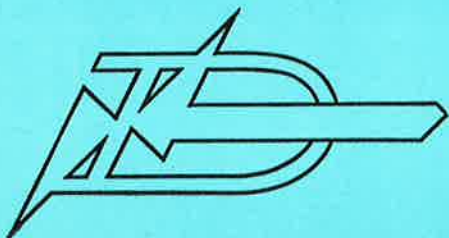
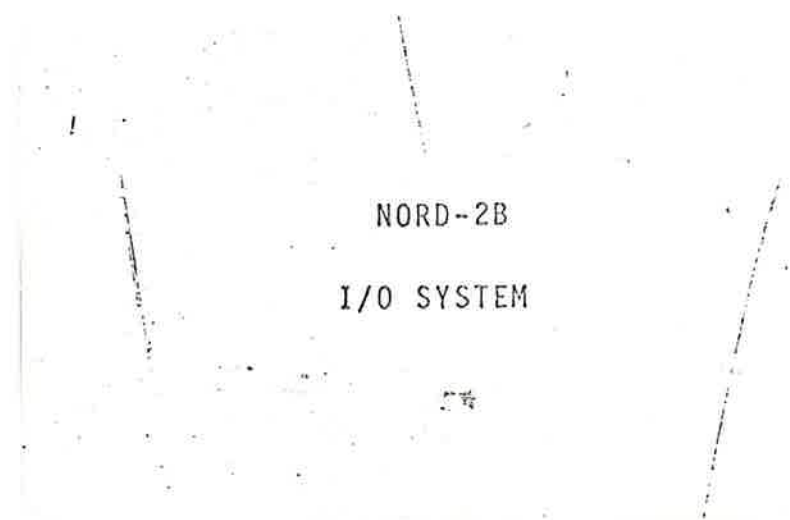


NORD-2B

COMPUTER SYSTEMS



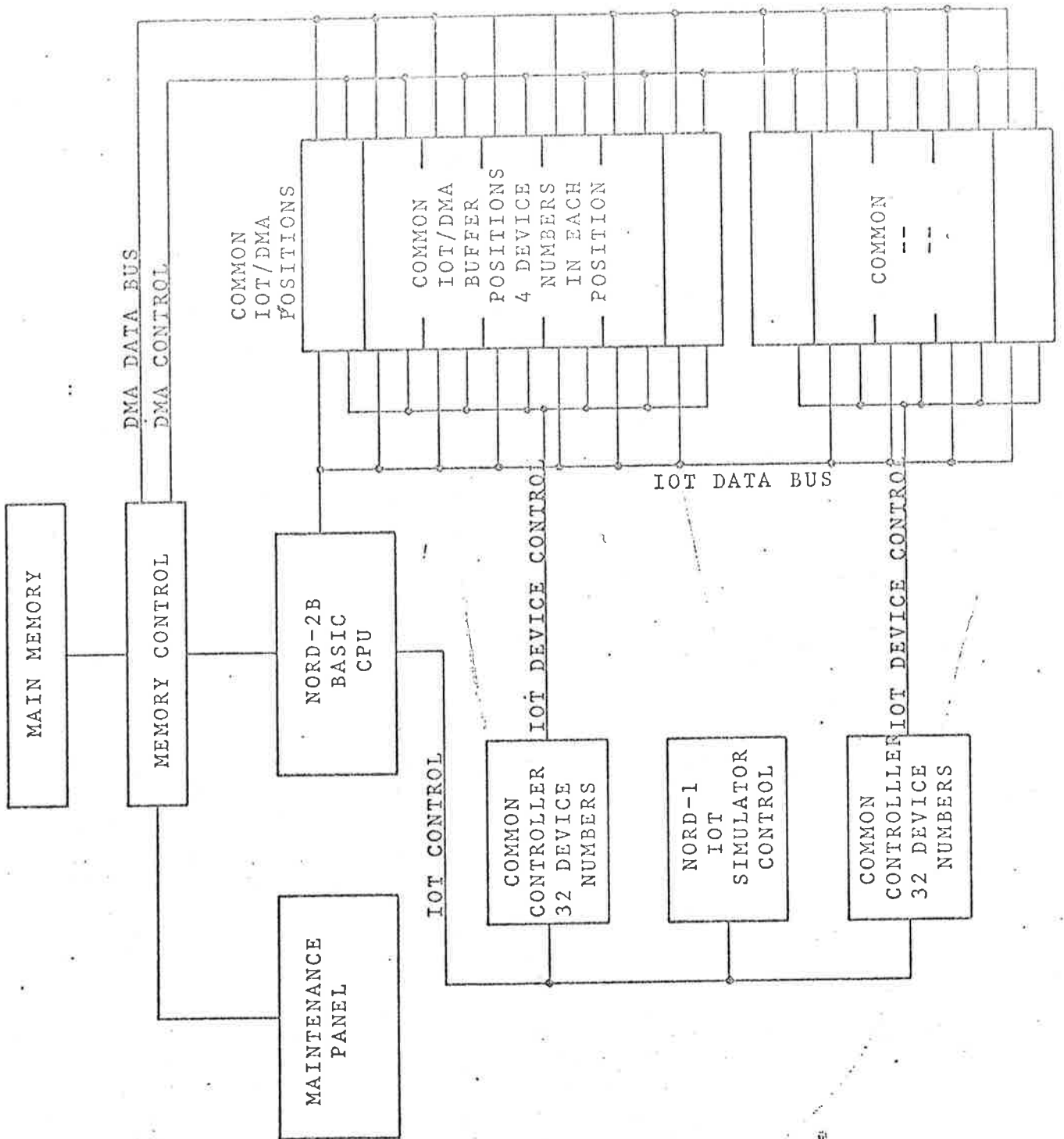
A/S NORSK DATA-ELEKTRONIKK

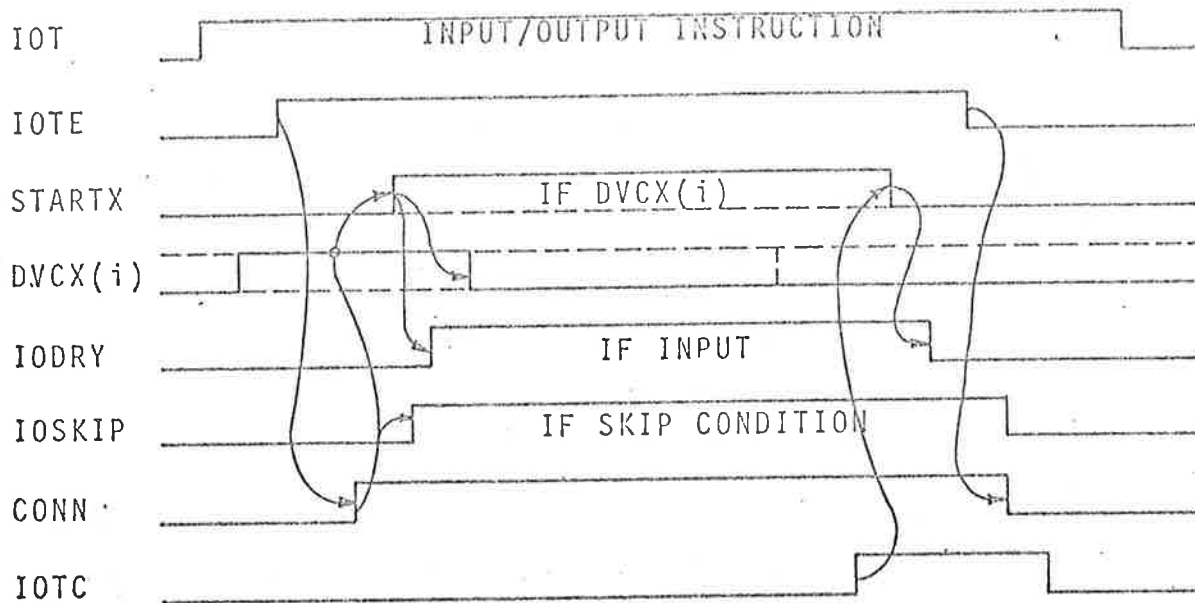
Økernveien 145 - Oslo 5 (Økern)

NORD-2B

I/O SYSTEM

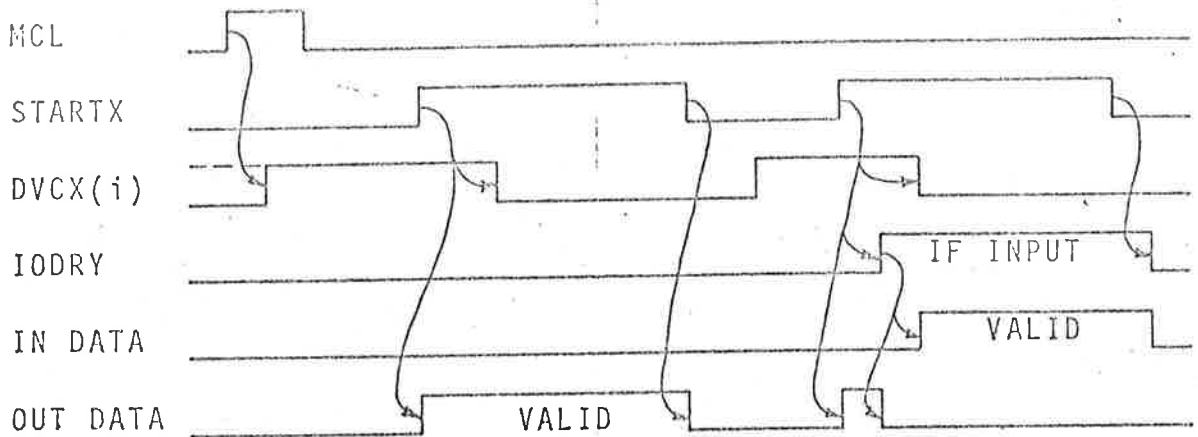
THE GENERAL NORD-2B SYSTEM





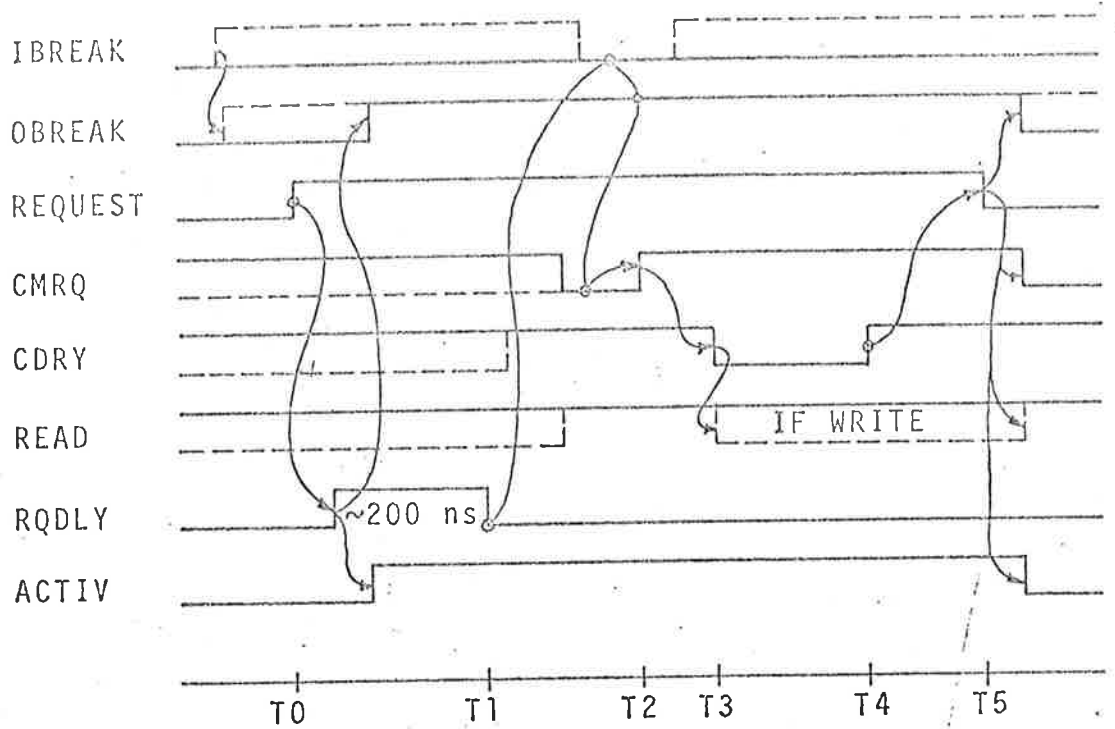
NORD-2B
I/O TIMING

NORD-2B TIMING
I/O BUFFER



1. IODRY must be presented not later than 200 ns after STARTX arrives.
2. STARTX must be decoded with IRO and IRI to define one of four START pulses.
3. Each DVCX corresponds to only one START pulse.
4. IODRY disables data from CPU.
5. Data from device should be enabled synchronous to IODRY.
6. Data may be transferred both to and from the A-register on the same IOT by strobing output data on the leading edge of START and then presenting IODRY.
7. DVCX must disappear during START in order to get the corresponding device busy.

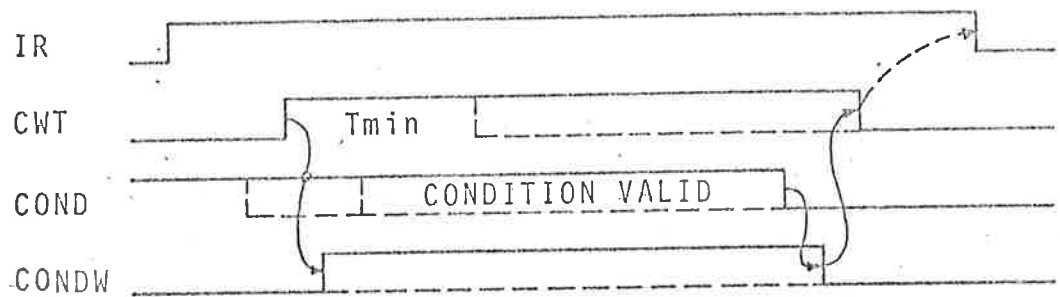
NORD-2B
DMA TIMING



$$\begin{aligned}
 \text{OBREAK}_1 &= \text{IBREAK}_1 + \text{ACTIV}_1 \\
 \text{RQDLY}_1 &= \text{REQUEST}(0,1) (\sim 200 \text{ ns}) \\
 \text{ACTIV}_1 &= \text{RQDLY}_1 + \text{ACTIV}_1 \cdot \text{REQUEST}_1 \\
 \text{CMRQ}_1 &= (\text{RQDLY}_0 \cdot \text{ACTIV}_1 \cdot \text{IBREAK}_0 \cdot \text{CMRQ}_0) (0,1) \\
 &\quad + \text{CMRQ}_1 \cdot \text{REQUEST}_1
 \end{aligned}$$

- T0 Local request
- T1 OBREAK has reached all lower priority devices
- T2 Access initiated
- T3 Present address
- T4 Data available (or if WRITE: Present data)
- T5 Access finished.

NORD-2B
CONDITIONAL WAIT



$$CONDW_1 = CWT_1 \cdot COND_1$$

$$T_{min} \approx 2-300 \text{ ns}$$

Terminal	G= output	Signal	Polarity	Connected to terminals	Terminal	G= output	Signal	Polarity	Connected to terminals
1		+5V			31	W	IOTD14	1	
2		Ground			32	W	MDB14	1	
3	W	IOTD0	1		33	W	IOTD15	1	
4	W	MDB0	1		34	W	MDB15	1	
5	W	IOTD1	1		35		IRO	1	
6	W	MDB1	1		36		IR1	1	
7	W	IOTD2	1		37		IR2	1	
8	W	MDB2	1		38		IR3	1	
9	W	IOTD3	1		39		IR4	1	
10	W	MDB3	1		40		IR5	1	
11	W	IOTD4	1		41		IR6	1	
12	W	MDB4	1		42		IR7	1	
13	W	IOTD5	1		43	W	IODRY	0	
14	W	MDB5	1		44				
15	W	IOTD6	1		45	G	DCX3	0	
16	W	MDB6	1		46		IBREAK	0	
17	W	IOTD7	1		47	G	DCX2	0	
18	W	MDB7	1		48	G	OBREAK	0	
19	W	IOTD8	1		49	G	DCX1	0	
20	W	MDB8	1		50	W	READ	1	
21	W	IOTD9	1		51	G	DCX0	0	
22	W	MDB9	1		52	W	CMRO	0	
23	W	IOTD10	1		53		STARTX	0	
24	W	MDB10	1		54		CDRY	0	
25	W	IOTD11	1		55	W	CONDW	0	
26	W	MDB11	1		56	W	LOAD	0	
27	W	IOTD12	1		57		CWT	0	
28	W	MDB12	1		58		MCL	0	
29	W	IOTD13	1		59		+5V		
30	W	MDB13	1		60		Ground		

DRAWN BY JEJ/eml
APPROVED BY
DATE 3/3/71

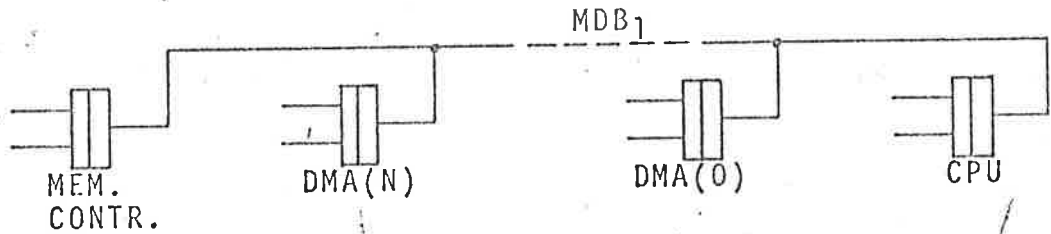
Remarks

Replacement for: Date

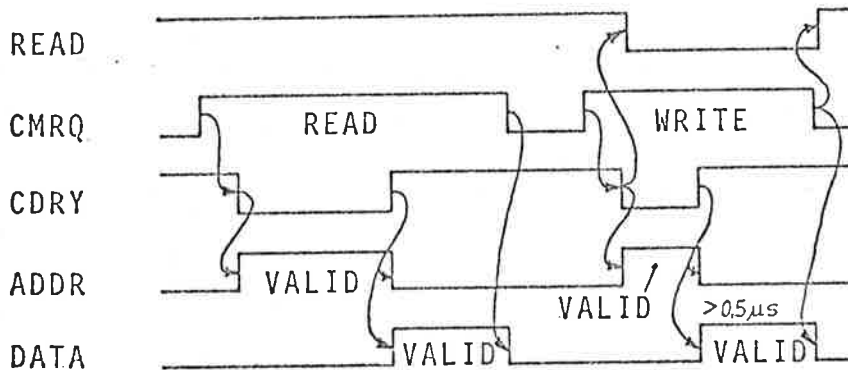
Replaced by: Date

.NORD-2B
MEMORY DATA BUS

1. MDB is a two-way wired-or line, 16 bits wide and logic "1" is high.
2. When referencing memory, a 16 bits address is first transmitted along MDB to memory. Thereafter a 16 bits data word is transferred in either direction on MDB, depending on read or write to memory.
3. Hardware:



4. Timing:



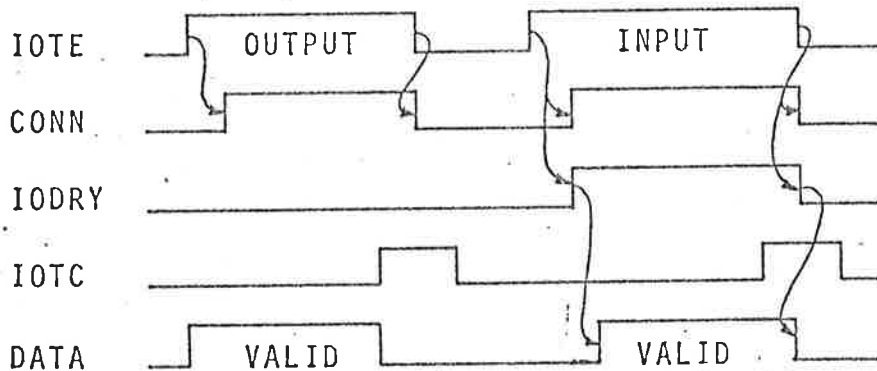
5. Write data must be valid at least $0.5\mu s$.
Read data are valid until CMRQ drops.
New memory access is inhibited until CMRQ drops.

NORD-2B
IOT DATA BUS

1. IOTD is a two-way wired-or line, 16 bits wide.
2. Logic "1" is high for output and low for input to CPU.
3. The data transfer direction is controlled by "Data Ready", IODRY. Data go from the CPU unless the addressed device signals IODRY.
4. Hardware:



5. Timing:



6. A two-way device should strobe output data on the leading edge of $CONN_1 \cdot IODRY_1$.

