARD - 4 SHOWN

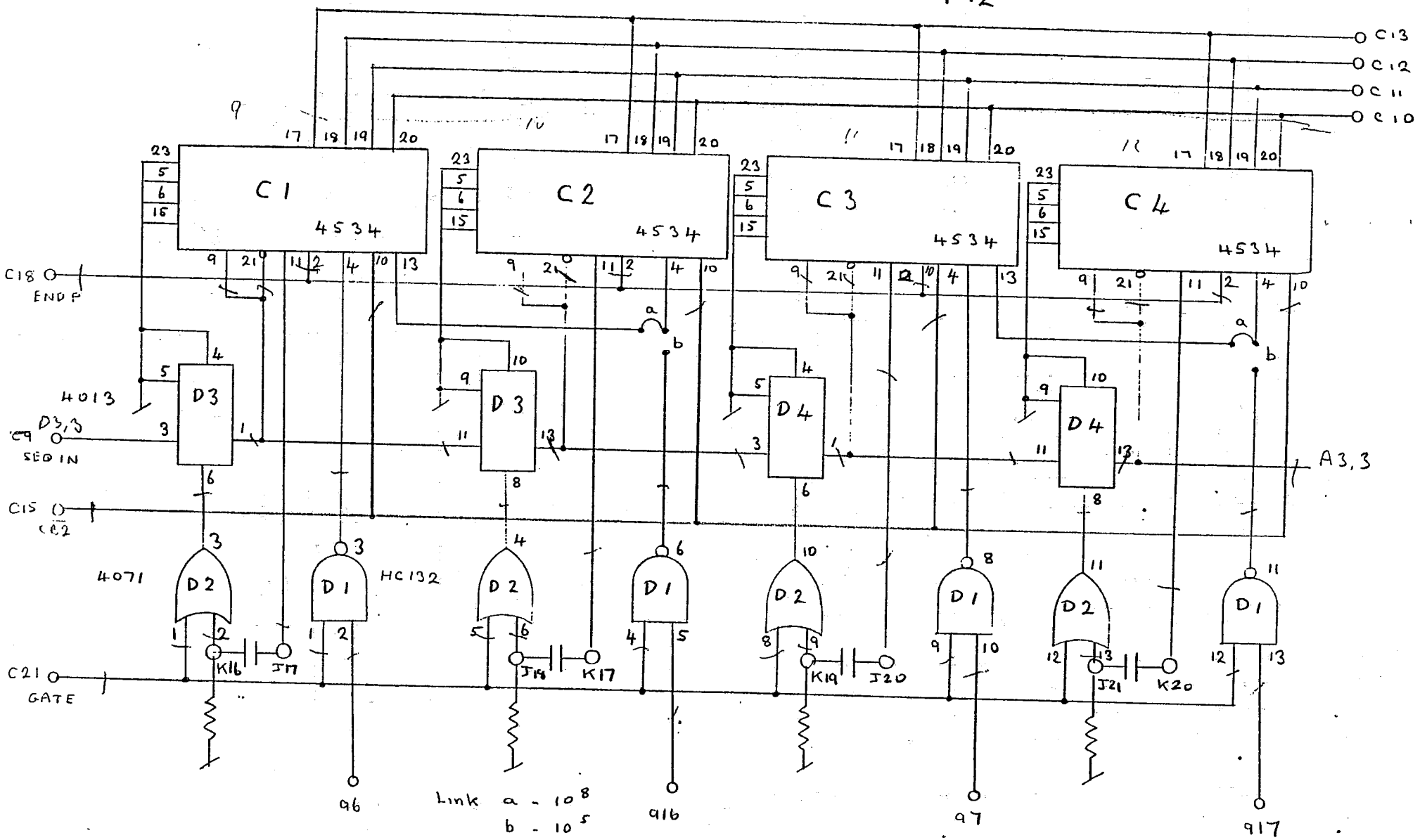
C. McLEOD
OCT 85



HIGH DENSITY SCALERS — 16 SCALERS/BOARD - 4 SHOWN

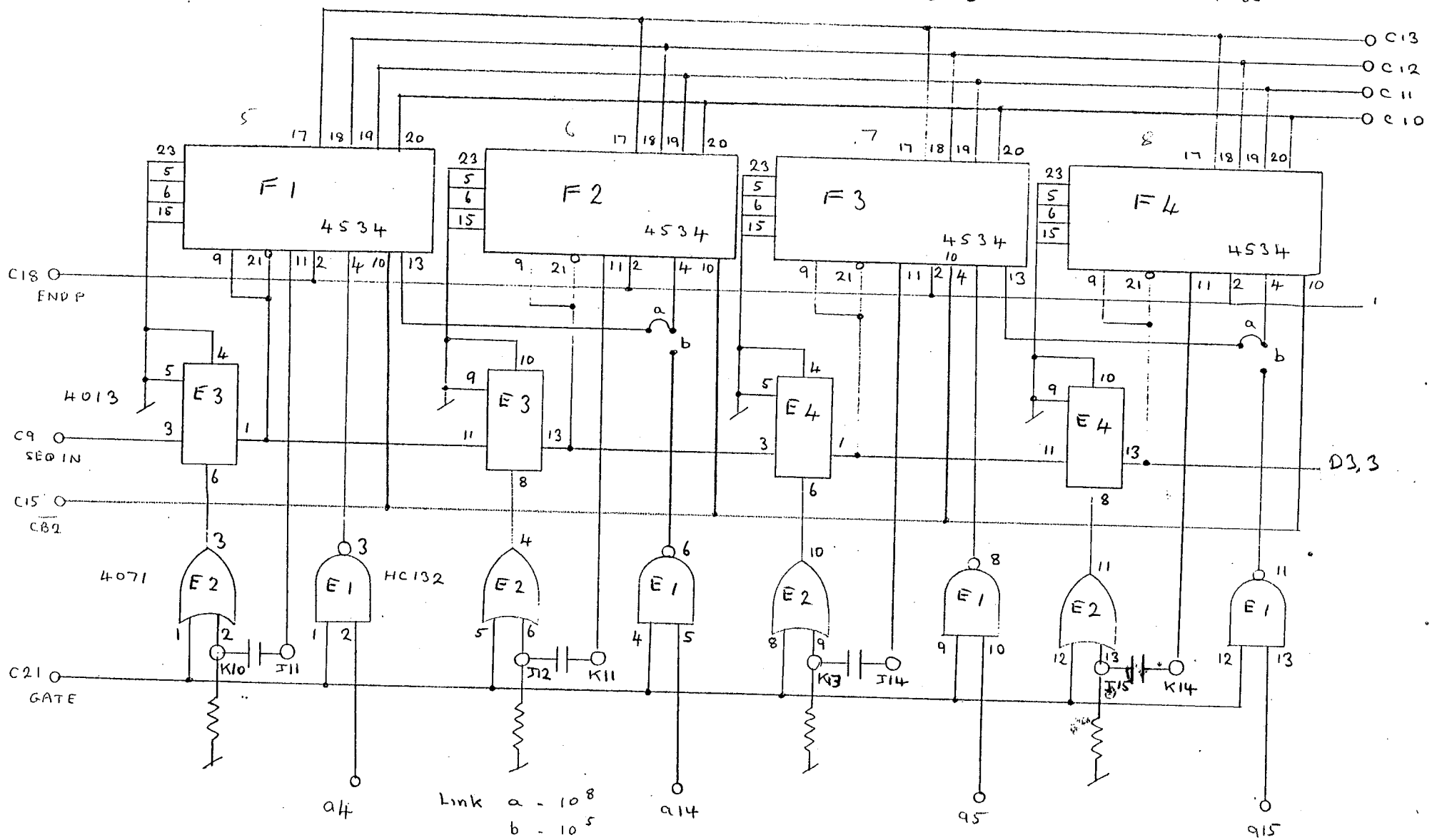
9-12

C.McLEOD
OCT 85



HIGH DENSITY SCALERS — 16 SCALERS/BOARD - 4 SHOWN — C.McLEOD OCT 85

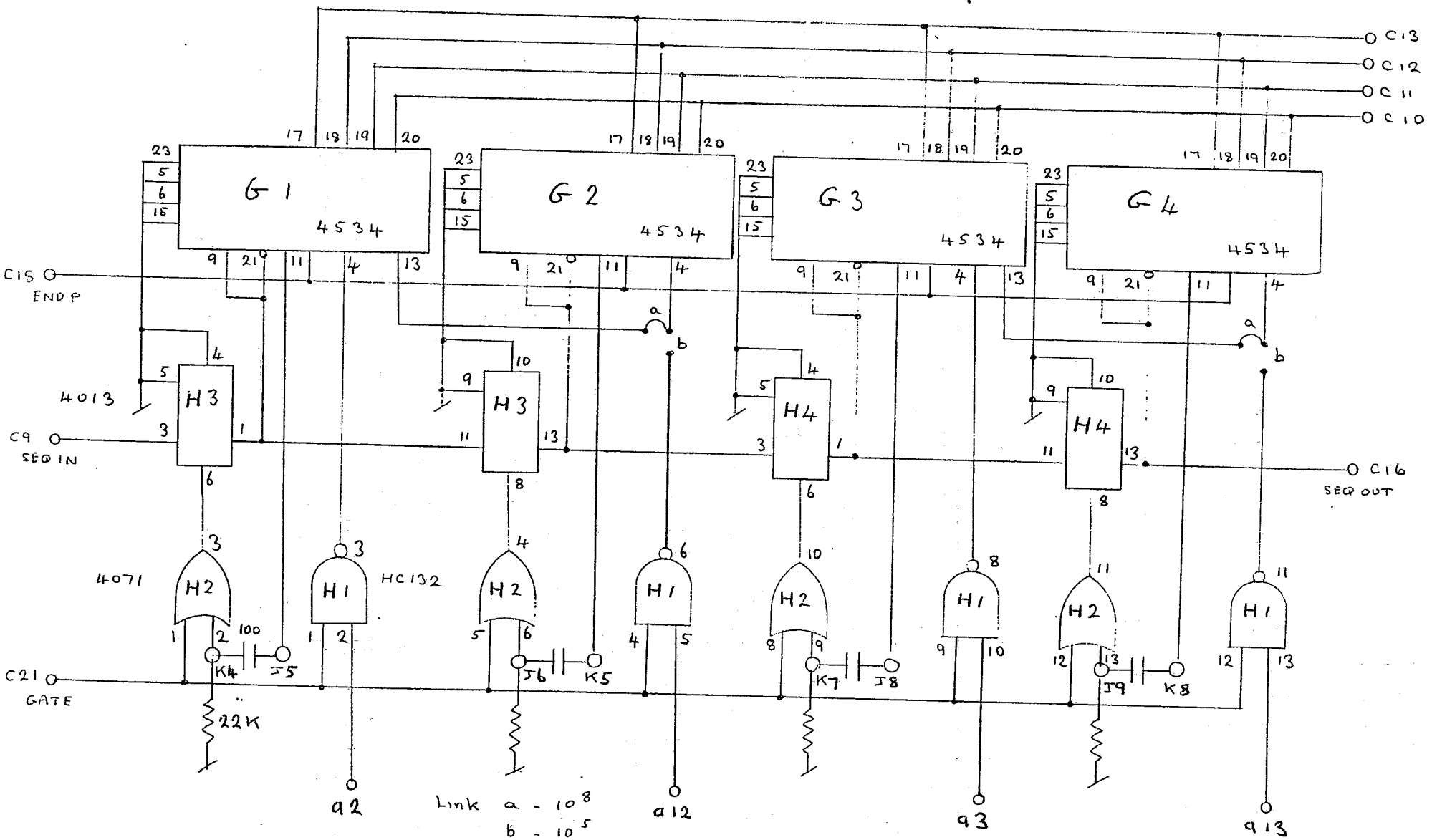
5-8



HIGH DENSITY SCALERS 16 SCALERS/BOARD - 4 SHOWN

1-4

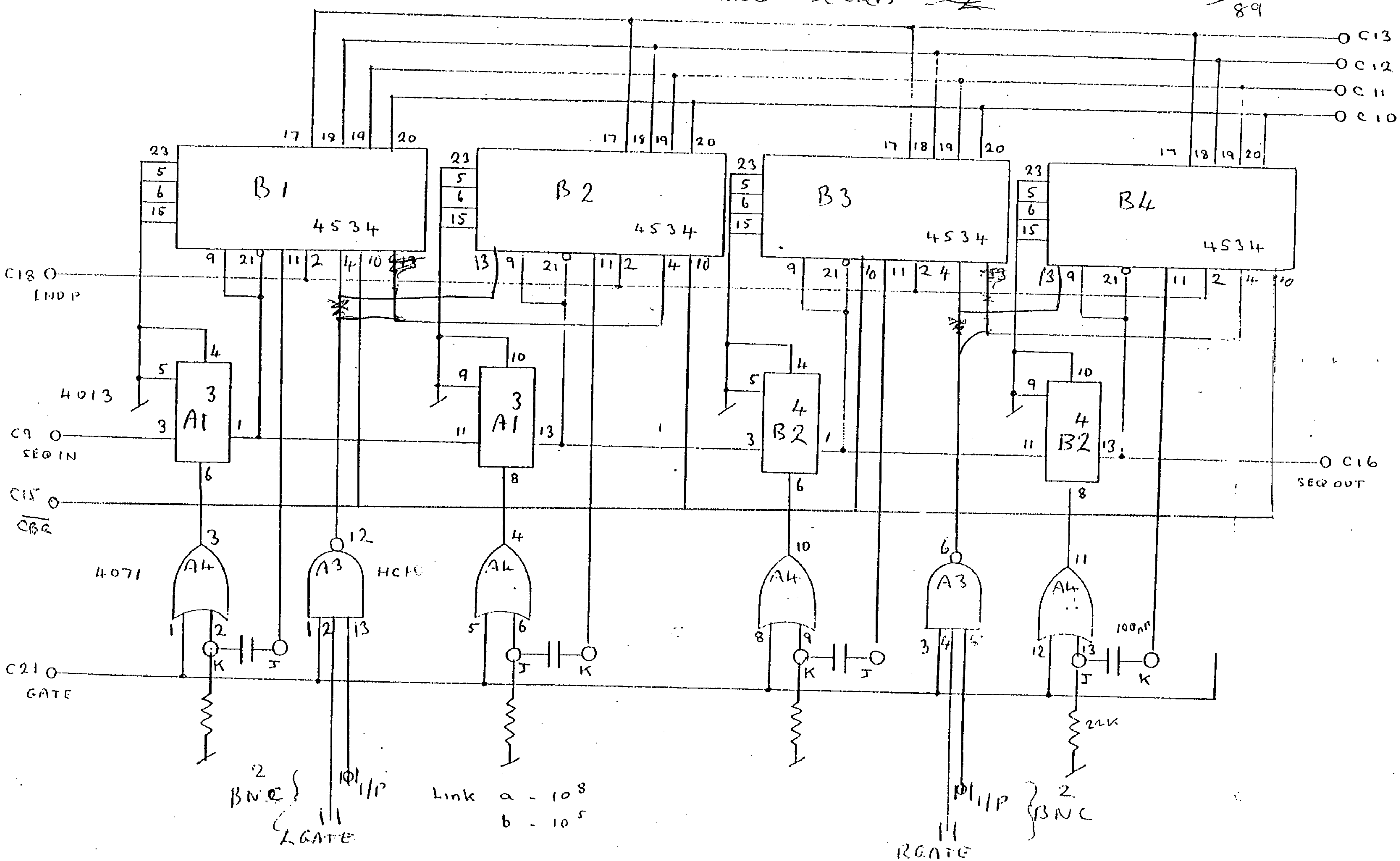
C. McLEOD
OCT 85



LUNAR

HIGH DENSITY SCALERS ~~16 SCALERS/BOARD~~ 2X 10 ~~decade~~ scalers

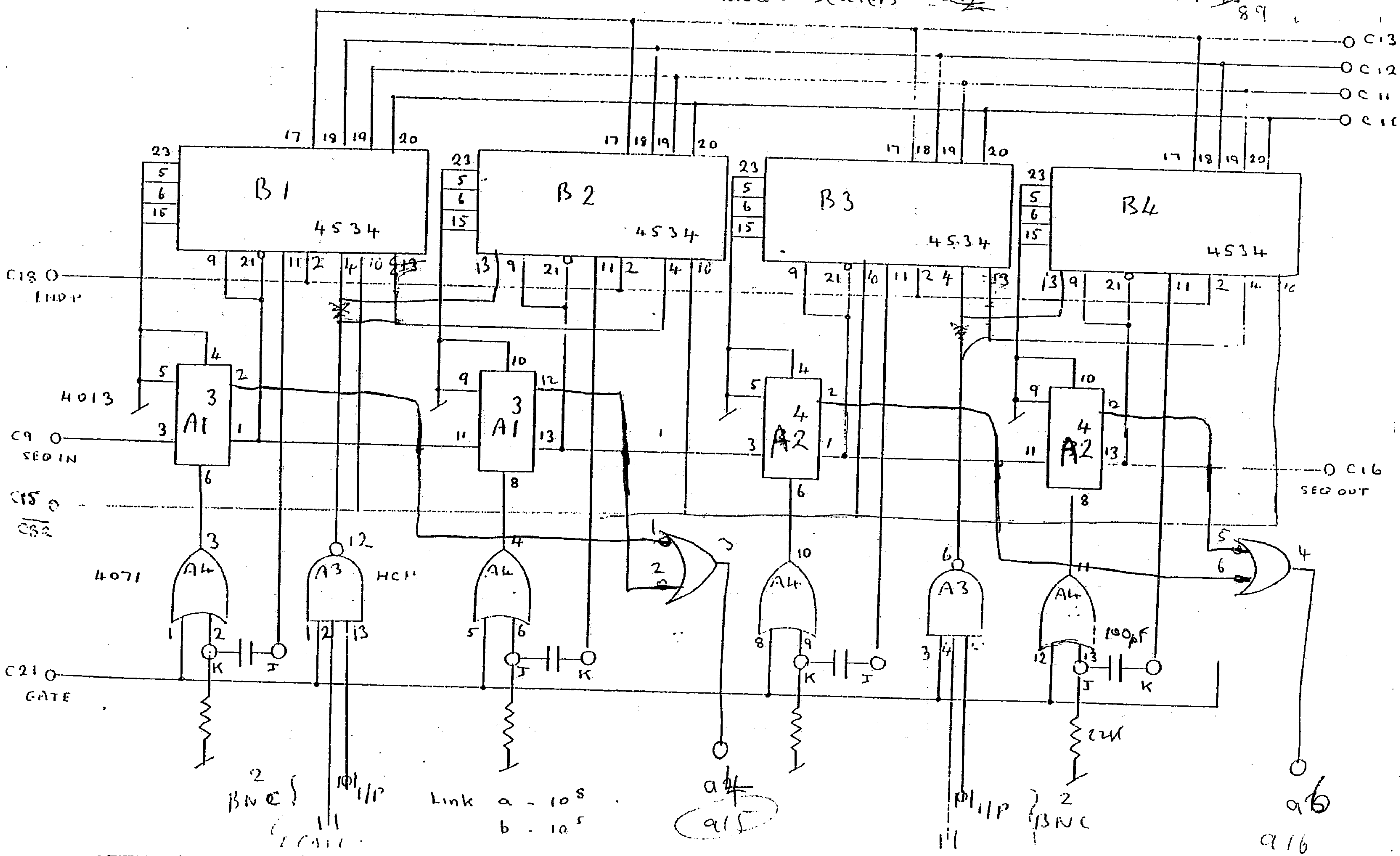
C. McLEOD Oct ~~88~~ 89



– LUNA R

HIGH DENSITY SCALERS ~~16 SCALERS/BOARD – 4 SHOWN~~ 2 X 10 decade scalers

C. McLEOD
Oct 89

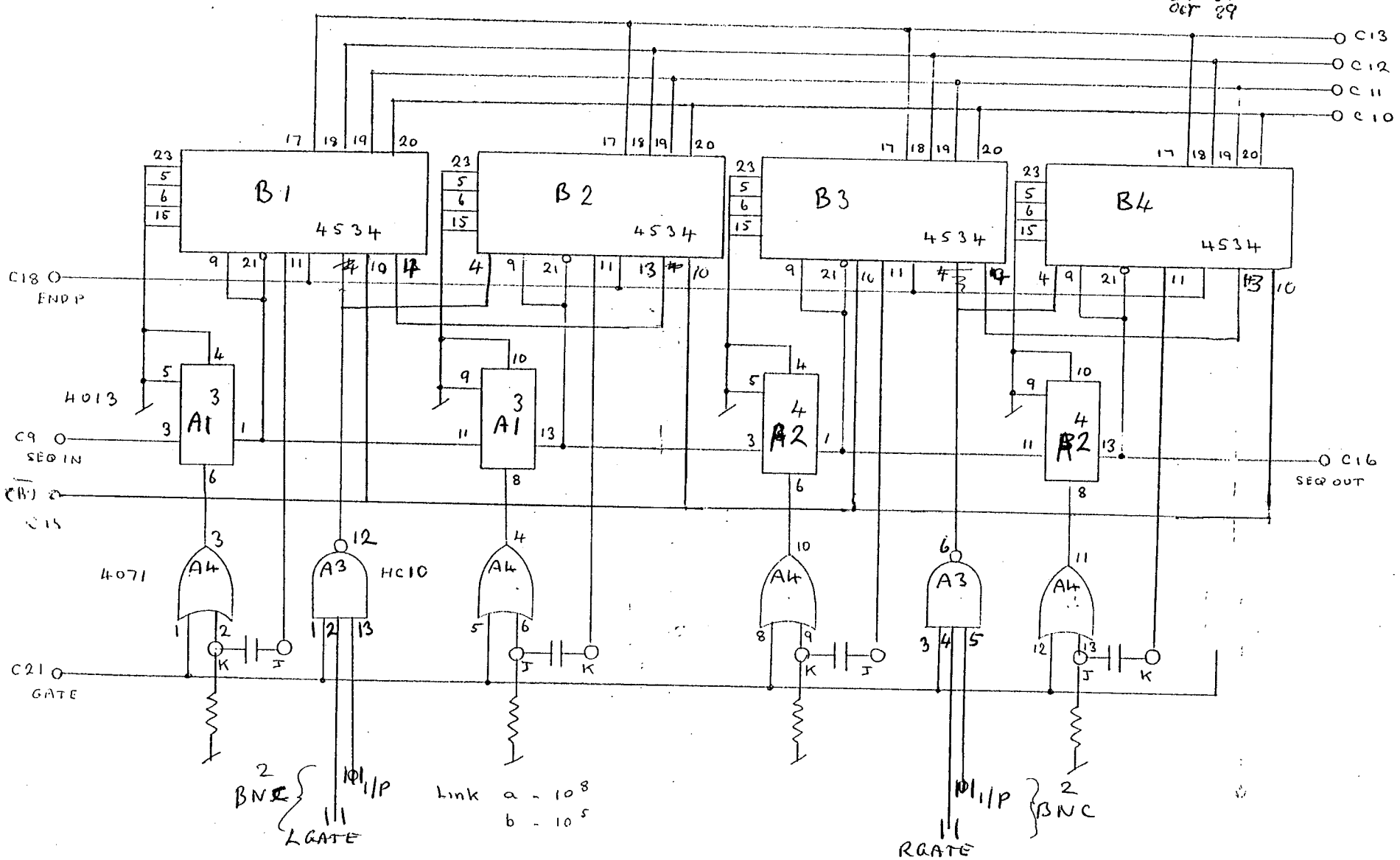


LUNAR.

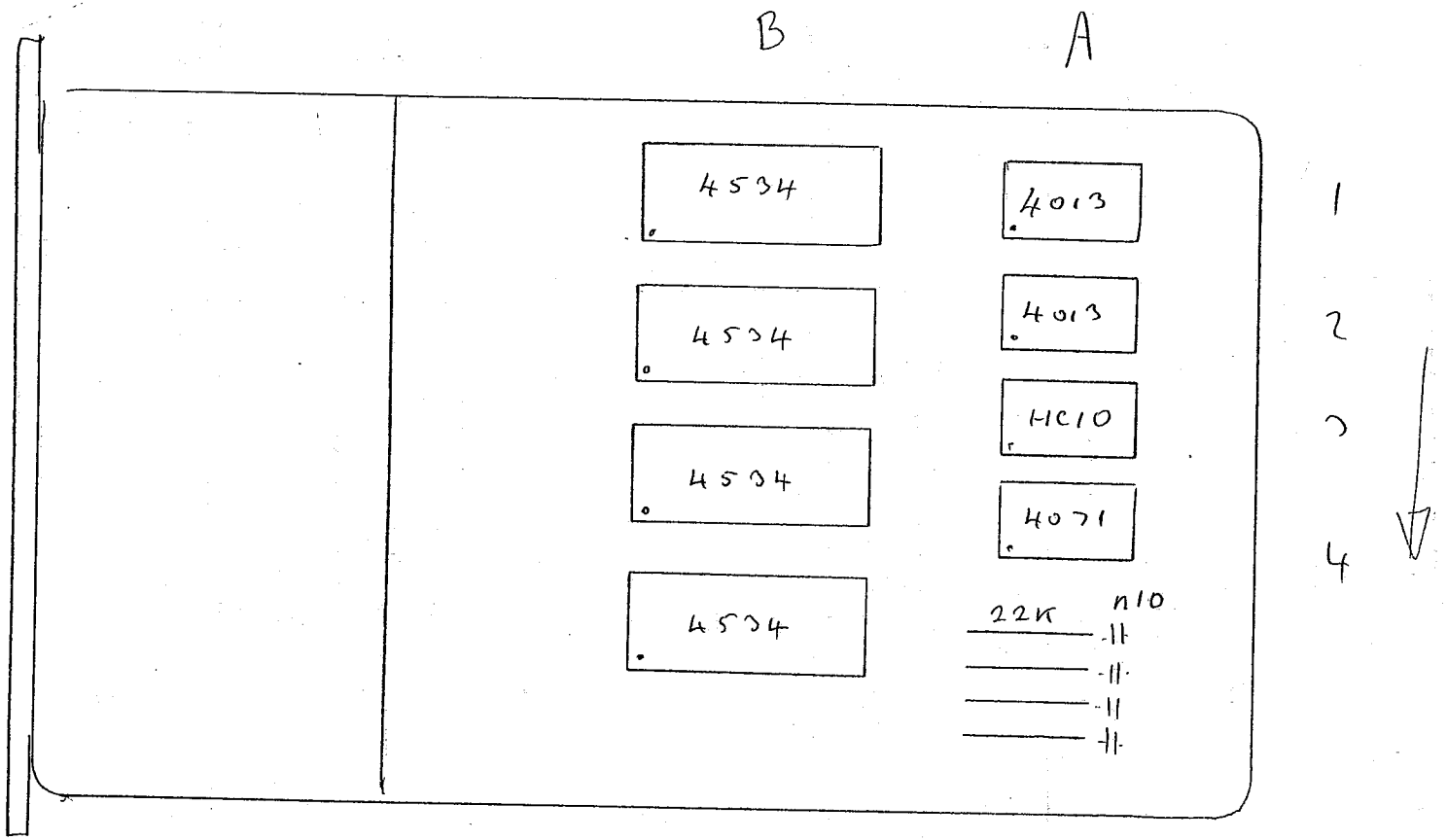
HIGH DENSITY SCALERS

~~B4~~ SCALERS / ~~BOARD~~ - ~~4 SMOOTH~~

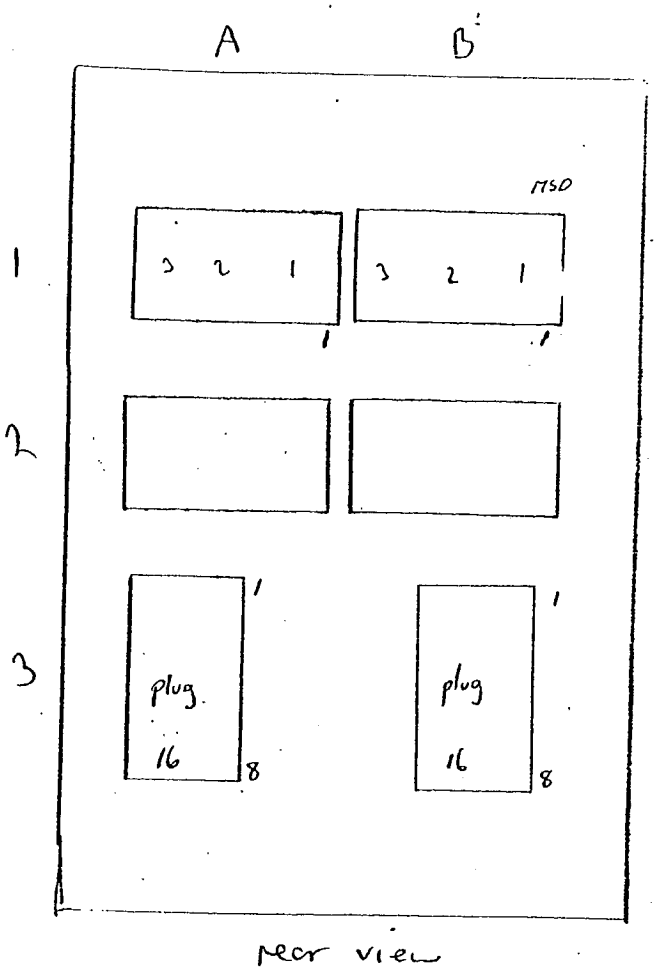
C.McLEOD
~~OCT 85~~
OCT 89



2 x 10 DIGIT SCALER LAYOUT.



MK1A SCALER DISPLAY BOARD



		A3		B3	
pin	A3/B3	A1	B1	A2	B2
1	g segt	10	10	10	10
2	b	8	8	8	8
3	e	5	5	5	5
4	d	3	3	3	3
5	e	2	2	2	2
6	f	11	11	11	11
7	a	9	9	9	9
8					
9	DIG 1	7		7	
10	2	4		4	
11	3	1		1	
12	4		7		7
13	5		4		4
14	6		1		1

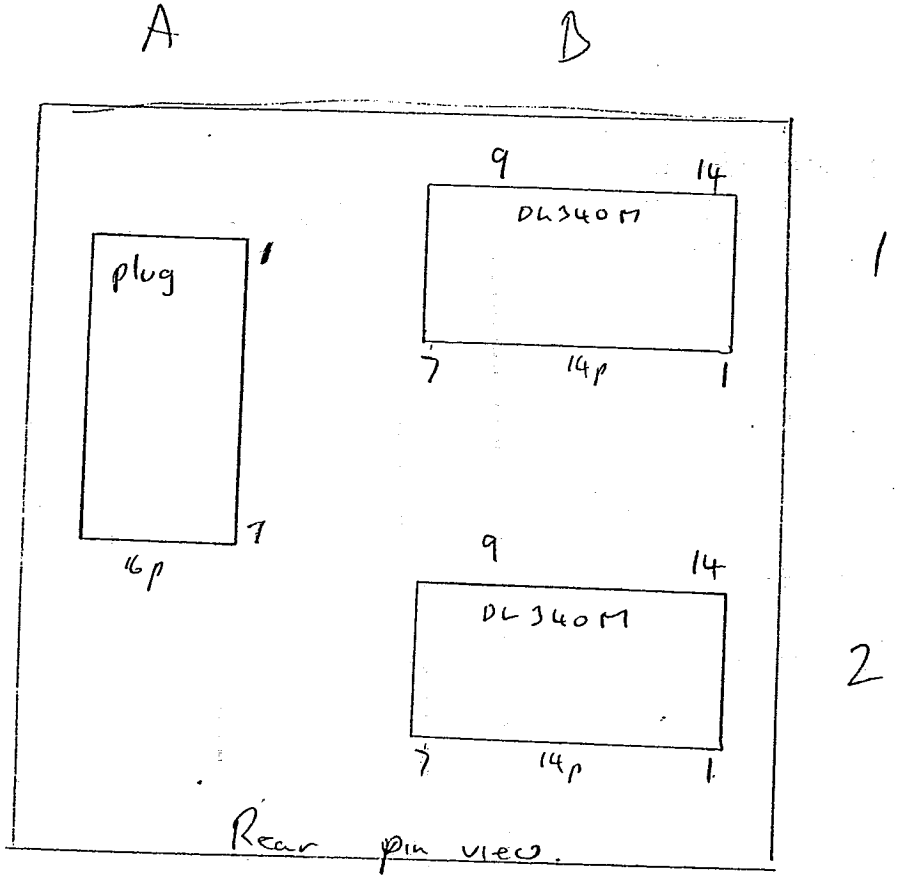
7218 Display

4	3
25	2
3	1
1	3
26	2
2	MSD 1

ie pin 9 goes to msd of display driver pin 2

12-4
10-7

MK 1 A DISPLAY BOARD CLOCK



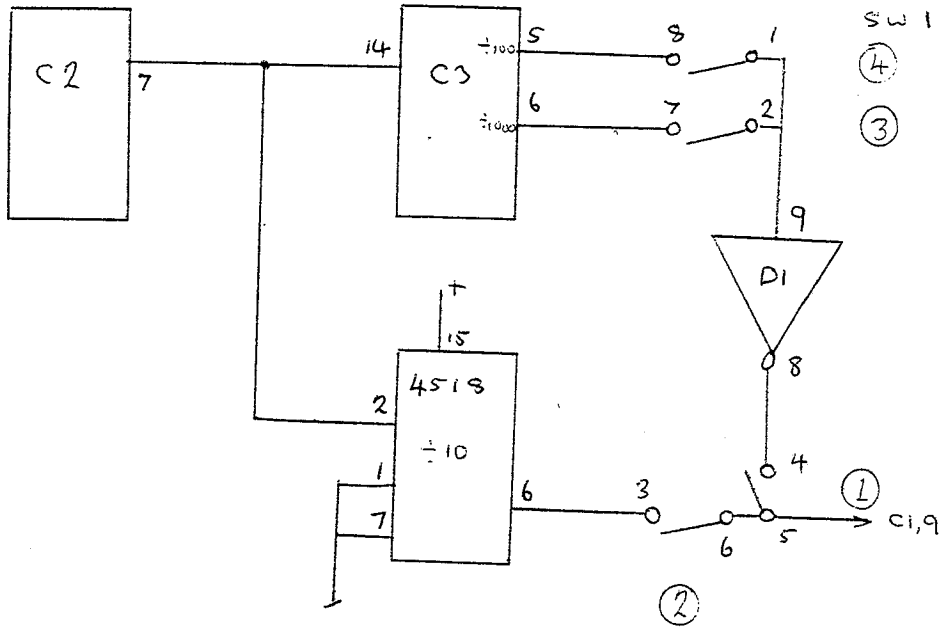
N.B. DISPLAY DIG 1 M.S.D.

7218D DIG 1 L.S.D.

pin	A1	B1	B2	
1	a	13	13	
2	b	9	9	
3	c	4	4	
4	d	3	3	
5	e	2	2	
6	f	11	11	
7	g	6	6	
8				
9	DIG 1		7	4
10	2		10	3
11	3		12	2
12	4		14	1
13	5	7		
14	6	10		
15	7	12		
16	8 MSD	14		

MK 1A CLOCK – MOD FOR C1S LAB EXPT.

PROVIDES SWITCHABLE CLOCK RATES

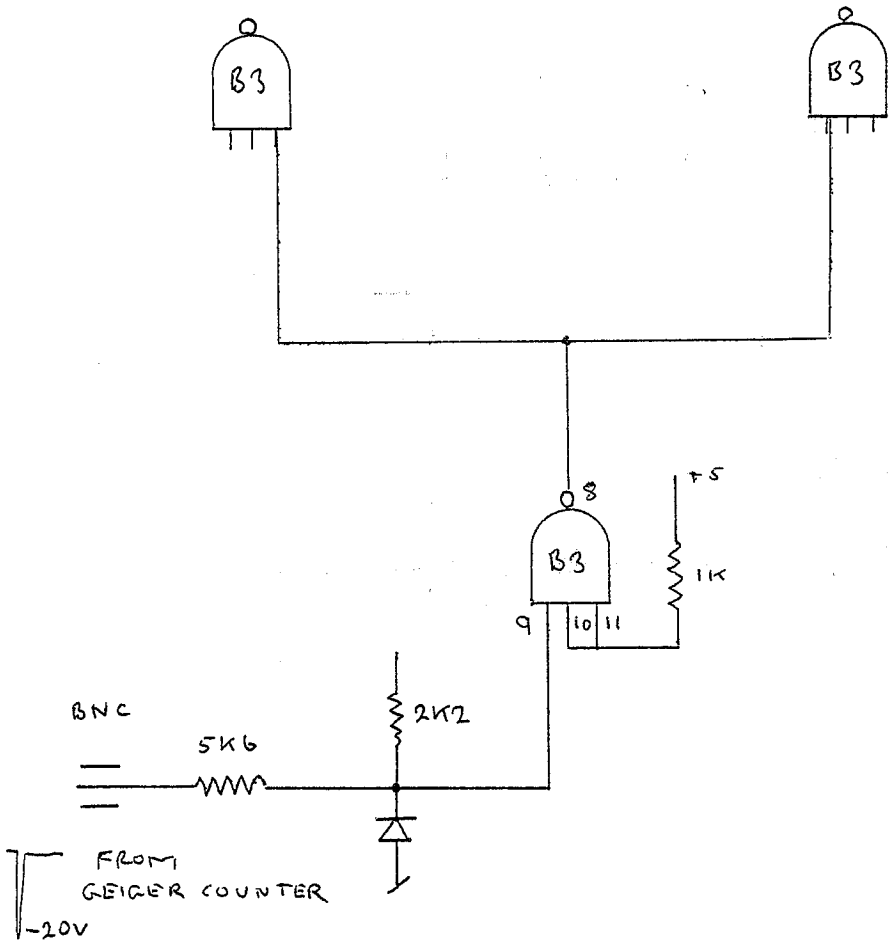


CLOCK RATES

SW1	10Sec	1sec	0·1sec
1	ON	ON	OFF
2	OFF	OFF	ON
3	ON	OFF	X
4	OFF	ON	X

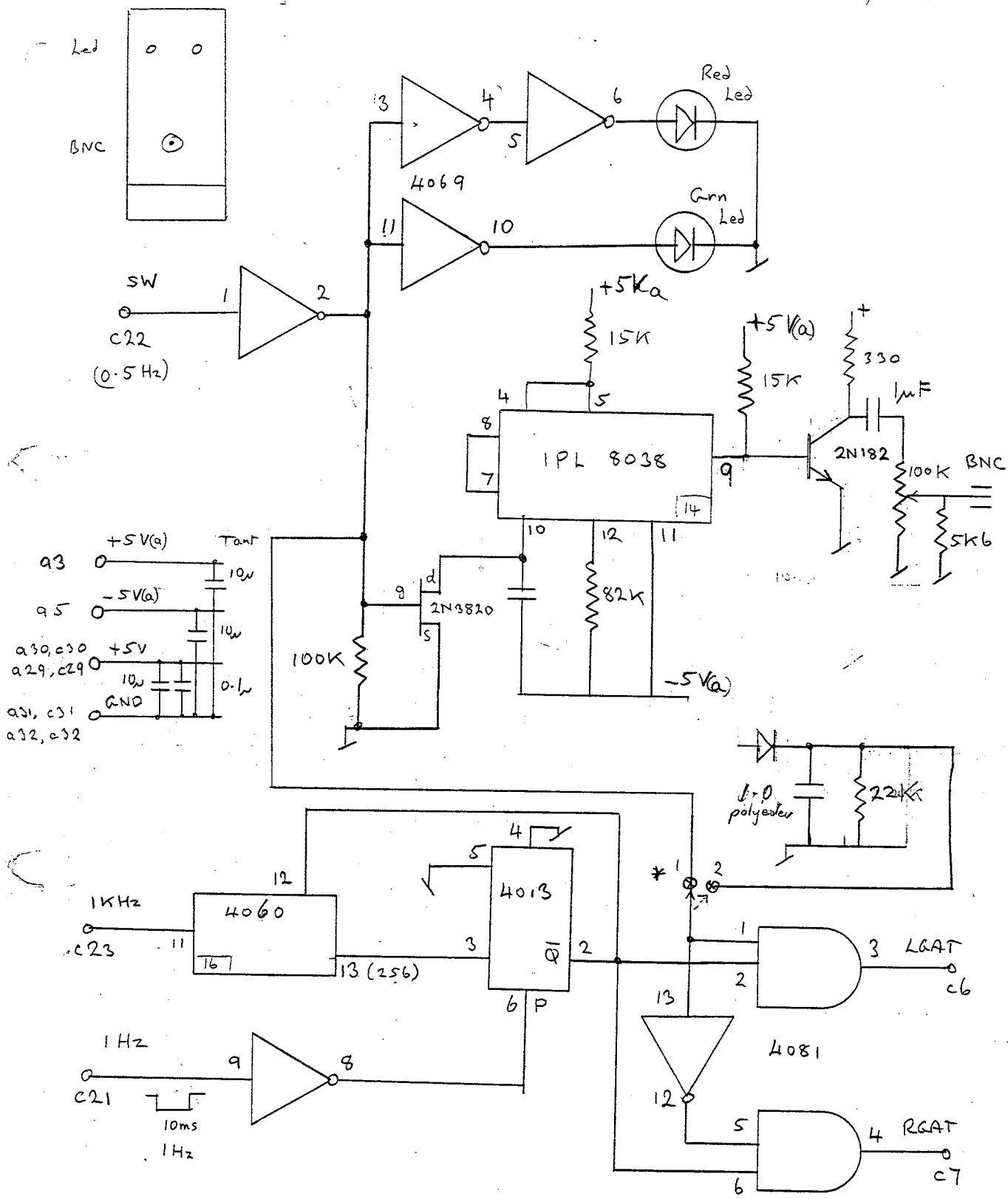
MK 1A SCALERS - MOD FOR CIS LAB EXPT.

ALLOWS INPUT FROM GEIGER COUNTER - 20V PULSES



MK1 PAUL LIQ. CRYSTAL DRIVER MODULE

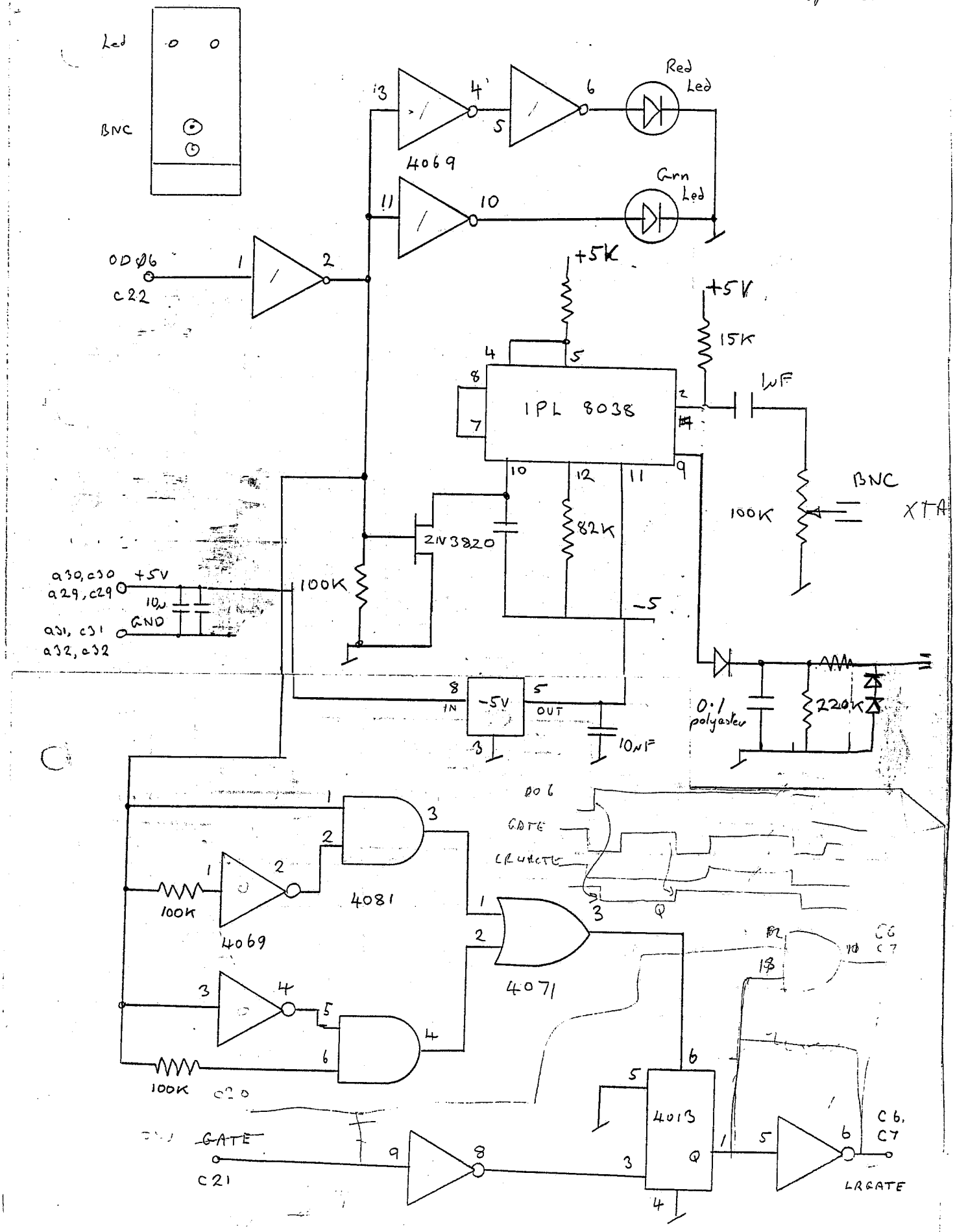
C.T.C. Lead. Apr. 1985



* Alternative position
for X tal ON check
Posn 2 monitors osc'r o/p.
" 1 " osc'r drive i/p.

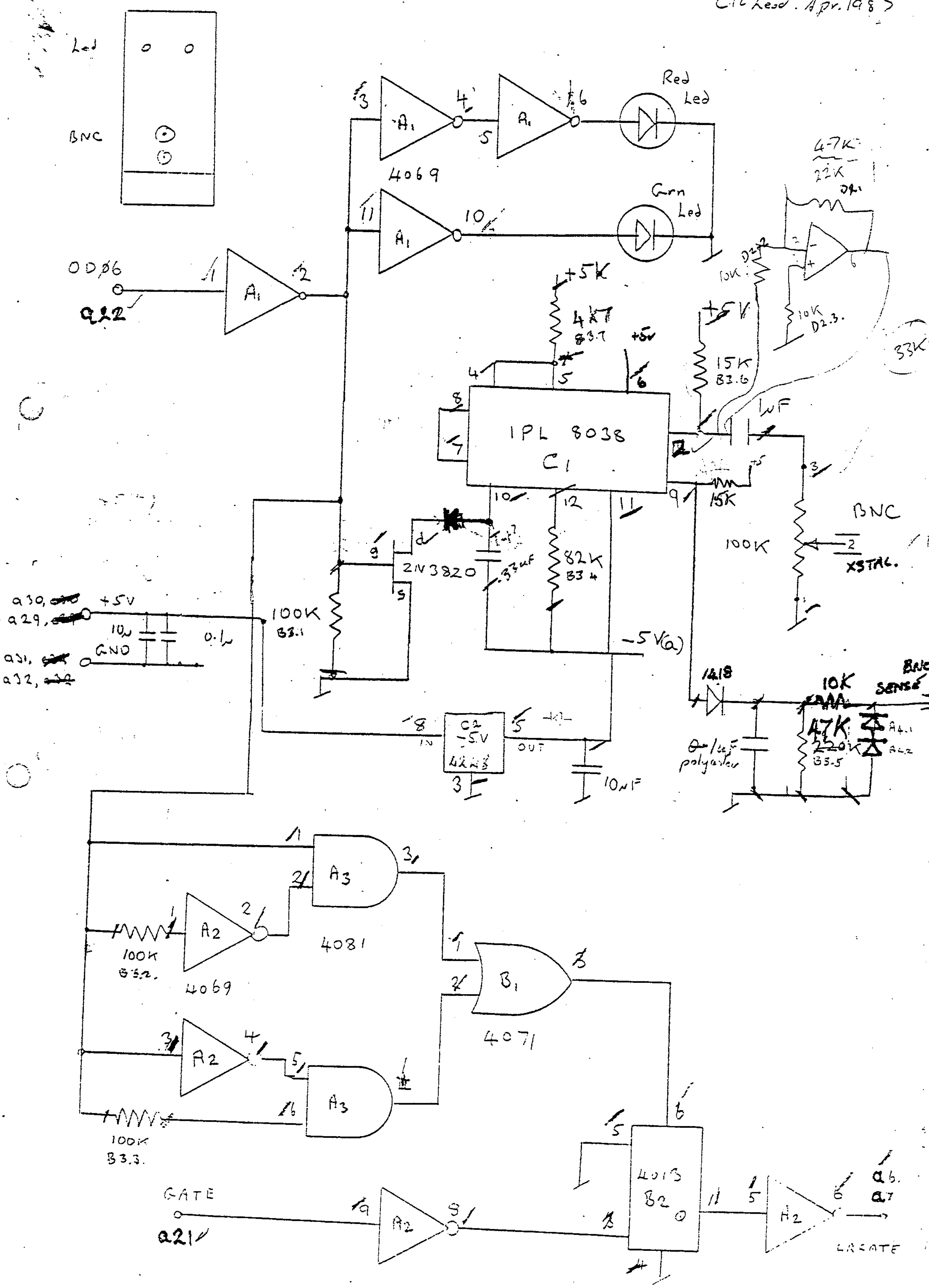
2D-SCALERS LIQ. CRYSTAL DRIVER MODULE

C.T.C Lead. Apr. 1987



2D SCALERS LIQ. CRYSTAL DRIVER MODULE

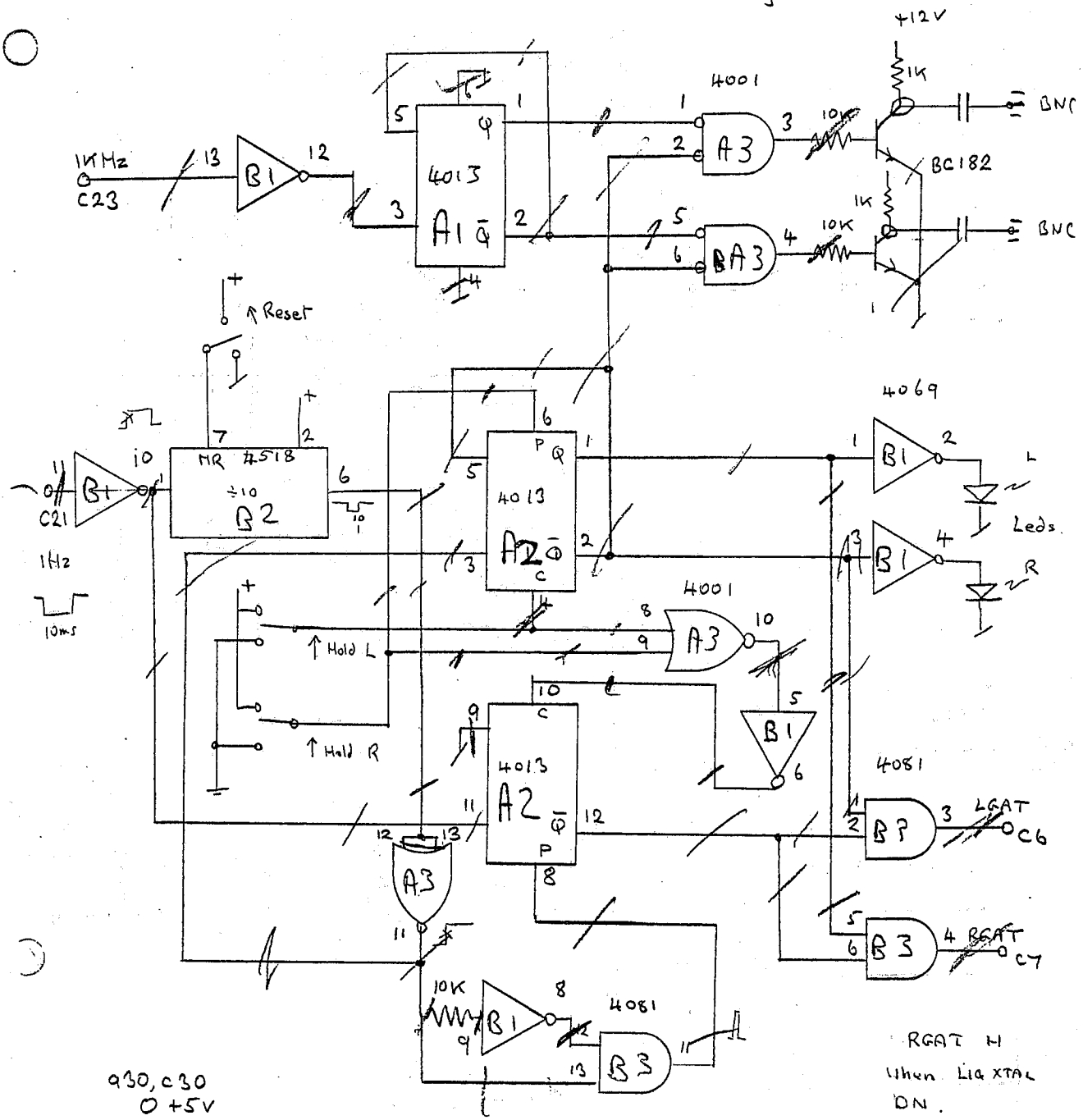
C.McLeod. Apr. 1987



LIQ. CRYSTAL DRIVER - BBC SCALER SYSTEM

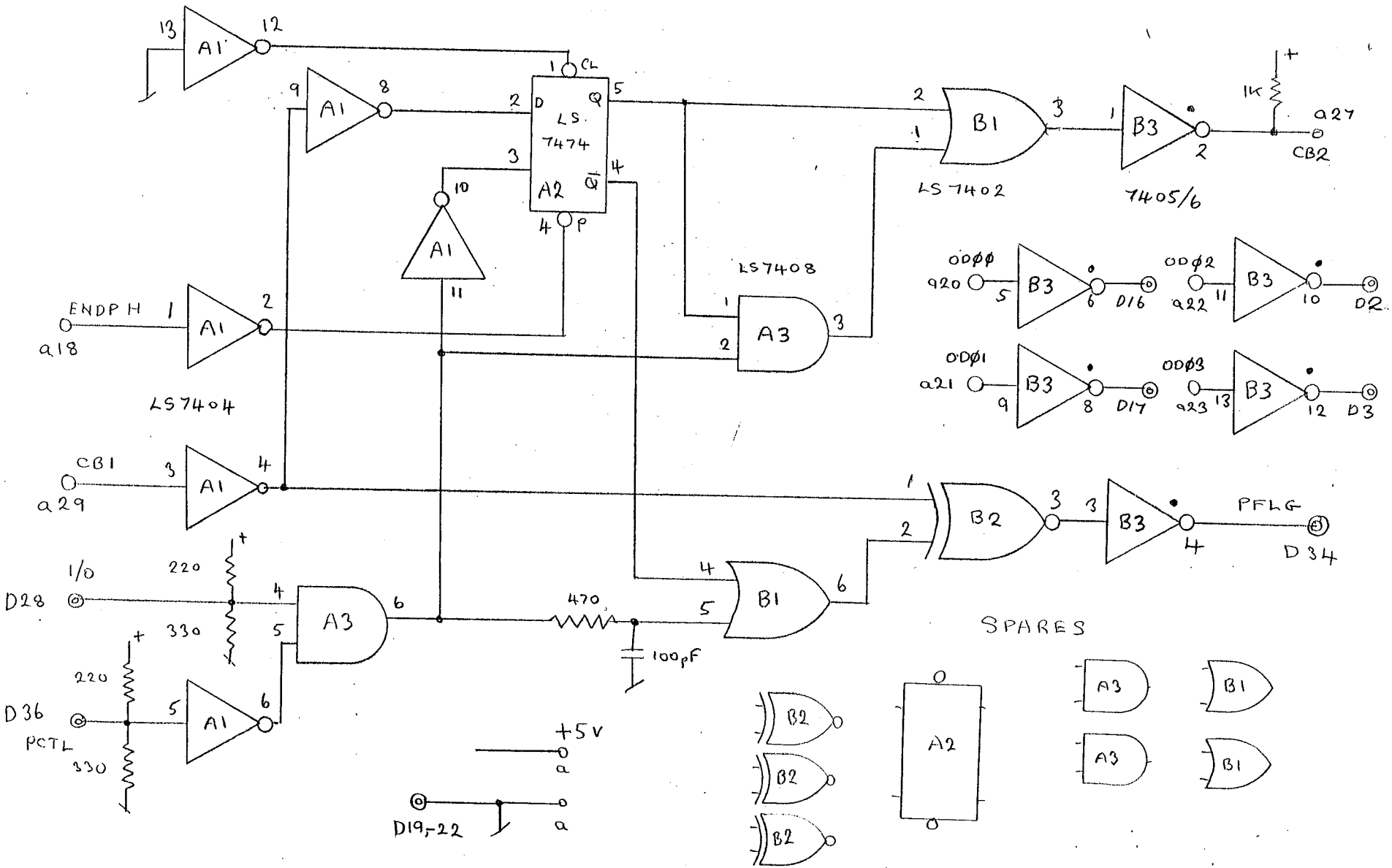
10 sec sample
1 sec delay

C.Micked
Apr. 1985



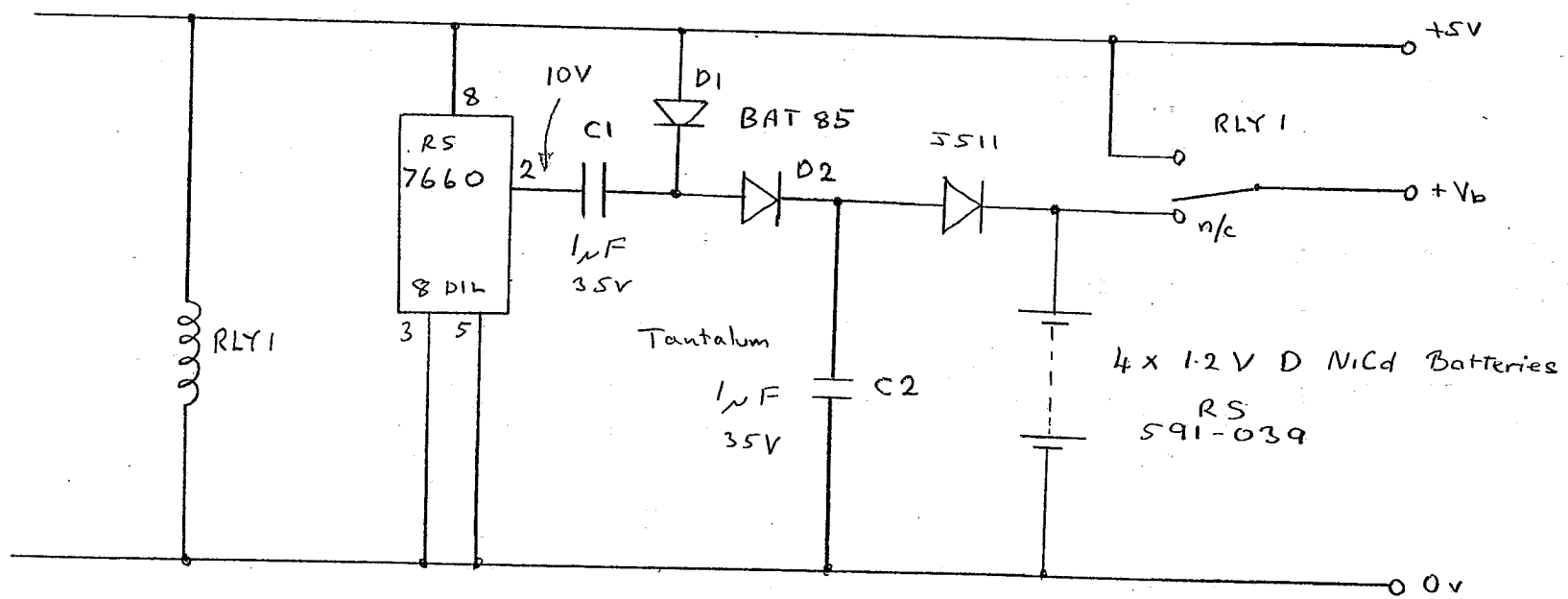
MK1A SCALERS - BBC / HP 982 (16 BIT I/F) CONVERTER

C.P M'Leod Feb 87



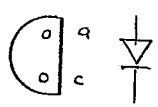
MK1A SCALERS - BATTERY BACKUP CIRCUIT

C. McLeod Feb 88



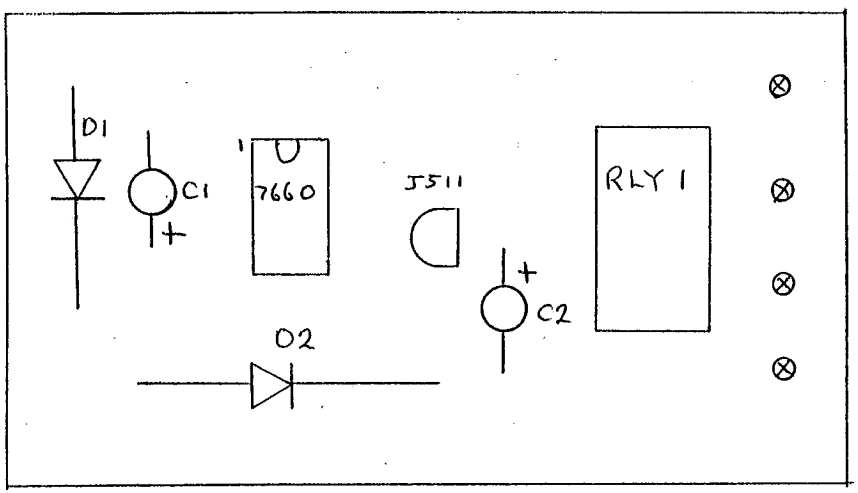
Voltage converter
RS 7660
304 598

SILICONIX J511
Constant current diode (4.7mA)
RS 283-508



BAT 85
-RS 300-978

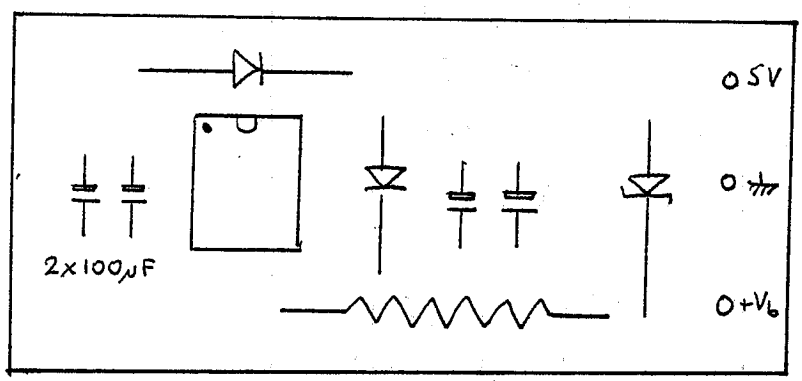
MK1A SCALERS - BATTERY BACKUP LAYOUT

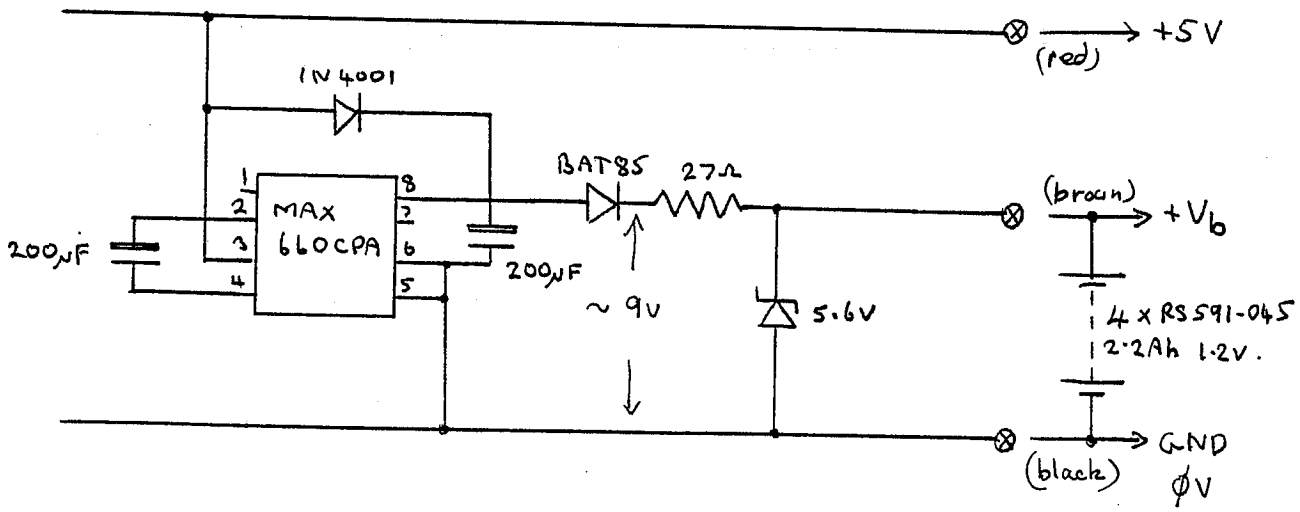


BATTERY CHARGER MOD FOR MK I CLOCK

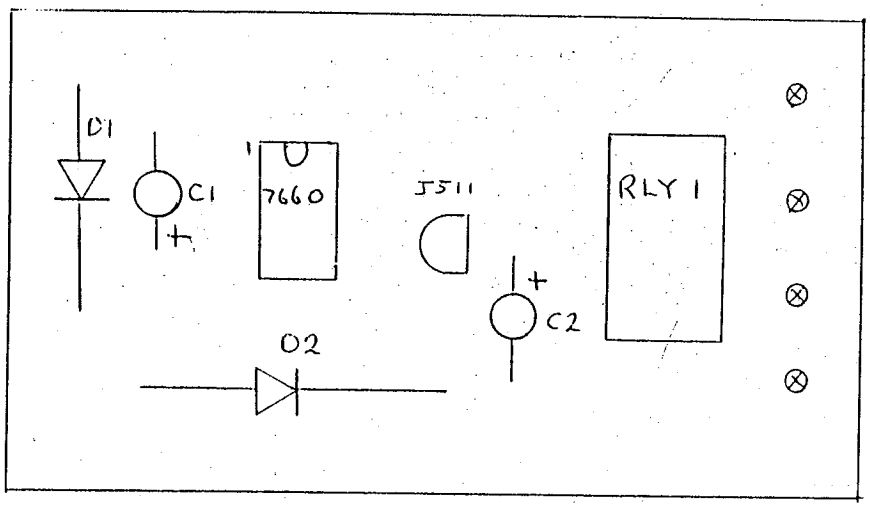
CM. Feb 93.

The clock draws ~ 65 mA with power on and ~ 2 mA on battery only. The battery receives ~ 40 mA of charging current.
The MAX 660 I.C. is configured as a voltage doubling circuit; the zener is provided for safety should the batteries be disconnected with power on.





MIKIA SCALERS - BATTERY BACKUP LAYOUT

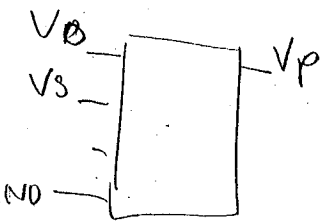


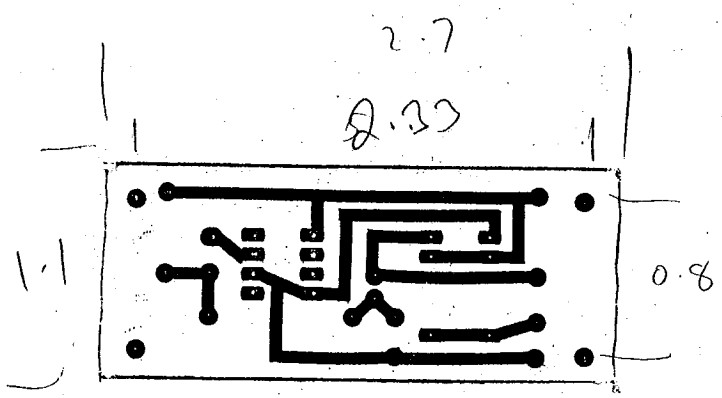
red (+5V PSU)

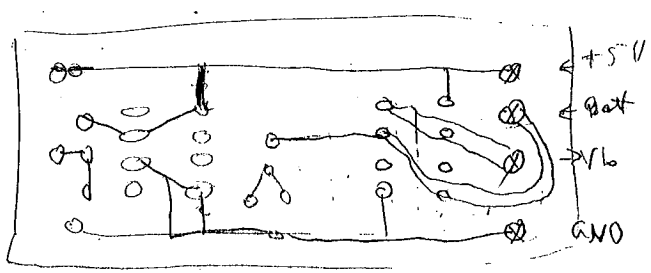
pink (Battery +)

brown (+Vb)

green (0V) (Battery −)







BATTERY BACKUP P.S.U.

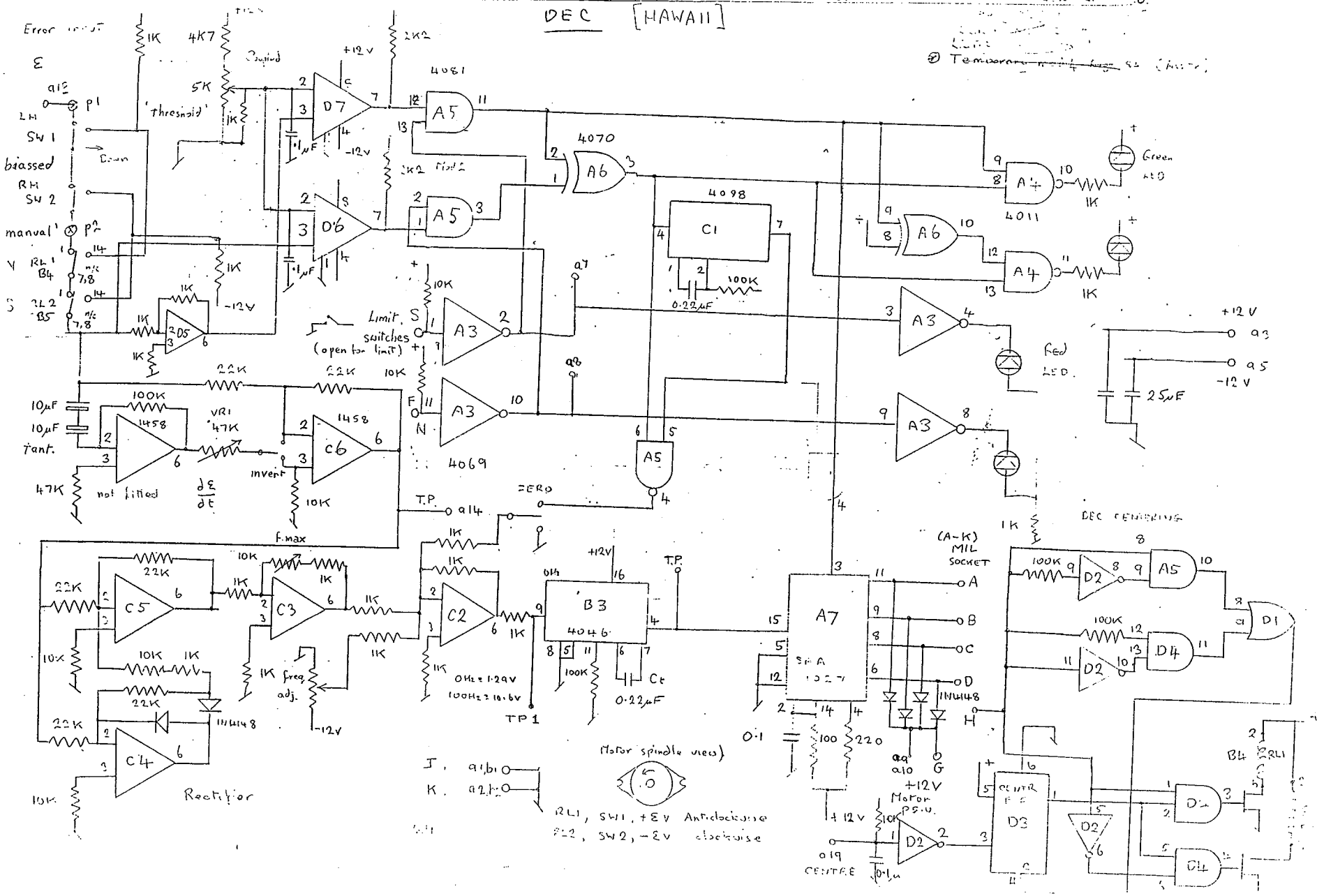
THIS WILL BE CHANGED FROM THE OLD SYSTEM.

A NEW SYSTEM WILL BE DEVELOPED AND SENT AS AN ADD ON BOX TO BE FITTED ON THE BACK OF THE CRATE

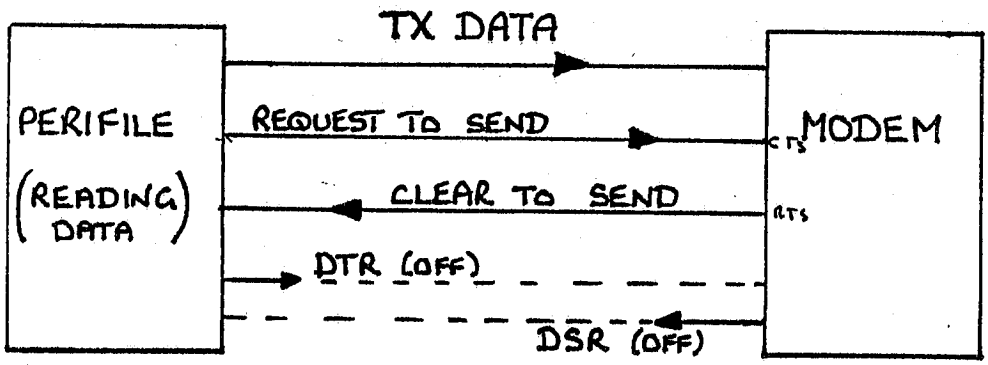
Fig 5a

PROPORTIONAL STEPPER DRIVER (DEC) 6.

DEC [HAWAII]



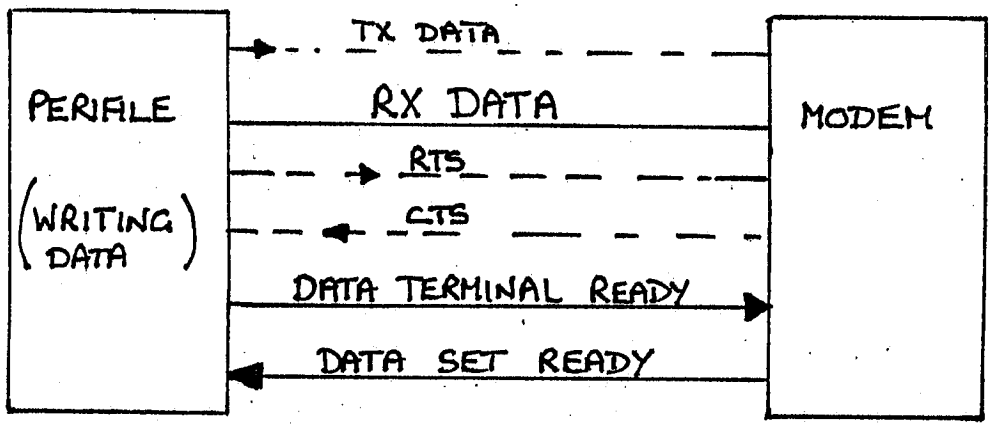
RS 232C



TERMINAL DATA SET

WHEN DATA READY TO BE TRANSMITTED (IE BUFFER FULL) RTS GOES TRUE - ONLY IF CTS IS TRUE OR WHEN CTS GOES TRUE WILL TX DATA BE SENT.

✳ NOTE - DTR IS RAISED IF CONTROL CHARACTER OPTION IS SELECTED SO THAT XON XOFF MAY BE RECD.



WHEN PERIFILE IS READY TO ACCEPT DATA FOR WRITING DTR WILL GO TRUE - USER SHOULD ENSURE DSR IS TRUE BEFORE SENDING DATA.

	5 Pin DIN	Lead	25 Way 'D'		
	1	Green	7	GND	
CTS RTS	2	Yellow	5, 6, 8	CTS, DSR,	2
DO RX	3	Red	2	TX	3
DI TX	4	Black	3	RX	4
MTS CTS	5	Blue	4	RTS	5
	Screen		1		

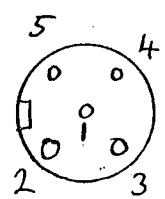
CLOCK ← TO → SCALER	→ XTAC COMMOR	
C6 → +5V	C6	LGAT
C7 → +5V	C7	RGAT
C10	C10	
C11	C11	
C12	C12	
C13	C13	
C15	C15	
C16 SEQOUT	C9 SEQIN	
C17 ENOH	C16 SEQOUT	
C18	C18	
C19	C19	
C21	C21	C21
C27	C27	
C22		C22
C23		C23

CLOCK ← TO BBC.	
a20	a20
a21	a21
a22	a22
a23	a23
a25	a25
a26	a26
a27	a27

SUPPLY	CLOCK	SCALER	BBC.
GND	a1, C1	a1, C1	a1 C1
GND	aec31 aec32	aec31, aec32	aec31, aec32
+5	aec29 aec30	aec29, aec30	aec29, aec30.
+UB 5V	a28, C28		

CABLE

B.B.C. COMPUTER RS423 PORT → PEREX TAPE UNIT



RS 423
PORT

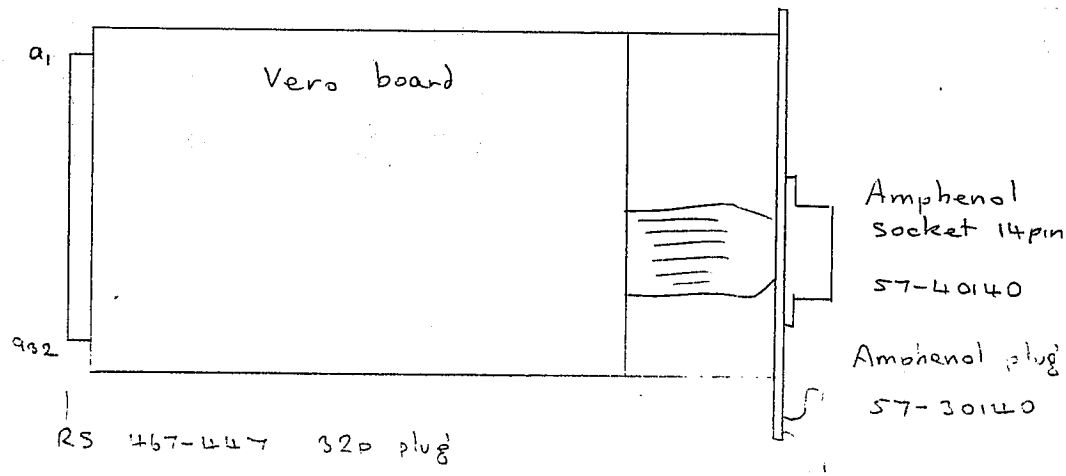
DIN PLUG BBC		25 W. 'D' free sockets PEREX		
ØV	1	7	SIGNAL GND	GREEN
CTS	2	6,20	DSR/DTR	YELLOW
DATA OUT	3	3	RX DATA	BLUE
DATA IN	4	2	TX DATA	RED
RTS	5	5	CTS	WHITE
	—	1	GND	SCREEN

MK1A SCALER SYSTEM - BBC INTERFACE

A	B		C	
AMPHENOL (FRONT PLUG/SKT)	EURO BACK PLANE	FUNCTION	BBC PORT	
1	a1	GND	5,7-odd-17	
2	a20	DØ	6	
3	a21	D1	8	
4	a22	D2	10	
5	a23	D3	12	
6	a25	D7	20	
7	a31, a32	GND	5 — 17	
8	a10	D6	18	
9	-			
10	-			
11	a24	GND	5 — 17	
12	a26	CB1	2	
13	a27	CB2	4	
14	-			

COLUMNS A + B - INTERFACE BOARD

COLUMNS A + C - BBC CABLE



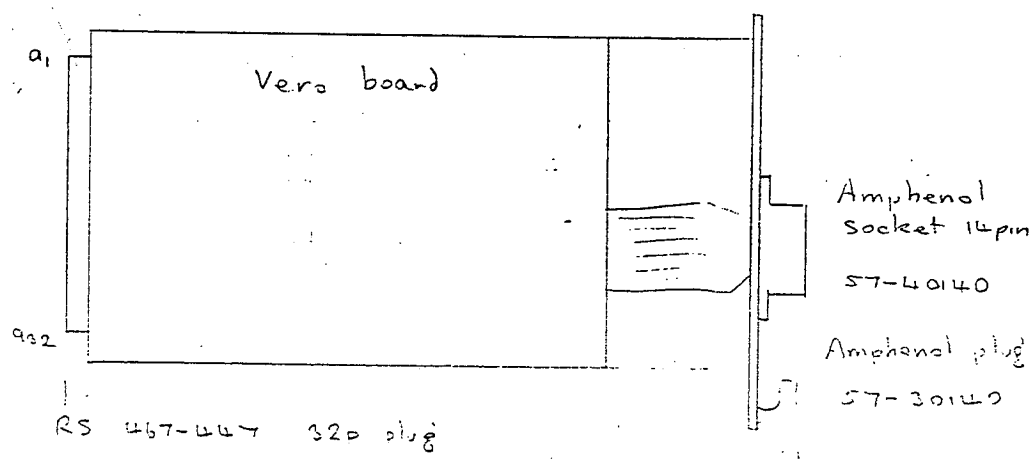
LUNAR

MUIA SCALER SYSTEM - BBC INTERFACE

A	B		C	
AMPHENOL (FRONT PLUG/SKT)	EURO BACK PLANE	FUNCTION	BBC PORT IDC.	
1	a1	GND	5,7-odd-17	
2	a20	DØ	6	
3	a21	D1	8	
4	a22	D2	10	
5	a23	D3	12	
6	a25	D7	20	
7	a31, a32	GND	5 ... 17	
8	a10	D6	18	
9	-	D4	14	
10	-	D5	16	
11	a24	GND	5 — 17	
12	a26	CB1	2	
13	a27	CB2	4	
14	-			

COLUMNS A + B - INTERFACE BOARD

COLUMNS A + C - BBC CABLE



	5 x	5 ARRAY		SCALER CABLE				C.McLeod NOV 86
SCALER CHANNEL		REAR PLANE		ARRAY ELEMENT		FRONT I.P.		
A 1		a2		1		A 25		
2		12		3		B 11		
3		3		5		B 33		
4		13		7		B 29		
5		4		9		A 15		
6		14		11		A 9		
7		5		13		A 37		
8		15		15		A 31		
9		6		17		B 15		
10		16		19		B 5		
11		7		21		A 13		
12		17		23		A 3		
13		8		25		A 35		
14		18						
15		9						
16		19						
B 17		c2		2		B 13		
18		12		4		B 9		
19		3		6		B 31		
20		13		8		B 25		
21		4		10		A 11		
22		14		12		A 5		
23		5		14		A 33		
24		15		16		A 27		
25		6		18		B 9		
26		16		20		B 27		
27		7		22		A 7		
28		17		24		A 29		
29		8						
30		18						
31		9						
32		19						