A FAULT-TOLERANT RISC MICROPROCESSOR
FOR SPACECRAFT APPLICATIONS

CONSTANTIN TIMOC

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163691

54-60

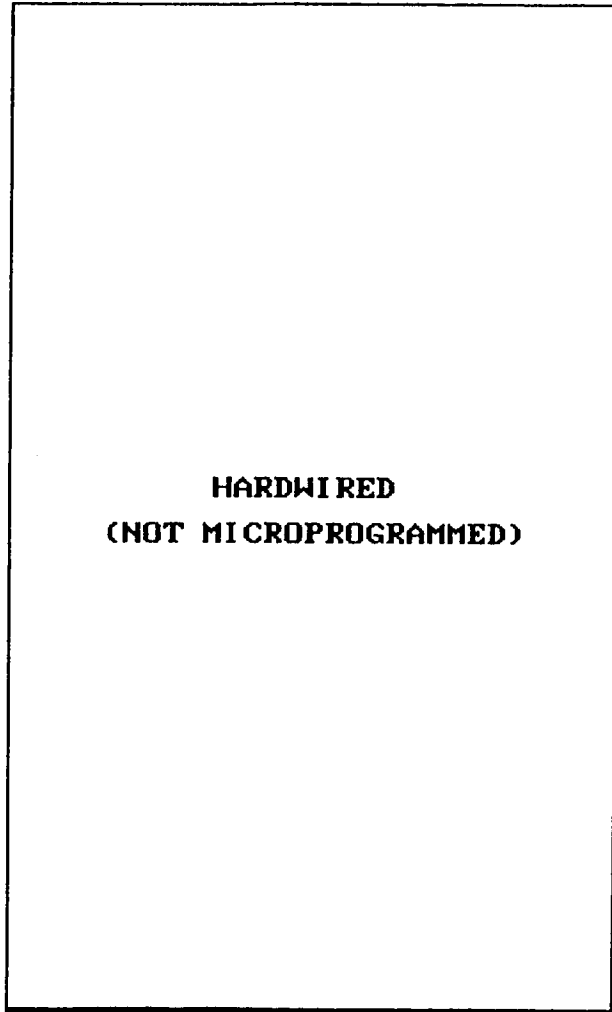# REDUCED INSTRUCTION SET COMPUTER

CONTROL UNIT

DATA AND ADDRESS UNIT

ADDRESS ADDER
PC INCREMENTER/MUX
GENERAL REGISTERS (32 x 32)
ALU
SHIFTER
MULTIPLIER/DIVIDER

HARDWIRED
(NOT MICROPROGRAMMED)

INTERRUPT UNIT

INTERRUPT REGISTERS
PRIORITY INTERRUPT LOGIC
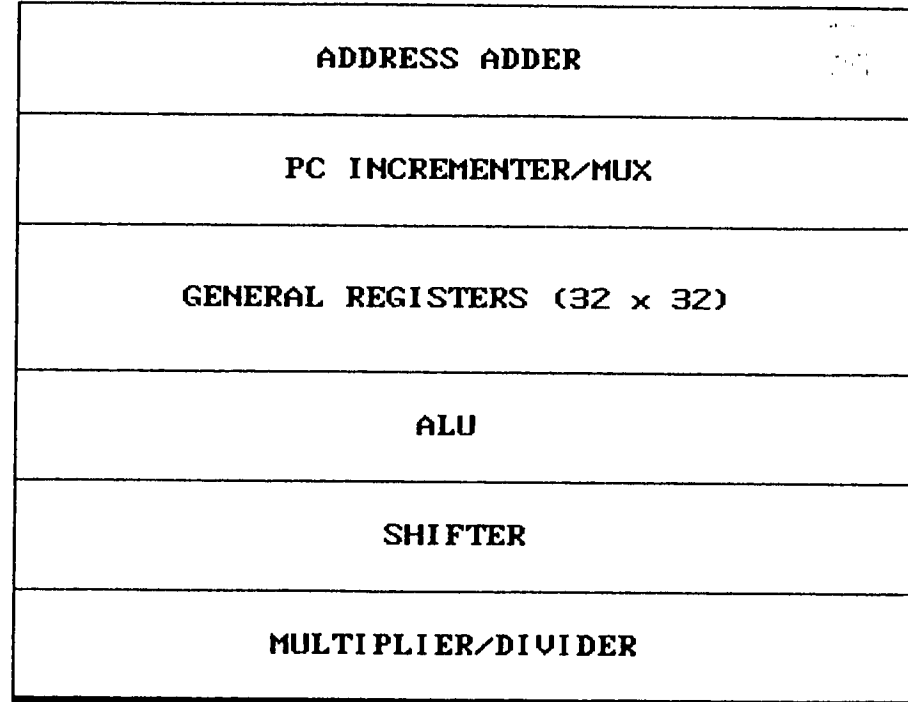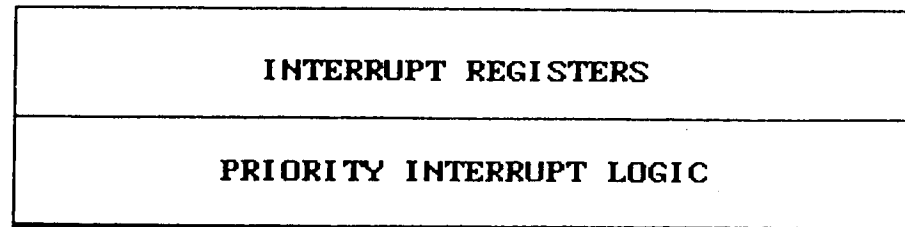
FAULT TOLERANT REGISTERS

GENERAL REGISTERS (32 x 32)	CHECK BITS

DOUBLE-RAIL

ERROR DETECTION AND CORRECTION LOGIC

FAULT TOLERANT ALU

FAULT TOLERANT ALU

DATA A   DATA B

⚡ DOUBLE-RAIL   ⚡ DOUBLE-RAIL

32-BIT ALU   32-BIT ALU

ERROR CORRECTOR

⚡ DOUBLE-RAIL

SUM

106

DOUBLE RAIL CMOS LOGIC

F = X0.X1

$\overline{F} = \overline{X0.X1}$

X0

$\overline{X0}$

X1

$\overline{X1}$

CLK

107
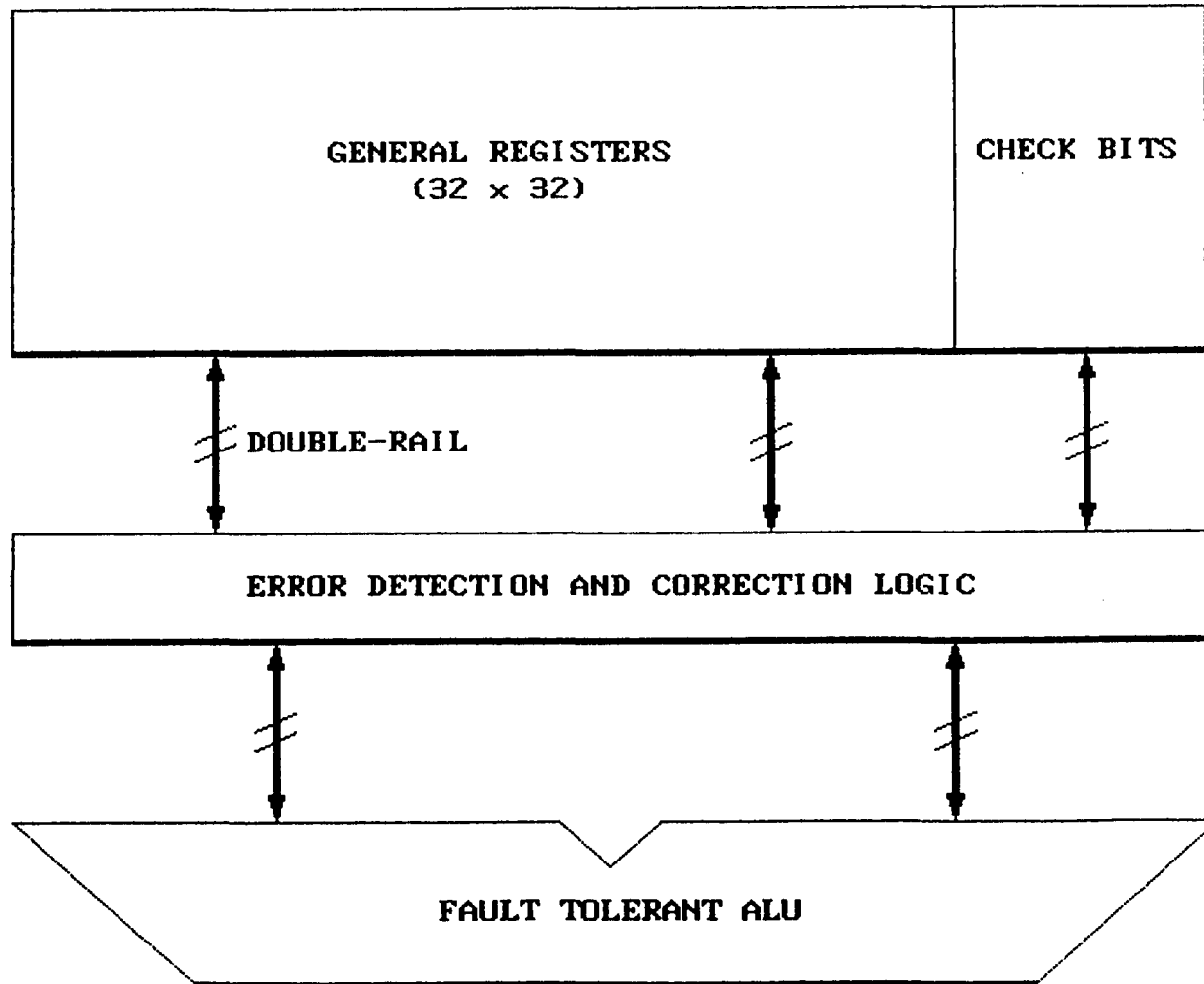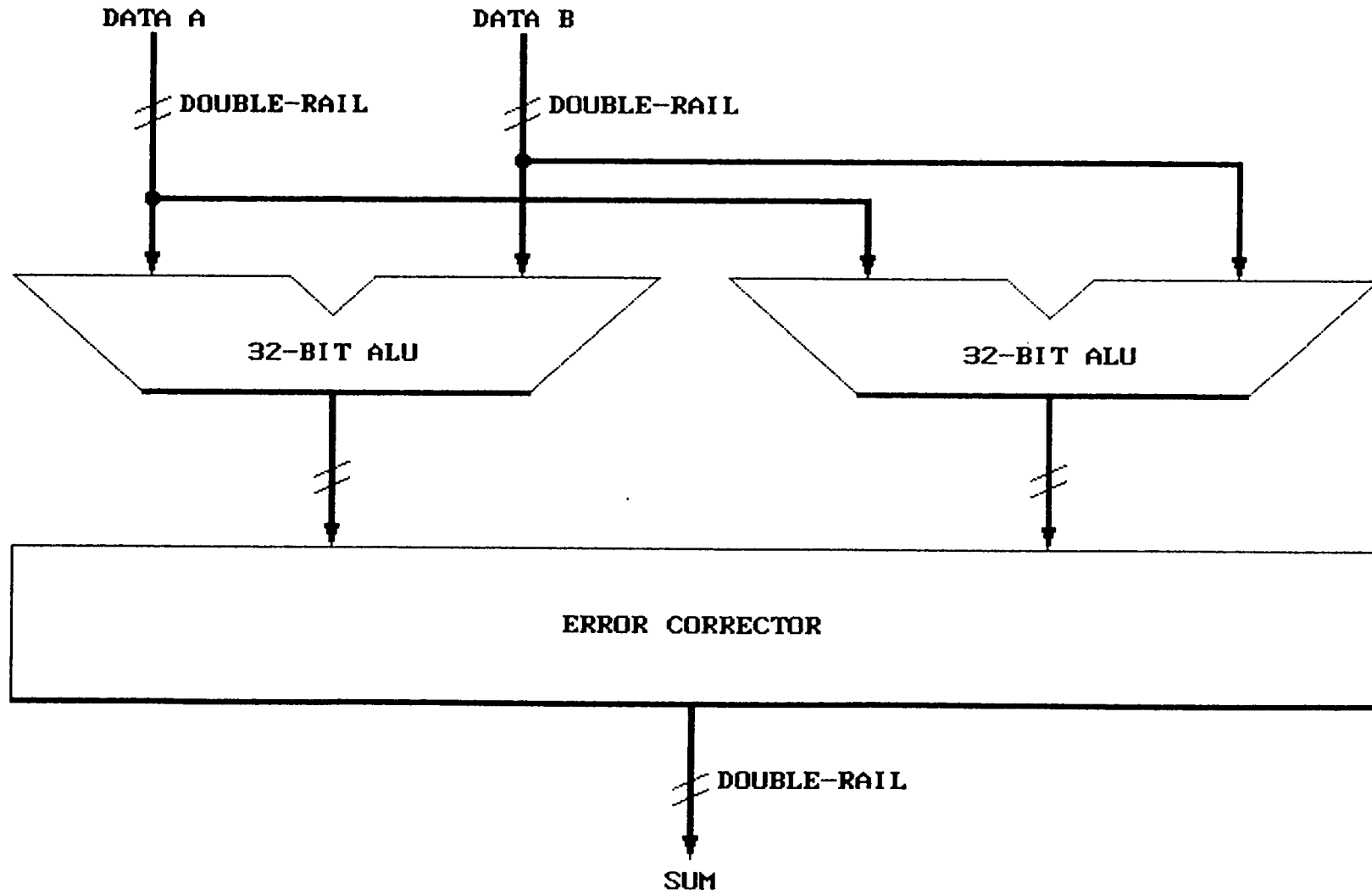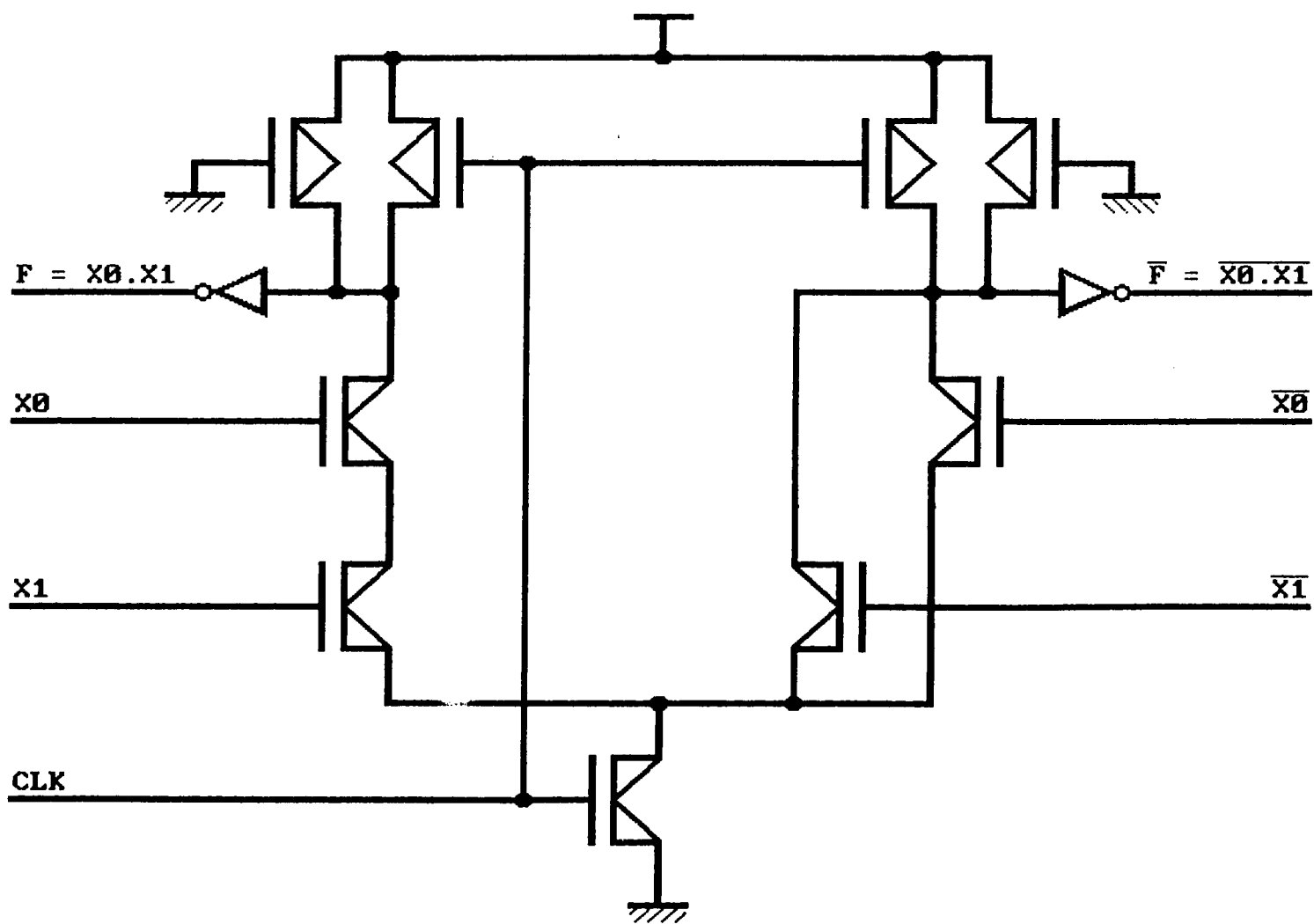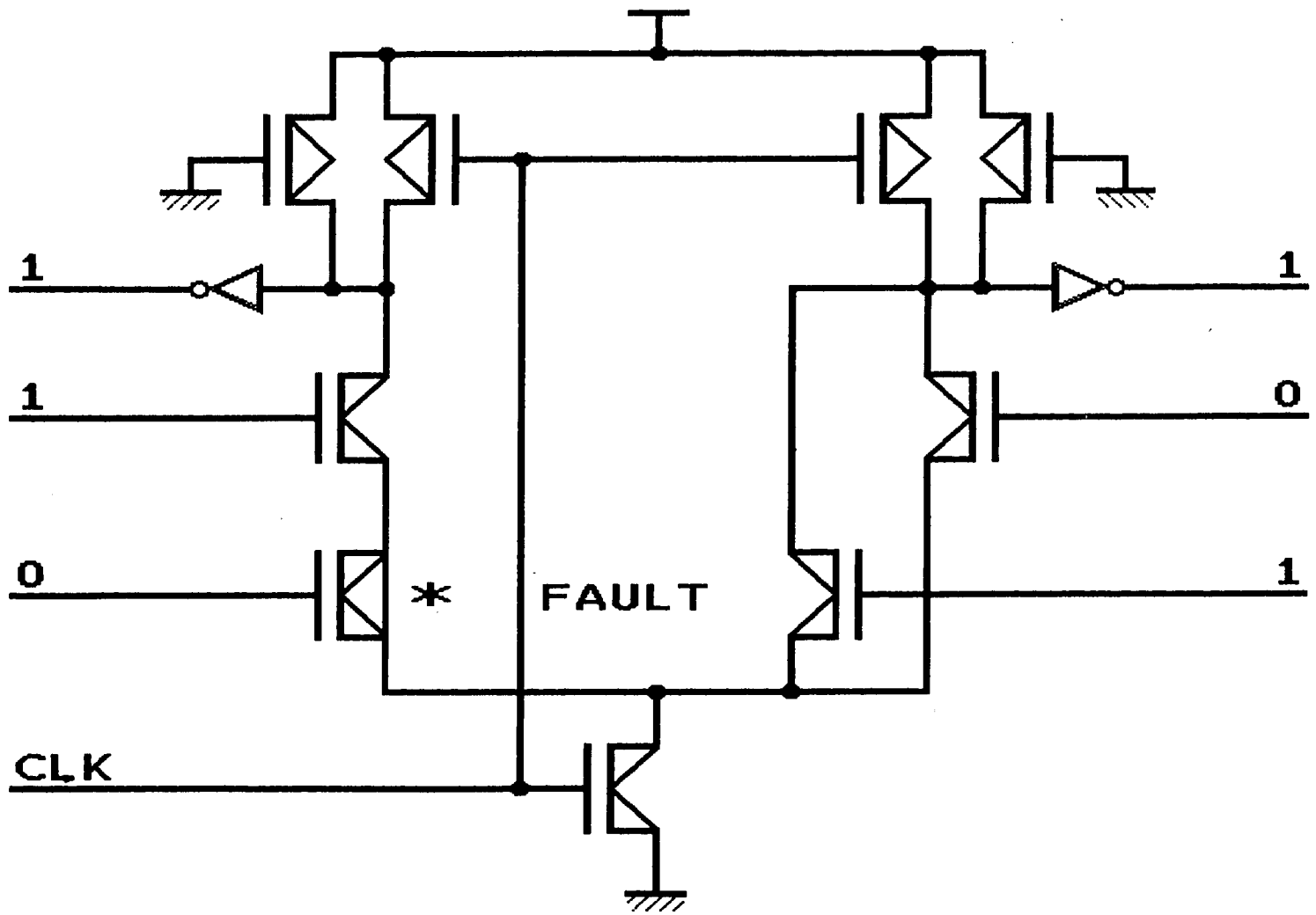
DOUBLE RAIL CMOS LOGIC
(GOOD CIRCUIT)
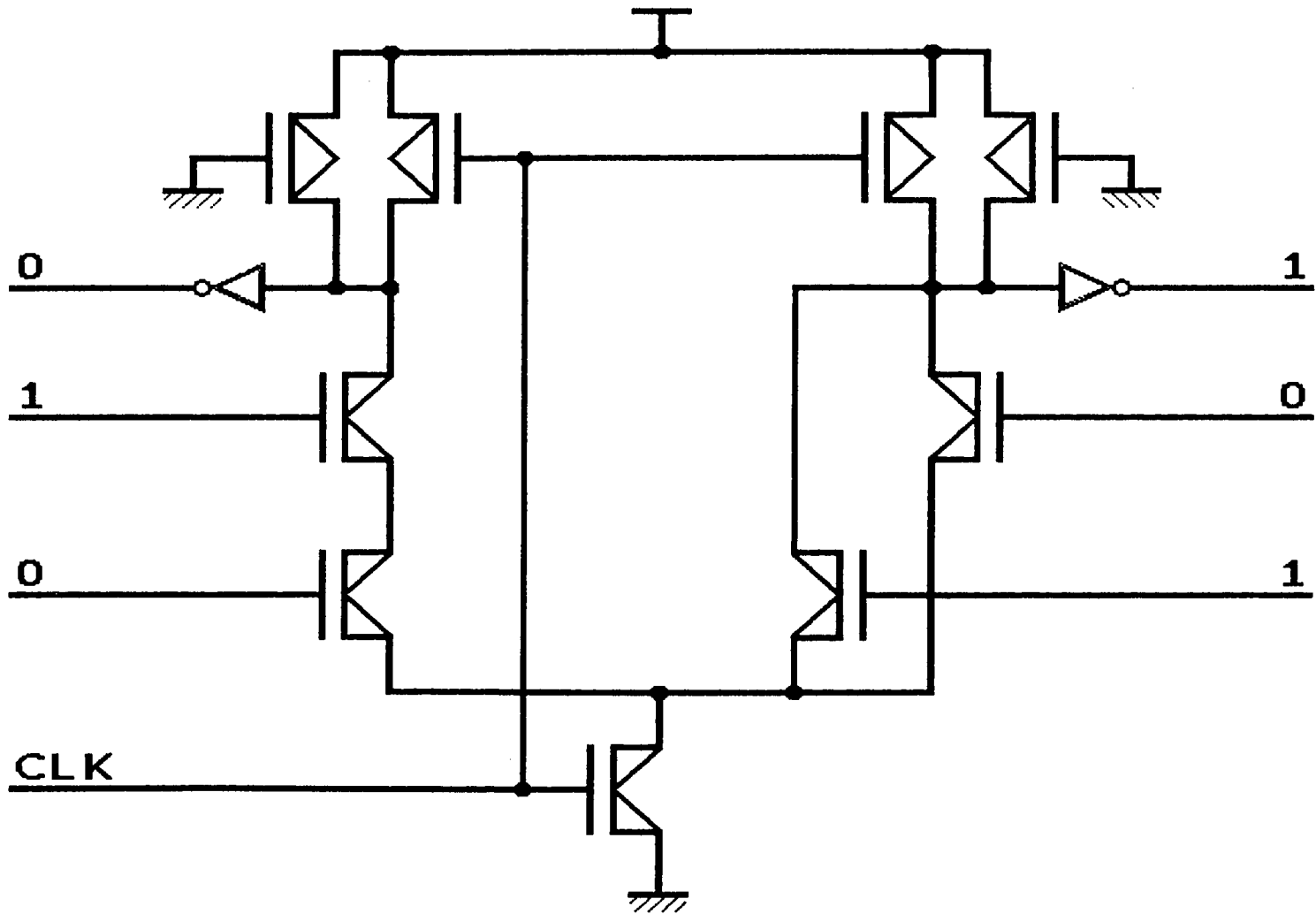
DOUBLE RAIL CMOS LOGIC
(TRANSISTOR STUCK-ON)

DOUBLE RAIL CMOS LOGIC
(TRANSISTOR STUCK-OFF)