		ROMB bits												Sequence chart
		∅	1	2	3	4	5	6	7	8	9	A	B	
		RCA 1 ∅		RCB	RCC 3 2 1 ∅				RCD 2 1 ∅			RCE 1 ∅		
LODZ ∅∅	t0	L	L	H	L	L	L	H	L	L	L	H	H	"r" → R∅
				r	F=B				R∅			EUC		EUC
	t1													
	t2													
	t3													
LODI ∅4	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	L	L	L	L	L	L	L	H	H	H	MEM → "r"
		MEM			F=A				"r"			EUC		EUC
	t2													
	t3													
LODA ∅8	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	L	L	L	L	L	H	L	H	L	L	MEM → MAR
		MEM			F=A				MAR					
	t2	L	H	L	L	L	L	L	L	L	H	H	H	MEM → "r"
		MEM			F=A				"r"			EUC		EUC
	t3													
LODX ∅C	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	H	L	L	H	L	H	L	H	L	L	MEM + "r" → MAR
		MEM		'r'	F=A+B (a)				MAR					
	t2	L	H	L	L	L	L	L	L	L	L	H	H	MEM → R∅
		MEM			F=A				R∅			EUC		EUC
	t3													

RCA 'A' Source Control

L L	FPR
L H	MEM
H L	TRA
H H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A−B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A−1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD Destination Control

L L L	Register zero
L L H	Register 'r'
L H L	FPR
L H H	TRA
H L L	MDR
H L H	MAR
H H L	PCR & MAR
H H H	IRR

RCE Instruction End Ctl

L L	Continue
L H	End if non-zero
H L	End if zero
H H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse

A-1

ROMB bits

Instr	t	0	1	2	3	4	5	6	7	8	9	A	B	Sequence chart
		RCA 1 0		RCB	RCC 3 2 1 0				RCD 2 1 0			RCE 1 0		
STRZ 10	t0	L	L	L	L	L	L	H	L	L	H	H	H	R0 → "r"
		∅			F=B				"r"			EUC		EUC
	t1													
	t2													
	t3													
SZJA 14	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	L	L	L	L	L	H	L	L	H	L	L	R0 → "r"
		∅			F=B				"r"					
	t2	L	H	L	H	L	L	H	H	H	L	H	H	MEM-1 → PCR & MAR EUC
		MEM			F=A-1 (a)				PCR & MAR			EUC		EUC
	t3													
STRA 18	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	L	L	L	L	L	H	L	H	L	L	MEM → MAR
		MEM			F=A				MAR					
	t2	L	L	H	L	L	L	H	H	L	L	H	H	"r" → MDR
			"r"		F=B				MDR			EUC		EUC
	t3													
STRX 1C	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	H	L	L	H	L	H	L	H	L	L	MEM+"r" → MAR
		MEM	"r"		F=A+B (a)				MAR					
	t2	L	L	L	L	L	L	H	H	L	L	H	H	R0 → MDR
		∅			F=B				MDR			EUC		EUC
	t3													

RCA 'A' Source Control

L	L	FPR
L	H	MEM
H	L	TRA
H	H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A-B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A-1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD Destination Control

L	L	L	Register zero
L	L	H	Register 'r'
L	H	L	FPR
L	H	H	TRA
H	L	L	MDR
H	L	H	MAR
H	H	L	PCR & MAR
H	H	H	IRR

RCE Instruction End Ctl

L	L	Continue
L	H	End if non-zero
H	L	End if zero
H	H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse)

A-2

ROMB bits

Instr	t	0 (RCA 1)	1 (RCA 0)	2 (RCB)	3 (RCC 3)	4 (RCC 2)	5 (RCC 1)	6 (RCC 0)	7 (RCD 2)	8 (RCD 1)	9 (RCD 0)	A (RCE 1)	B (RCE 0)	Sequence chart
ADDZ 20	t0	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
				"r"	F=B				TRA					
	t1	H	L	L	L	L	H	L	L	L	L	H	H	TRA + R0 → R0 [EUC]
		TRA		0	F=A+B(a)				R0			EUC		
	t2													
	t3													
ADDI 24	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1(a)				PCR & MAR					
	t1	L	H	H	L	L	H	L	L	L	H	H	H	MEM + "r" → "r" [EUC]
		MEM		"r"	F=A+B(a)				"r"			EUC		
	t2													
	t3													
ADDA 28	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	L	L	L	L	L	H	L	H	L	L	MEM → MAR
		MEM			F=A				MAR					
	t2	L	H	H	L	L	H	L	L	L	H	H	H	MEM + "r" → "r" [EUC]
		MEM		"r"	F=A+B(a)				"r"			EUC		
	t3													
ADDX 2C	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	H	L	L	H	L	H	L	H	L	L	MEM + "r" → MAR
		MEM		"r"	F=A+B (a)				MAR					
	t2	L	H	L	L	L	H	L	L	L	L	H	H	MEM + R0 → R0 [EUC]
		MEM		0	F=A+B (a)				R0			EUC		
	t3													

RCA 'A' Source Control

L	L	FPR
L	H	MEM
H	L	TRA
H	H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A−B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A−1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD Destination Control

L L L	Register zero
L L H	Register 'r'
L H L	FPR
L H H	TRA
H L L	MDR
H L H	MAR
H H L	PCR & MAR
H H H	IRR

RCE Instruction End Ctl

L L	Continue
L H	End if non-zero
H L	End if zero
H H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (invers

A-3

ROMB bits

Instr	t	0	1	2	3	4	5	6	7	8	9	A	B	Sequence chart
		RCA 1 0		RCB	RCC 3 2 1 0				RCD 2 1 0			RCE 1 0		
SUBZ 30	t0	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
		"r"			F=B				TRA					
	t1	H	L	L	L	L	H	H	L	L	L	H	H	TRA − R0 → R0 [EUC]
		TRA		0	F=A−B (a)				R0			EUC		
	t2														
	t3														
SUBI 34	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	H	L	L	H	H	L	L	H	H	H	MEM − "r" → "r" [EUC]
		MEM		"r"	F=A−B (a)				"r"			EUC		
	t2														
	t3														
SUBA 38	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	L	L	L	L	L	H	L	H	L	L	MEM → MAR
		MEM			F=A				MAR					
	t2	L	H	H	L	L	H	H	L	L	H	H	H	MEM − "r" → "r" [EUC]
		MEM		"r"	F=A−B (a)				"r"			EUC		
	t3														
SUBX 3C	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	H	L	L	H	L	H	L	H	L	L	MEM + "r" → MAR
		MEM		"r"	F=A+B (a)				MAR					
	t2	L	H	L	L	L	H	H	L	L	L	H	H	MEM − R0 → R0 [EUC]
		MEM		0	F=A−B (a)				R0			EUC		
	t3														

RCA 'A' Source Control

L	L	FPR
L	H	MEM
H	L	TRA
H	H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC   ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A−B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A−1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD   Destination Control

L	L	L	Register zero
L	L	H	Register 'r'
L	H	L	FPR
L	H	H	TRA
H	L	L	MDR
H	L	H	MAR
H	H	L	PCR & MAR
H	H	H	IRR

RCE   Instruction End Ctl

L	L	Continue
L	H	End if non-zero
H	L	End if zero
H	H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse)

Control ROM Coding Table

 ROMB bits

Instr	t	0 (RCA 1)	1 (RCA 0)	2 (RCB)	3 (RCC 3)	4 (RCC 2)	5 (RCC 1)	6 (RCC 0)	7 (RCD 2)	8 (RCD 1)	9 (RCD 0)	A (RCE 1)	B (RCE 0)	Sequence chart
ANDZ 40	t0	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
				"r"		F=B				TRA				
	t1	H	L	L	L	H	L	L	L	L	L	H	H	TRA . R0 → R0 / EUC
		TRA		0		F=A.B (l)				R0		EUC		
	t2													
	t3													
ANDI 44	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR				F=A+1 (a)			PCR & MAR					
	t1	L	H	H	L	H	L	L	L	L	H	H	H	MEM . "r" → "r" / EUC
		MEM		"r"		F=A.B (l)				"r"		EUC		
	t2													
	t3													
ANDA 48	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR				F=A+1 (a)			PCR & MAR					
	t1	L	H	L	L	L	L	L	H	L	H	L	L	MEM → MAR
		MEM				F=A				MAR				
	t2	L	H	H	L	H	L	L	L	L	H	H	H	MEM . "r" → "r" / EUC
		MEM		"r"		F=A.B (l)				"r"		EUC		
	t3													
ANDX 4C	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR				F=A+1 (a)			PCR & MAR					
	t1	L	H	H	L	L	H	L	H	L	H	L	L	MEM + "r" → MAR
		MEM		"r"		F=A+B (a)				MAR				
	t2	L	H	L	L	H	L	L	L	L	L	H	H	MEM . R0 → R0 / EUC
		MEM		0		F=A.B (l)				R0		EUC		
	t3													

RCA 'A' Source Control

L	L	FPR
L	H	MEM
H	L	TRA
H	H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A−B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A−1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD Destination Control

L	L	L	Register zero
L	L	H	Register 'r'
L	H	L	FPR
L	H	H	TRA
H	L	L	MDR
H	L	H	MAR
H	H	L	PCR & MAR
H	H	H	IRR

RCE Instruction End Ctl

L	L	Continue
L	H	End if non-zero
H	L	End if zero
H	H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse)

A-5

ROMB bits

		0	1	2	3	4	5	6	7	8	9	A	B	Sequence chart
		RCA 1 0		RCB	RCC 3 2 1 0				RCD 2 1 0			RCE 1 0		
IORZ 50	t0	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
		"r"			F=B				TRA					
	t1	H	L	L	L	H	L	H	L	L	L	H	H	TRA + R0 → R0
		TRA	0		F=A+B (l)				R0			EUC		EUC
	t2													
	t3													
IORI 54	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	H	L	H	L	H	L	L	H	H	H	MEM + "r" → "r"
		MEM	"r"		F=A+B (l)				"r"			EUC		EUC
	t2													
	t3													
IORA 58	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	L	L	L	L	L	H	L	H	L	L	MEM → MAR
		MEM			F=A				MAR					
	t2	L	H	H	L	H	L	H	L	L	H	H	H	MEM + "r" → "r"
		MEM	"r"		F=A+B (l)				"r"			EUC		EUC
	t3													
IORX 5C	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	H	L	L	H	L	H	L	H	L	L	MEM + "r" → MAR
		MEM	"r"		F=A+B (a)				MAR					
	t2	L	H	L	L	H	L	H	L	L	L	H	H	MEM + R0 → R0
		MEM	0		F=A+B (l)				R0			EUC		EUC
	t3													

RCA 'A' Source Control

L L	FPR
L H	MEM
H L	TRA
H H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A−B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A−1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD Destination Control

L L L	Register zero
L L H	Register 'r'
L H L	FPR
L H H	TRA
H L L	MDR
H L H	MAR
H H L	PCR & MAR
H H H	IRR

RCE Instruction End Ctl

L L	Continue
L H	End if non-zero
H L	End if zero
H H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse)

Main ROMB bit table (columns 0–B grouped as RCA 1 0 | RCB | RCC 3 2 1 0 | RCD 2 1 0 | RCE 1 0):

Instr.	t	0	1	2	3	4	5	6	7	8	9	A	B	Sequence chart
		RCA		RCB	RCC				RCD			RCE		
EORZ 60	t0	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
		"r"			F=B				TRA					
	t1	H	L	L	L	H	H	L	L	L	L	H	H	TRA ⊕ R0 → R0 ; EUC
		TRA		'0'	F=A⊕B(l)				R0			EUC		
	t2													
	t3													
EORI 64	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	H	L	H	H	L	L	L	H	H	H	MEM ⊕ "r" → "r" ; EUC
		MEM		"r"	F=A⊕B(l)				"r"			EUC		
	t2													
	t3													
EORA 68	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	L	L	L	L	L	H	L	H	L	L	MEM → MAR
		MEM			F=A				MAR					
	t2	L	H	H	L	H	H	L	L	L	H	H	H	MEM ⊕ "r" → "r" ; EUC
		MEM		"r"	F=A⊕B(l)				"r"			EUC		
	t3													
EORX 6C	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	H	L	L	H	L	H	L	H	L	L	MEM + "r" → MAR
		MEM		"r"	F=A+B (a)				MAR					
	t2	L	H	L	L	H	H	L	L	L	L			MEM ⊕ R0 → R0 ; EUC
		MEM		0	F=A⊕B(l)				R0					
	t3													

RCA 'A' Source Control

L	L	FPR
L	H	MEM
H	L	TRA
H	H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A−B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A−1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD Destination Control

L	L	L	Register zero
L	L	H	Register 'r'
L	H	L	FPR
L	H	H	TRA
H	L	L	MDR
H	L	H	MAR
H	H	L	PCR & MAR
H	H	H	IRR

RCE Instruction End Ctl

L	L	Continue
L	H	End if non-zero
H	L	End if zero
H	H	End unconditional

Notes :
- '+' = logical OR
- '.' = logical AND
- '⊕' = logical EXOR
- 'N' = low true (inverse)

Main table — ROMB bits

Instr	t	0	1	2	3	4	5	6	7	8	9	A	B	Sequence chart
		RCA 1	0	RCB	RCC 3	2	1	0	RCD 2	1	0	RCE 1	0	
INVR 70	t0	L	L	H	L	L	L	H	L	H	H	L	L	"r"→TRA
				"r"	\<F=B			\>	\<TRA		\>			
	t1	H	L	L	L	H	H	H	L	L	H	H	H	TRA→"r" (EUC)
		\<TRA\>			\<F=AN(l)\>				\<"r"\>			\<EUC\>		
	t2														
	t3														
INVA 74	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1→PCR & MAR
		\<PCR\>			\<F=A+1(a)\>				\<PCR & MAR\>					
	t1	L	H	L	L	L	L	L	H	L	H	L	L	MEM→MAR
		\<MEM\>			\<F=A\>				\<MAR\>					
	t2	L	H	L	L	H	H	H	H	L	L	H	H	MEM→MDR (inv)
		\<MEM\>			\<F=AN\>				\<MDR\>			\<EUC\>		
	t3														
INCR 78	t0	L	L	H	L	L	L	H	L	H	H	L	L	"r"→TRA
				"r"	\<F=B\>				\<TRA\>					
	t1	H	L	L	H	L	L	L	L	L	H	H	H	TRA+1→"r" (EUC)
		\<TRA\>			\<F=A+1(a)\>				\<"r"\>			\<EUC\>		
	t2														
	t3														
f0 MACRO	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1→PCR & MAR
		\<PCR\>			\<F=A+1(a)\>				\<PCR & MAR\>					
INCA 7C	t1	L	H	L	L	L	L	L	H	L	H	L	L	MEM→MAR
		\<MEM\>			\<F=A\>				\<MAR\>					
	t2	L	H	L	H	L	L	L	H	L	L	H	H	MEM+1→MDR (EUC)
		\<MEM\>			\<F=A+1(a)\>				\<MDR\>			\<EUC\>		
f1 MACRO	t3	L	H	L	L	L	L	L	H	H	H	L	L	MEM→IRR
		\<MEM\>			\<F=A\>				\<IRR\>					

RCA 'A' Source Control

L	L	FPR
L	H	MEM
H	L	TRA
H	H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A−B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A−1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD Destination Control

L	L	L	Register zero
L	L	H	Register 'r'
L	H	L	FPR
L	H	H	TRA
H	L	L	MDR
H	L	H	MAR
H	H	L	PCR & MAR
H	H	H	IRR

RCE Instruction End Ctl

L	L	Continue
L	H	End if non-zero
H	L	End if zero
H	H	End unconditional

Notes:
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse)

A-8

ROMB bits

Instr	time	RCA 1	RCA 0	RCB	RCC 3	RCC 2	RCC 1	RCC 0	RCD 2	RCD 1	RCD 0	RCE 1	RCE 0	Sequence chart
DECR 80	t0	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
		"r"			F=B				TRA					
	t1	H	L	L	H	L	L	H	L	L	H	H	H	TRA-1 → "r"
		TRA			F=A-1 (a)				"r"			EUC		$\overline{EUC}$
	t2													
	t3													
DECA 84	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	L	L	L	L	L	H	L	H	L	L	MEM → MAR
		MEM			F=A				MAR					
	t2	L	H	L	H	L	L	H	H	L	L	H	H	MEM-1 → MDR
		MEM			F=A-1 (a)				MDR			EUC		$\overline{EUC}$
	t3													
DLYR 88	t0	L	L	H	L	L	L	H	L	H	H	H	L	"r" → TRA
		"r"			F=B				TRA			EIZ		$\overline{EIZ}$
	t1	H	L	L	H	L	L	H	L	H	H	H	L	TRA-1 → TRA
		TRA			F=A-1 (a)				TRA			EIZ		$\overline{EIZ}$
	t2	H	L	L	H	L	L	H	L	H	H	H	L	TRA-1 → TRA
		TRA			F=A-1 (a)				TRA			EIZ		$\overline{EIZ}$
	t3	H	L	L	H	L	L	H	L	H	H	H	L	TRA-1 → TRA
		TRA			F=A-1 (a)				TRA			EIZ		$\overline{EIZ}$
DLYI 8C	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	L	L	L	L	L	L	H	H	H	L	MEM → TRA
		MEM			F=A				TRA			EIZ		$\overline{EIZ}$
	t2	H	L	L	H	L	L	H	L	H	H	H	L	TRA-1 → TRA
		TRA			F=A-1 (a)				TRA			EIZ		$\overline{EIZ}$
	t3	H	L	L	H	L	L	H	L	H	H	H	L	TRA-1 → TRA
		TRA			F=A-1 (a)				TRA			EIZ		$\overline{EIZ}$

RCA 'A' Source Control

L	L	FPR
L	H	MEM
H	L	TRA
H	H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A-B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A-1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD Destination Control

L	L	L	Register zero
L	L	H	Register 'r'
L	H	L	FPR
L	H	H	TRA
H	L	L	MDR
H	L	H	MAR
H	H	L	PCR & MAR
H	H	H	IRR

RCE Instruction End Ctl

L	L	Continue
L	H	End if non-zero
H	L	End if zero
H	H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse)

		ROMB bits												Sequence chart
		0	1	2	3	4	5	6	7	8	9	A	B	
		RCA 1 0		RCB	RCC 3 2 1 0				RCD 2 1 0			RCE 1 0		
90 JMPA	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1(α)				PCR&MAR					
	t1	L	H	L	H	L	L	H	H	H	L	H	H	MEM-1 → PCR & MAR
		MEM			F=A-1(α)				PCR&MAR			EUC		[EUC]
	t2													
	t3													
94 JMPX	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1(α)				PCR&MAR					
	t1	L	H	H	L	L	H	L	L	H	H	L	L	MEM + "r" → TRA
		MEM	"r"		F=A+B(α)				TRA					
	t2	H	L	L	H	L	L	H	H	H	L	H	H	TRA-1 → PCR & MAR
		TRA			F=A-1(α)				PCR&MAR			EUC		[EUC]
	t3													
98 NOP	t0	H	L	L	L	L	L	L	L	H	H	H	H	TRA → TRA
		TRA			F=A				TRA			EUC		[EUC]
	t1													
	t2													
	t3													
9C HALT	t0	H	L	L	L	L	L	L	L	H	H	H	H	TRA → TRA
		TRA			F=A				TRA			EUC		HALT [EUC]
	t1													
	t2													
	t3													

RCA 'A' Source Control

L	L	FPR
L	H	MEM
H	L	TRA
H	H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A-B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A-1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD Destination Control

L	L	L	Register zero
L	L	H	Register 'r'
L	H	L	FPR
L	H	H	TRA
H	L	L	MDR
H	L	H	MAR
H	H	L	PCR & MAR
H	H	H	IRR

RCE Instruction End Ctl

L	L	Continue
L	H	End if non-zero
H	L	End if zero
H	H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse

ROMB bits

Instr	t	0	1	2	3	4	5	6	7	8	9	A	B	Sequence chart
		RCA 1 0		RCB	RCC 3 2 1 0				RCD 2 1 0			RCE 1 0		
A0 JNZA	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	L	H	L	L	L	H	L	H	H	H	L	"r" → TRA
				'r'	F=B				TRA			EZ		[EZ]
	t2	L	H	L	H	L	L	H	H	H	L	H	H	MEM−1 → PCR & MAR
		MEM			F=A−1 (a)				PCR & MAR			EUC		[EUC]
	t3													
A4 JNZX	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	L	L	L	L	L	H	L	H	H	H	L	"R0" → TRA
				0	F=B				TRA			EZ		[EZ]
	t2	L	H	H	L	L	H	L	L	H	H	L	L	MEM + "r" → TRA
		MEM		'r'	F=A+B (a)				TRA					
	t3	H	L	L	H	L	L	H	H	H	L	H	H	TRA−1 → PCR & MAR
		TRA			F=A−1 (a)				PCR & MAR			EUC		[EUC]
A8 JZA	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	L	H	L	L	L	H	L	H	H	L	H	"r" → TRA
				'r'	F=B				TRA			ENZ		[ENZ]
	t2	L	H	L	H	L	L	H	H	H	L	H	H	MEM−1 → PCR & MAR
		MEM			F=A−1 (a)				PCR & MAR			EUC		[EUC]
	t3													
AC JZX	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	L	L	L	L	L	H	L	H	H	L	H	R0 → TRA
				0	F=B				TRA			ENZ		[ENZ]
	t2	L	H	H	L	L	H	L	L	H	H	L	L	MEM + "r" → TRA
		MEM		'r'	F=A+B (a)				TRA					
	t3	H	L	L	H	L	L	H	H	H	L	H	H	TRA−1 → PCR & MAR
		TRA			F=A−1 (a)				PCR & MAR			EUC		[EUC]

RCA 'A' Source Control

L	L	FPR
L	H	MEM
H	L	TRA
H	H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A−B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A−1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD Destination Control

LLL	Register zero
LLH	Register 'r'
LHL	FPR
LHH	TRA
HLL	MDR
HLH	MAR
HHL	PCR & MAR
HHH	IRR

RCE Instruction End Ctl

L	L	Continue
L	H	End if non-zero
H	L	End if zero
H	H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse

| PB/80 Control ROM Coding. | 12-6-80 | PB | 12-16 |

ROMB bits

		Ø	1	2	3	4	5	6	7	8	9	A	B	Sequence chart
		RCA 1 0		RCB	RCC 3 2 1 0				RCD 2 1 0			RCE 1 0		
INA BØ	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	L	L	L	L	L	H	L	H	L	L	MEM → MAR
		MEM			F=A				MAR					
	t2	L	L	L	L	L	L	L	H	L	L	H	H	FPR → MDR
		FPR			F=A				MDR			EUC		[EUC]
	t3													
INR .84	t0	L	L	L	L	L	L	L	L	L	H	H	H	FPR → "r"
		FPR			F=A				"r"			EUC		[EUC]
	t1													
	t2													
	t3													
OUTA B8	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	H	L	L	L	L	L	H	L	H	L	L	MEM → MAR
		MEM			F=A				MAR					
	t2	L	H	L	L	L	L	L	L	H	L	H	H	MEM → FPR
		MEM			F=A				FPR			EUC		[EUC]
	t3													
OUTR BC	t0	L	L	H	L	L	L	H	L	H	L	H	H	"r" → FPR
				"r"	F=B				FPR			EUC		[EUC]
	t1													
	t2													
	t3													

RCA 'A' Source Control

L L	FPR
L H	MEM
H L	TRA
H H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC   ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A−B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A−1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD   Destination Control

L L L	Register zero
L L H	Register 'r'
L H L	FPR
L H H	TRA
H L L	MDR
H L H	MAR
H H L	PCR & MAR
H H H	IRR

RCE   Instruction End Ctl

L L	Continue
L H	End if non-zero
H L	End if zero
H H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse)

A-12

ROMB bits

Instr	t	0 (RCA 1)	1 (RCA 0)	2 (RCB)	3 (RCC 3)	4 (RCC 2)	5 (RCC 1)	6 (RCC 0)	7 (RCD 2)	8 (RCD 1)	9 (RCD 0)	A (RCE 1)	B (RCE 0)	Sequence chart
SRR C0	t0	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
				"r"		F=B				TRA				
	t1	H	L	L	H	H	L	L	L	L	H	H	H	TRA (SR) → "r"
		TRA				F=A (SR)				"r"		EUC		EUC
	t2													
	t3													
SLR C4	t0	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
				"r"		F=B				TRA				
	t1	H	L	L	H	H	L	H	L	L	H	H	H	TRA (SL) → "r"
		TRA				F=A (SL)				"r"		EUC		EUC
	t2													
	t3													
RRR C8	t0	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
				"r"		F=B				TRA				
	t1	H	L	L	H	H	L	L	L	L	H	H	H	TRA (RR) → "r"
		TRA				F=A (RR)				"r"		EUC		EUC
	t2													
	t3													
RLR CC	t0	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
				"r"		F=B				TRA				
	t1	H	L	L	H	H	H	H	L	L	H	H	H	TRA (RL) → "r"
		TRA				F=A (RL)				"r"		EUC		EUC
	t2													
	t3													

RCA 'A' Source Control

L	L	FPR
L	H	MEM
H	L	TRA
H	H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC   ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A-B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A-1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD   Destination Control

L	L	L	Register zero
L	L	H	Register 'r'
L	H	L	FPR
L	H	H	TRA
H	L	L	MDR
H	L	H	MAR
H	H	L	PCR & MAR
H	H	H	IRR

RCE   Instruction End Ctl

L	L	Continue
L	H	End if non-zero
H	L	End if zero
H	H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse)

Instr	Time	0	1	2	3	4	5	6	7	8	9	A	B	Sequence chart
		RCA 1 0		RCB	RCC 3 2 1 0				RCD 2 1 0			RCE 1 0		
IJNA D0	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
				"r"	F=B				TRA					EZ
	t2	H	L	L	H	L	L	L	L	L	H	H	L	TRA+1 → "r"
		TRA			F=A+1 (a)				"r"			EZ		[EZ]
	t3	L	H	L	H	L	L	H	H	H	L	H	H	MEM-1 → PCR & MAR
		MEM			F=A-1 (a)				PCR & MAR			EUC		[EUC]
DJNA D4	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
				"r"	F=B				TRA					EZ
	t2	H	L	L	H	L	L	H	L	L	H	H	L	TRA-1 → "r"
		TRA			F=A-1 (a)				"r"			EZ		[EZ]
	t3	L	H	L	H	L	L	H	H	H	L	H	H	MEM-1 → PCR & MAR
		MEM			F=A-1 (a)				PCR & MAR			EUC		[EUC]
XJNA D8	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
				"r"	F=B				TRA					
	t2	H	L	L	L	H	H	L	L	H	H	H	L	TRA ⊕ R0 → TRA
		TRA	φ		F=A⊕B (l)				TRA			EZ		[EZ]
	t3	L	H	L	H	L	L	H	H	H	L	H	H	MEM-1 → PCR & MAR
		MEM			F=A-1 (a)				PCR & MAR			EUC		[EUC]
XJZA DC	t0	H	H	L	H	L	L	L	H	H	L	L	L	PCR+1 → PCR & MAR
		PCR			F=A+1 (a)				PCR & MAR					
	t1	L	L	H	L	L	L	H	L	H	H	L	L	"r" → TRA
				"r"	F=B				TRA					
	t2	H	L	L	L	H	H	L	L	H	H	L	H	TRA ⊕ R0 → TRA
		TRA	φ		F=A⊕B (L)				TRA			ENZ		[ENZ]
	t3	L	H	L	H	L	L	H	H	H	L	H	H	MEM-1 → PCR & MAR
		MEM			F=A-1 (a)				PCR & MAR			EUC		[EUC]

ROMB bits

RCA 'A' Source Control

L	L	FPR
L	H	MEM
H	L	TRA
H	H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC   ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A-B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A-1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD   Destination Control

L	L	L	Register zero
L	L	H	Register 'r'
L	H	L	FPR
L	H	H	TRA
H	L	L	MDR
H	L	H	MAR
H	H	L	PCR & MAR
H	H	H	IRR

RCE   Instruction End Ctl

L	L	Continue
L	H	End if non-zero
H	L	End if zero
H	H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse)

ROMB bits

		0 1	2	3 4 5 6	7 8 9	A B	Sequence chart
		RCA 1 0	RCB	RCC 3 2 1 0	RCD 2 1 0	RCE 1 0	
FPC-DR MACRO	t0	L L	H	L L L H	L H L	L L	"r" ⟶ FPR
			"r"	F=B	FPR		
E0	t1						
	t2						
	t3						
FPC-DM MACRO	t0	L H	L	L L L L	L H L	L L	MEM ⟶ FPR
		MEM		F=A	FPR		
E4	t1						
	t2						
	t3						
FPC-LR MACRO	t0	L L	L	L L L L	L L H	L L	FPR ⟶ "r"
		FPR		F=A	"r"		
E8	t1						
	t2						
	t3						
FPC-LM MACRO	t0	L L	L	L L L L	H L L	L L	FPR ⟶ MEM
		FPR		F=A	MDR		
EC	t1						
	t2						
	t3						

RCA 'A' Source Control

L L	FPR
L H	MEM
H L	TRA
H H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A−B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A−1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD Destination Control

L L L	Register zero
L L H	Register 'r'
L H L	FPR
L H H	TRA
H L L	MDR
H L H	MAR
H H L	PCR & MAR
H H H	IRR

RCE Instruction End Ctl

L L	Continue
L H	End if non-zero
H L	End if zero
H H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse)

A-15

PB/80 Control ROM Coding.		12-6-80	PB	16-16

Main Table — ROMB bits

		RCA (1 0)	RCB	RCC (3 2 1 0)	RCD (2 1 0)	RCE (1 0)	Sequence chart
	bit	0 1	2	3 4 5 6	7 8 9	A B	
FPC-DPC MACRO / F0	t0	H H	L	L L L L	L H L	L L	PCR → FPR
		PCR		F=A	FPR		
	t1						
	t2						
	t3						
FPC-P+1 MACRO / F4	t0	H H	L	H L L L	H H L	L L	PCR+1 → PCR & MAR
		PCR		F=A+1 (a)	PCR & MAR		
	t1						
	t2						
	t3						
FPC-LPC MACRO / F8	t0	L L	L	L L L L	H H L	L L	FPR → PCR & MAR
		FPR		F=A	PCR & MAR		
	t1						
	t2						
	t3						
FPC-RST MACRO / FC	t0	H H	L	L L L L	H H L	L L	00 → PCR & MAR
				F=A	PCR & MAR		
	t1						ZABUS ZEROS ABUS
	t2						
	t3						

RCA 'A' Source Control

L	L	FPR
L	H	MEM
H	L	TRA
H	H	PCR

RCB 'B' Source Control

L	Register zero
H	Register 'r'

RCC ALU Control

LLLL	F=A
LLLH	F=B
LLHL	F=A+B (arith.)
LLHH	F=A−B (arith.)
LHLL	F=A.B (logic.)
LHLH	F=A+B (logic.)
LHHL	F=A⊕B (logic.)
LHHH	F=AN (logic.)
HLLL	F=A+1 (arith.)
HLLH	F=A−1 (arith.)
HHLL	F=A (SR)
HHLH	F=A (SL)
HHHL	F=A (RR)
HHHH	F=A (RL)

RCD Destination Control

L L L		Register zero
L L H		Register 'r'
L H L		FPR
L H H		TRA
H L L		MDR
H L H		MAR
H H L		PCR & MAR
H H H		IRR

RCE Instruction End Ctl

L	L	Continue
L	H	End if non-zero
H	L	End if zero
H	H	End unconditional

Notes :
'+' = logical OR
'.' = logical AND
'⊕' = logical EXOR
'N' = low true (inverse)