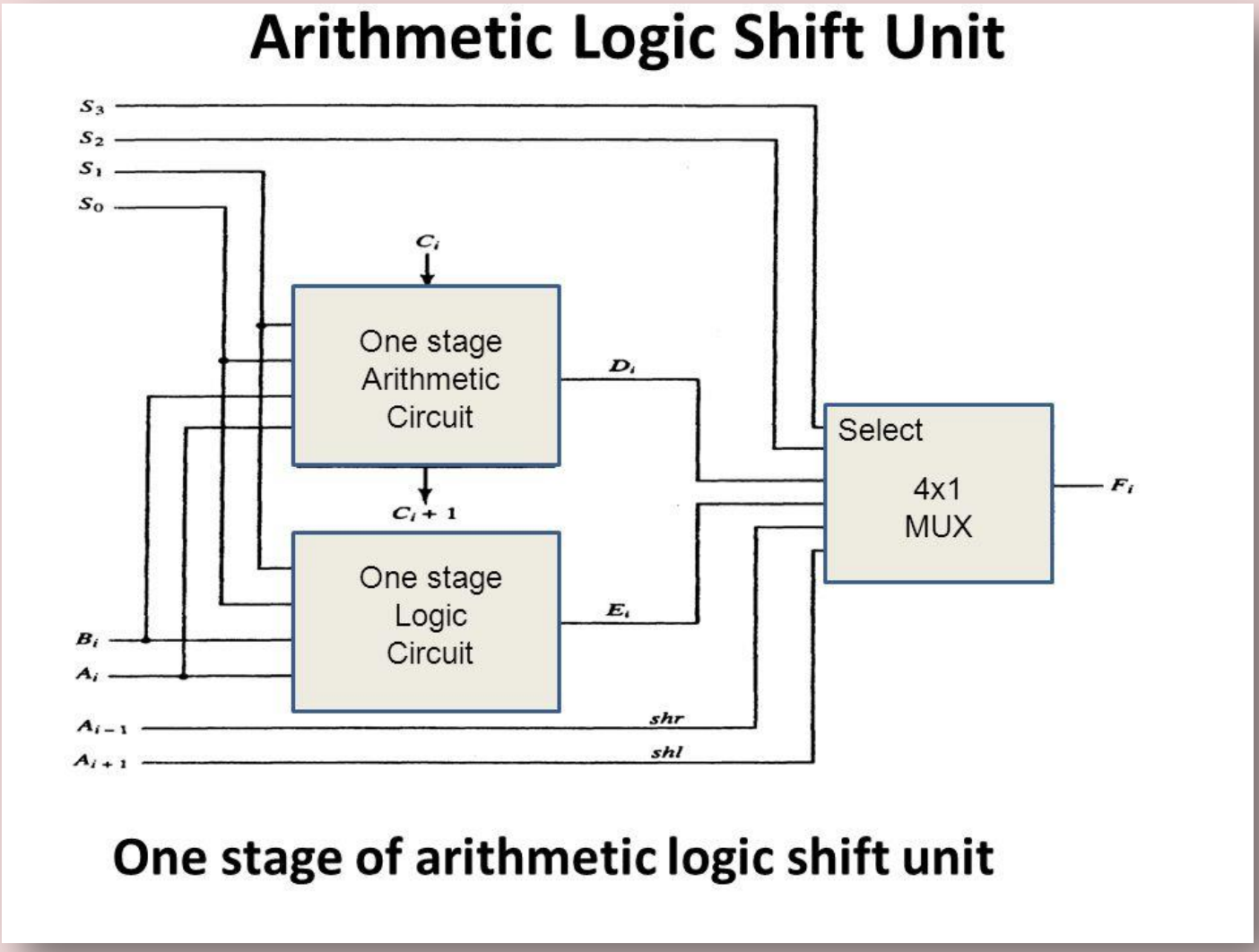
|: ARITHMETIC & LOGIC SHIFT UNIT :|

An arithmetic logic unit (ALU) is a digital circuit used to perform arithmetic, logic and shift operations. It represents the fundamental building block of the central processing unit (CPU) of a computer. Modern CPUs contain very powerful and complex ALUs. In addition to ALUs, modern CPUs contain a control unit (CU).

- **Block Diagram of ALS Unit**

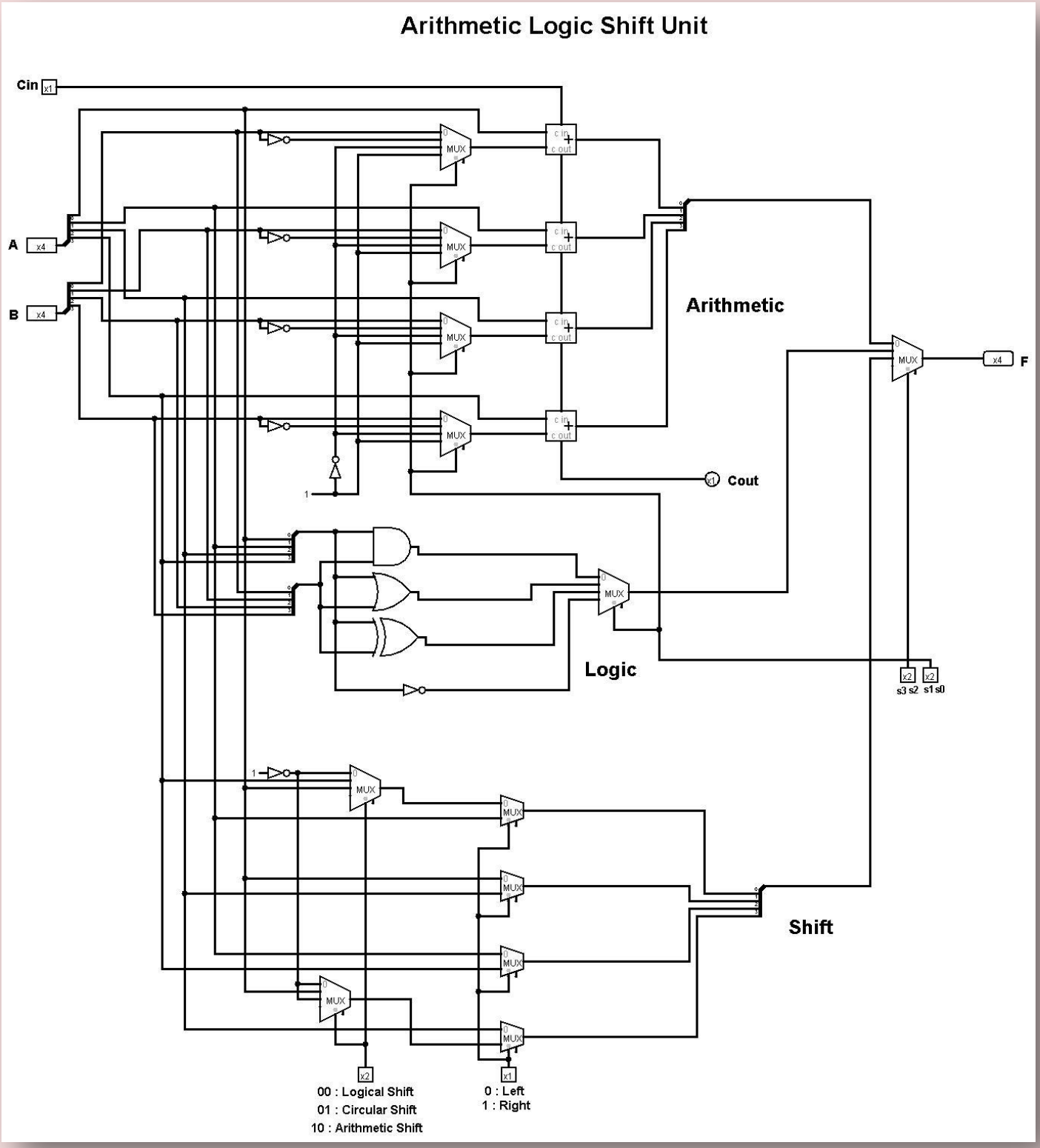


One stage of arithmetic logic shift unit

Reference Table that Shows the all the input/output of my circuit

S3	S2	S1	S0	cin	X2	X1	OPERATION
0	0	0	0	0	-	-	F=A+B
0	0	0	0	1	-	-	F=A+B+1
0	0	0	1	0	-	-	F=A+B’
0	0	0	1	1	-	-	F=A+B’+1
0	0	1	0	0	-	-	F=A
0	0	1	0	1	-	-	F=A+1
0	0	1	1	0	-	-	F=A-1
0	0	1	1	1	-	-	F=A
0	1	0	0	-	-	-	F=A&B
0	1	0	1	-	-	-	F=A|B
0	1	1	0	-	-	-	F=A^B
0	1	1	1	-	-	-	F=A’
1	0	-	-	-	00	0	F=SHL A
1	0	-	-	-	00	1	F=SHR A
1	0	-	-	-	01	0	F=CIL A
1	0	-	-	-	01	1	F=CIR A
1	0	-	-	-	10	0	F=ASHL A
1	0	-	-	-	10	1	F=ASHR A

- **FULL CIRCUIT IMPLEMENTATION IN LOGISIM**

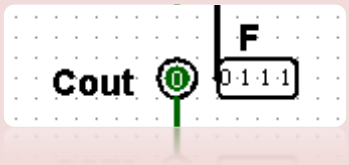


Sample Test Cases

1. Test Cases For Arithmetic Operation:

A=0011 B=0011

S3=0	S2=0	S1=0	S0=0	Cin=1	F=a+b+1=0111



A=0011 B=0011

S3=0	S2=0	S1=0	S0=1	Cin=1	F=a+b'+1=0000 Cout=1

A=0011 B=0011

S3=0	S2=0	S1=1	S0=1	Cin=0	F=a-1=0010

2. Test Cases for Logical Operation

A=0011 B=0011

S3=0	S2=1	S1=0	S0=0	F=A&B=0011

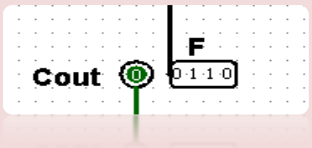
A=0011 B=0011

S3=0	S2=1	S1=1	S0=0	F=A^B=0000

3. Test Cases for Shift Operation

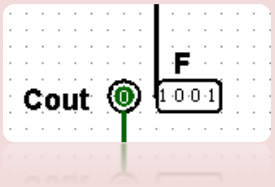
A=0011

S3=1	S2=0	X2=00	X1=0	F= SHL A=0110



A=0011

S3=1	S2=0	X2=01	X1=1	F= CIR A=1001



A=0011

S3=1	S2=0	X2=10	X1=1	F= ASHR A=0001