Fetch

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_0	MA←PC : C←PC+4	PC_{out}, MAin, INC4, C_{in}	T_0	MA←PC	PC_{out}, C=B, MA_{in}	T_0	MA←PC : MD←M[MA] : PC←PC+4	PC_{out}, MA^B_{in}, INC4, PC_{in}, Read, Wait
T_1	MD←M[MA] : PC←C	Read, Wait, C_{out}, PC_{in}	T_1	PC←PC+4 : MD←M[MA]	PC_{out}, INC4, PC_{in}, Read, Wait			
T_2	IR←MD	MD_{out}, IR_{in}	T_2	IR←MD	MD_{out}, C=B, IR_{in}	T_1	IR←MD	MD_{out}, C=B, IR_{in}

OPC 1: ld r_a, c_2 / ld r_a, $c_2(r_b)$

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	(r_b=0)→(A←0) (r_b≠0)→(A←R[r_b])	Gr_b, BA_{out}, A_{in}	T_3	(r_b=0)→(A←0) (r_b≠0)→(A←R[r_b])	Gr_b, BA_{out}, C=B, A_{in}	T_2	(r_b=0)→(MA←C_2{Sign Ext}) (r_b≠0)→(MA←R[r_b] +C_2{Sign Ext}):MD←M[MA]	G^Ar_b, BA^A_{out}, C_{2out}, ADD, MA^C_{in}, Read, Wait
T_4	C←A+C_2{Sign Ext}	C_{2out}, ADD, C_{in}	T_4	MA←A+C_2{Sign Ext}	C_{2out}, ADD, MA_{in}			
T_5	MA←C	C_{out}, MA_{in}	T_5	MD←M[MA]	Read, Wait			
T_6	MD←M[MA]	Read, Wait	T_6	R[r_a]←MD	MD_{out}, C=B, Sr_a, R_{in}, End.	T_3	R[r_a]←MD	MD_{out}, C=B, Sr_a, R_{in}, End.
T_7	R[r_a]←MD	MD_{out}, Gr_a, R_{in}, End.						

OPC 2: ldr r_a, c_1

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	A←PC	PC_{out}, A_{in}	T_3	A←PC	PC_{out}, C=B, A_{in}	T_2	R[r_a]←PC	PC_{out}, C=B, Sr_a, R_{in}
T_4	C←A+C_1{Sign Ext}	C_{1out}, ADD, C_{in}	T_4	MA←A+C_1{Sign Ext}	C_{1out}, ADD, MA_{in}	T_3	MA←R[r_a]+ C_1{Sign Ext} : MD←M[MA]	C_{1out}, G^Ar_a, Rout, ADD, MA^C_{in}, Read, Wait
T_5	MA←C	C_{out}, MA_{in}	T_5	MD←M[MA]	Read, Wait			
T_6	MD←M[MA]	Read, Wait	T_6	R[r_a]←MD	MD_{out}, C=B, Sr_a, R_{in}, End.	T_4	R[r_a]←MD	MD_{out}, C=B, Sr_a, R_{in}, End.
T_7	R[r_a]←MD	MD_{out}, Gr_a, R_{in}, End.						

OPC 3: st r_a, c_2 / st r_a, $c_2(r_b)$

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	(r_b=0)→(A←0) (r_b≠0)→(A←R[r_b])	Gr_b, BA_{out}, A_{in}	T_3	(r_b=0)→(A←0) (r_b≠0)→(A←R[r_b])	Gr_b, BA_{out}, C=B, A_{in}	T_2	MD←R[r_a]	G^Br_a, R_{out}, C=B, MD_{bus}
T_4	C←A+C_2{Sign Ext}	C_{2out}, ADD, C_{in}	T_4	MA←A+C_2{Sign Ext}	C_{2out}, ADD, MA_{in}	T_3	(r_b=0)→(MA←C_2{Sign Ext}) (r_b≠0)→(MA←R[r_b] +C_2{Sign Ext}):M[MA]←MD	G^Ar_b, BA^A_{out}, C_{2out}, ADD, MA_{in}, Write, Wait, End.
T_5	MA←C	C_{out}, MA_{in}	T_5	MD←R[r_a]	Gr_a, R_{out}, C=B, MD_{bus}			
T_6	MD←R[r_a]	Gr_a, R_{out}, MD_{bus}	T_6	M[MA]←MD	Write, Wait, End.			
T_7	M[MA]←MD	Write, Wait, End.						

OPC 4: str r_a, c_1

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	A←PC	PC_{out}, A_{in}	T_3	A←PC	PC_{out}, A_{in}	T_2	MD←R[r_a]	Gr_a, R_{out}, MD_{bus}
T_4	C←A+C_1{Sign Ext}	C_{1out}, ADD, C_{in}	T_4	MA←A+C_1{Sign Ext}	C_{1out}, ADD, MA_{in}	T_3	MA←PC+C_1{Sign Ext} : M[MA]←MD	C_{1out}, ADD, MA_{in}, Write, Wait, End.
T_5	MA←C	C_{out}, MA_{in}	T_5	MD←R[r_a]	Gr_a, R_{out}, MD_{bus}			
T_6	MD←R[r_a]	Gr_a, R_{out}, MD_{bus}	T_6	M[MA]←MD	Write, Wait, End.			
T_7	M[MA]←MD	Write, Wait, End.						

OPC 5: la r_a, c_2 / la r_a, r_b, c_2

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	(r_b=0)→(A←0) (r_b≠0)→(A←R[r_b])	Gr_b, BA_{out}, A_{in}	T_3	(r_b=0)→(A←0) (r_b≠0)→(A←R[r_b])	Gr_b, BA_{out}, C=B, A_{in}	T_2	(r_b=0)→(R[r_a]←C_2{Sign Ext}) (r_b≠0)→(R[r_a]←R[r_b] +C_2{Sign Ext})	G^Ar_b, BA^A_{out}, C_{2out}, ADD, Sr_a, R_{in}, End.
T_4	C←A+C_2{Sign Ext}	C_{2out}, ADD, C_{in}	T_4	R[r_a]←A+C_2{Sign Ext}	C_{2out}, ADD, Sr_a, R_{in}, End.			
T_5	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 6: lar r_a, c_1

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	A←PC	PC_{out}, A_{in}	T_3	A←PC	PC_{out}, A_{in}	T_2	R[r_a]←PC	PC_{out}, C=B, Sr_a, R_{in}
T_4	C←A+C_1{Sign Ext}	C_{1out}, ADD, C_{in}	T_4	R[r_a]←A+C_1{Sign Ext}	C_{1out}, ADD, Sr_a, R_{in}, End.	T_3	R[r_a]←R[ra]+C_1{Sign Ext}	G^Ar_a, Rout, C_{1out}, ADD, Sr_a, R_{in}, End.
T_5	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 8: br r_b / brzr r_b, r_c / brnz r_b, r_c / brpl r_b, r_c / brmi r_b, r_c

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	CON←Cond(R[r_c])	Gr_c, R_{out}, CON_{in}	T_3	CON←Cond(R[r_c])	Gr_c, R_{out}, CON_{in}	T_2	CON←Cond(R[r_c])	G^Ar_c, R^A_{out}, CON_{in}
T_4	CON→(PC←R[r_b])	CON→(Gr_b, R_{out}, PC_{in}), End.	T_4	CON→(PC←R[r_b])	CON→(Gr_b, R_{out}, C=B, PC_{in}), End.	T_3	CON→(PC←R[r_b])	CON→(Gr_b, R_{out}, C=B, PC_{in}), End.

OPC 9: brl r_a, r_b / brlnv r_a / brlzr r_a, r_b, r_c / brlnz r_a, r_b, r_c / brlpl r_a, r_b, r_c / brlmi r_a, r_b, r_c

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	CON←Cond(R[r_c])	Gr_c, R_{out}, CON_{in}	T_3	CON←Cond(R[r_c])	Gr_c, R_{out}, CON_{in}	T_2	CON←Cond(R[r_c])	G^Ar_c, R^A_{out}, CON_{in}
T_4	R[r_a]←PC	PC_{out}, Gr_a, R_{in}	T_4	R[r_a]←PC	PC_{out}, C=B, Sr_a, R_{in}	T_3	R[r_a]←PC	PC_{out}, C=B, Sr_a, R_{in}
T_5	CON→(PC←R[r_b])	CON→(Gr_b, R_{out}, PC_{in}), End.	T_5	CON→(PC←R[r_b])	CON→(Gr_b, R_{out}, C=B, PC_{in}), End.	T_4	CON→(PC←R[r_b])	CON→(Gr_b, R_{out}, C=B, PC_{in}), End.

OPC 12: add r_a, r_b, r_c

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	A←R[r_b]	Gr_b, R_{out}, A_{in}	T_3	A←R[r_b]	Gr_b, R_{out}, C=B, A_{in}	T_2	R[r_a]← R[r_b]+R[r_c]	G^Ar_b, R^A_{out}, G^Br_c, R^B_{out}, ADD, Sra, R_{in}, End.
T_4	C←A+R[r_c]	Gr_c, R_{out}, ADD, C_{in}	T_4	R[r_a]←A+R[r_c]	Gr_c, R_{out}, ADD, Sra, R_{in}, End.			
T_5	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 13: addi r_a, r_b, c_2

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	A←R[r_b]	Gr_b, R_{out}, A_{in}	T_3	A←R[r_b]	Gr_b, R_{out}, C=B, A_{in}	T_2	R[r_a]←R[r_b]+C_2{Sign Ext}	G^Ar_b, BA^A_{out}, C_{2out}, ADD, Sr_a, R_{in}, End.
T_4	C←A+C_2{Sign Ext}	C_{2out}, ADD, C_{in}	T_4	R[r_a]←A+C_2{Sign Ext}	C_{2out}, ADD, Sr_a, R_{in}, End.			
T_5	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 14: sub r_a, r_b, r_c

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	A←R[r_b]	Gr_b, R_{out}, A_{in}	T_3	A←R[r_b]	Gr_b, R_{out}, C=B, A_{in}	T_2	R[r_a]← R[r_b]-R[r_c]	G^Ar_b, $R^A{}_{out}$, G^Br_c, $R^B{}_{out}$, SUB, Sr_a, R_{in}, End.
T_4	C←A-R[r_c]	Gr_c, R_{out}, SUB, C_{in}	T_4	R[r_a]←A-R[r_c]	Gr_c, R_{out}, SUB, Sr_a, R_{in}, End.			
T_5	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 15: neg r_a, r_c

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	A←R[r_c]	Gr_c, R_{out}, A_{in}	T_3	A←R[r_c]	Gr_c, R_{out}, C=B, A_{in}	T_2	R[r_a]← R[r_c]-R[r_c]	G^Ar_c, $R^A{}_{out}$, G^Br_c, $R^B{}_{out}$, SUB, Sr_a, R_{in}
T_4	C←A-R[r_c]	Gr_c, R_{out}, SUB, C_{in}	T_4	A←A-R[r_c]	Gr_c, R_{out}, SUB, A_{in}			
T_5	A←C	C_{out}, A_{in}	T_5	R[r_a]←A-R[r_c]	Gr_c, R_{out}, SUB, Sr_a, R_{in}, End.	T_3	R[r_a]← R[r_a]-R[r_c]	G^Ar_c, $R^A{}_{out}$, G^Br_c, $R^B{}_{out}$, SUB, Sr_a, R_{in}, End.
T_6	C←A-R[r_c]	Gr_c, R_{out}, SUB, C_{in}						
T_7	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 20: and r_a, r_b, r_c

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	A←R[r_b]	Gr_b, R_{out}, A_{in}	T_3	A←R[r_b]	Gr_b, R_{out}, C=B, A_{in}	T_2	R[r_a]← R[r_b]ΛR[r_c]	G^Ar_b, $R^A{}_{out}$, G^Br_c, $R^B{}_{out}$, AND, Sr_a, R_{in}, End.
T_4	C←AΛR[r_c]	Gr_c, R_{out}, AND, C_{in}	T_4	R[r_a]←AΛR[r_c]	Gr_c, R_{out}, AND, Sr_a, R_{in}, End.			
T_5	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 21: andi r_a, r_b, c_2

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	A←R[r_b]	Gr_b, R_{out}, A_{in}	T_3	A←R[r_b]	Gr_b, R_{out}, C=B, A_{in}	T_2	R[r_a]←R[r_b] ΛC_2{Sign Ext}	G^Ar_b, $BA^A{}_{out}$, C_{2out}, AND, Sr_a, R_{in}, End.
T_4	C←AΛC_2{Sign Ext}	C_{2out}, AND, C_{in}	T_4	R[r_a]←AΛC_2{Sign Ext}	C_{2out}, AND, Sr_a, R_{in}, End.			
T_5	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 22: or r_a, r_b, r_c

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	A←R[r_b]	Gr_b, R_{out}, A_{in}	T_3	A←R[r_b]	Gr_b, R_{out}, C=B, A_{in}	T_2	R[r_a]← R[r_b]VR[r_c]	G^Ar_b, $R^A{}_{out}$, G^Br_c, $R^B{}_{out}$, OR, Sra, R_{in}, End.
T_4	C←AVR[r_c]	Gr_c, R_{out}, OR, C_{in}	T_4	R[r_a]←AVR[r_c]	Gr_c, R_{out}, OR, Sra, R_{in}, End.			
T_5	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 23: ori r_a, r_b, c_2

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	A←R[r_b]	Gr_b, R_{out}, A_{in}	T_3	A←R[r_b]	Gr_b, R_{out}, C=B, A_{in}	T_2	R[r_a]←R[r_b]VC_2{Sign Ext}	G^Ar_b, $BA^A{}_{out}$, C_{2out}, OR, Sr_a, R_{in}, End.
T_4	C←AVC_2{Sign Ext}	C_{2out}, OR, C_{in}	T_4	R[r_a]←AVC_2{Sign Ext}	C_{2out}, OR, Sr_a, R_{in}, End.			
T_5	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 24: not r_a, r_c

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	C←¬ R[r_c]	Gr_c, R_{out}, NOT, C_{in}	T_3	R[r_a]←¬ R[r_c]	Gr_c, R_{out}, NOT, Sr_a, R_{in}, End.	T_2	R[r_a]←¬ R[r_c]	G^Br_c, $R^B{}_{out}$, NOT, Sr_a, R_{in}, End.
T_4	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 26: shr r_a, r_b, c_3 / shr r_a, r_b, r_c

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	n←IR<4..0>	C_{1out}, Ld	T_3	n←IR<4..0>	C_{1out}, Ld	T_2	n←IR<4..0>	C_{1out}, Ld
T_4	(n=0)→(n←R[r_c]<4..0>)	(n=0)→(Gr_c, R_{out}, Ld)	T_4	(n=0)→(n←R[r_c]<4..0>)	(n=0)→(Gr_c, R_{out}, Ld)	T_3	(n=0)→(n←R[r_c]<4..0>)	(n=0)→(Gr_c, R_{out}, Ld)
T_5	C←R[r_b]	Gr_b, R_{out}, C=B, C_{in}	T_5	R[r_a]←R[r_b]	Gr_b, R_{out}, C=B, Sr_a, R_{in}	T_4	R[r_a]←R[r_b]	G^Br_b, $R^B{}_{out}$, C=B, Sr_a, R_{in}
T_6	Shr (:= (n≠0)→(C←0#C<31..1> : n←n-1 ; Shr));	(n≠0)→(C_{out}, SHR, C_{in}, Decr, Goto6)	T_6	Shr (:= (n≠0)→ (R[r_a]←0#R[r_a]<31..1> : n←n-1 ; Shr));	(n≠0)→(Gr_a, R_{out}, SHR, Sr_a, R_{in}, Decr, Goto6) (n=0)→End.	T_5	Shr (:= (n≠0)→ (R[r_a]←0#R[r_a]<31..1> : n←n-1 ; Shr));	(n≠0)→(G^Br_a, $R^B{}_{out}$, SHR, Sr_a, R_{in}, Decr, Goto5) (n=0)→End.
T_7	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 27: shra r_a, r_b, c_3 / shra r_a, r_b, r_c

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	n←IR<4..0>	C_{1out}, Ld	T_3	n←IR<4..0>	C_{1out}, Ld	T_2	n←IR<4..0>	C_{1out}, Ld
T_4	(n=0)→(n←R[r_c]<4..0>)	(n=0)→(Gr_c, R_{out}, Ld)	T_4	(n=0)→(n←R[r_c]<4..0>)	(n=0)→(Gr_c, R_{out}, Ld)	T_3	(n=0)→(n←R[r_c]<4..0>)	(n=0)→(Gr_c, R_{out}, Ld)
T_5	C←R[r_b]	Gr_b, R_{out}, C=B, C_{in}	T_5	R[r_a]←R[r_b]	Gr_b, R_{out}, C=B, Sr_a, R_{in}	T_4	R[r_a]←R[r_b]	G^Br_b, $R^B{}_{out}$, C=B, Sr_a, R_{in}
T_6	Shra (:= (n≠0)→(C←C<31>#C<31..1> : n←n-1 ; Shra));	(n≠0)→(C_{out}, SHRA, C_{in}, Decr, Goto6)	T_6	Shra (:= (n≠0)→(R[r_a]← R[r_a]<31>#R[r_a]<31..1> : n←n-1 ; Shra));	(n≠0)→(Gr_a, R_{out}, SHRA, Sr_a, R_{in}, Decr, Goto6) (n=0)→End.	T_5	Shra (:= (n≠0)→(R[r_a]← R[r_a]<31>#R[r_a]<31..1> : n←n-1 ; Shra));	(n≠0)→(G^Br_a, $R^B{}_{out}$, SHRA, Sr_a, R_{in}, Decr, Goto5) (n=0)→End.
T_7	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 28: shl r_a, r_b, c_3 / shl r_a, r_b, r_c

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	n←IR<4..0>	C_{1out}, Ld	T_3	n←IR<4..0>	C_{1out}, Ld	T_2	n←IR<4..0>	C_{1out}, Ld
T_4	(n=0)→(n←R[r_c]<4..0>)	(n=0)→(Gr_c, R_{out}, Ld)	T_4	(n=0)→(n←R[r_c]<4..0>)	(n=0)→(Gr_c, R_{out}, Ld)	T_3	(n=0)→(n←R[r_c]<4..0>)	(n=0)→(Gr_c, R_{out}, Ld)
T_5	C←R[r_b]	Gr_b, R_{out}, C=B, C_{in}	T_5	R[r_a]←R[r_b]	Gr_b, R_{out}, C=B, Sr_a, R_{in}	T_4	R[r_a]←R[r_b]	G^Br_b, $R^B{}_{out}$, C=B, Sr_a, R_{in}
T_6	Shl (:= (n≠0)→(C←C<30..0>#0 : n←n-1 ; Shl));	(n≠0)→(C_{out}, SHL, C_{in}, Decr, Goto6)	T_6	Shl (:= (n≠0)→ (R[r_a]← R[r_a]<30..0>#0 : n←n-1 ; Shl));	(n≠0)→(Gr_a, R_{out}, SHL, Sr_a, R_{in}, Decr, Goto6) (n=0)→End.	T_5	Shl (:= (n≠0)→ (R[r_a]←R[r_a]<30..0>#0 : n←n-1 ; Shl));	(n≠0)→(G^Br_a, $R^B{}_{out}$, SHL, Sr_a, R_{in}, Decr, Goto5) (n=0)→End.
T_7	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

OPC 29: shc r_a, r_b, c_3 / shc r_a, r_b, r_c

1-Bus			2-Bus			3-Bus		
Step	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**	**Step**	**Concrete RTN**	**Control Sequence**
T_3	n←IR<4..0>	C_{1out}, Ld	T_3	n←IR<4..0>	C_{1out}, Ld	T_2	n←IR<4..0>	C_{1out}, Ld
T_4	(n=0)→(n←R[r_c]<4..0>)	(n=0)→(Gr_c, R_{out}, Ld)	T_4	(n=0)→(n←R[r_c]<4..0>)	(n=0)→(Gr_c, R_{out}, Ld)	T_3	(n=0)→(n←R[r_c]<4..0>)	(n=0)→(Gr_c, R_{out}, Ld)
T_5	C←R[r_b]	Gr_b, R_{out}, C=B, C_{in}	T_5	R[r_a]←R[r_b]	Gr_b, R_{out}, C=B, Sr_a, R_{in}	T_4	R[r_a]←R[r_b]	G^Br_b, R^B_{out}, C=B, Sr_a, R_{in}
T_6	Shc (:= (n≠0)→ (C← C<30..0>#C<31> : n←n-1 ; Shc));	(n≠0)→(C_{out}, SHC, C_{in}, Decr, Goto6)	T_6	Shc (:= (n≠0)→(R[r_a]← R[r_a]<31..1># R[r_a]<31> : n←n-1 ; Shc));	(n≠0)→(Gr_a, R_{out}, SHC, Sr_a, R_{in}, Decr, Goto6) (n=0)→End.	T_5	Shc (:= (n≠0)→(R[r_a]← R[r_a]<31..1># R[r_a]<31> : n←n-1 ; Shc));	(n≠0)→(G^Br_a, R^B_{out}, SHC, Sr_a, R_{in}, Decr, Goto5) (n=0)→End.
T_7	R[r_a]←C	C_{out}, Gr_a, R_{in}, End.						

Command		Steps		
opc	**name**	**1-bus**	**2-bus**	**3-bus**
-	fetch	3	3	2
0	nop			
1	ld	8	7	4
2	ldr	8	7	5
3	st	8	7	4
4	str	8	7	4
5	la	6	5	3
6	lar	6	5	4
8	br	5	5	4
9	brl	6	6	5
10	een			
11	edi			
12	add	6	5	3
13	addi	6	5	3
14	sub	6	5	3
15	neg	8	6	4
16	svi			
17	ri			
20	and	6	5	3
21	andi	6	5	3
22	or	6	5	3
23	ori	6	5	3
24	not	5	4	3
26	shr	8+n	7+n	6+n
27	shra	8+n	7+n	6+n
28	shl	8+n	7+n	6+n
29	shc	8+n	7+n	6+n
30	rfi			
31	stop			

Free OP Codes: 7,18,19,25