NEPTUNE
DC Circuit Breaker
ATP Transient
Analysis
SCHEMATIC OF BREAKER CIRCUIT
STAGE 1
STAGE 2
STAGE 3
STAGE 4
STAGES

- Design of logic circuit
- Design of power circuit
- Integration of logic circuit with the power circuit
**SEQUENCE OF OPERATION**

A & B are control parameters  
S1 through S4 are the switch status

<table>
<thead>
<tr>
<th>STAGE</th>
<th>A</th>
<th>B</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>Normal Operation</td>
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<tr>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Start of BREAK Operation</td>
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<tr>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>DELAY</td>
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<tr>
<td>4</td>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>Discharge of Capacitor</td>
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<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>DELAY</td>
</tr>
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<td>6</td>
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<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Soft closing through R1</td>
</tr>
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</table>
SEQUENCE OF OPERATION

It is a 2-input system

Input A : Gives indication of Fault.
  \[ A = 0 \] ..... Normal operation.
  \[ A = 1 \] ..... Break operation.

Input B : Gives indication that capacitor is fully charged when B changes from 0 to 1.
TIMING DIAGRAM...
LOGIC CIRCUIT

- The purpose of the logic circuit is to operate the switches of the breaker circuit at appropriate instants of time.

- On indication of fault current, the logic circuit is activated and operates the switches of the breaker circuit over the entire sequence of break and make.
LOGIC CIRCUIT

-ve transition of A OR +ve transition of B

MONOSTA -BLE
1 SHOT
TRANSIENT ANALYSIS…

- Task is “Develop necessary Transient Models and perform the Analysis”.
- Under certain circumstances such as short circuit, transients will occur in the system.
- This and other scenario need to be modeled so as to perfect the system design, and to be able to predict the effects of faults.
Alternate Transient Program...
WHAT IS ATP?

- ATP is a universal program system for digital simulation of transient phenomena of electromagnetic as well as electromechanical nature.
- With this digital program, complex networks and control systems of arbitrary structure can be simulated. ATP has extensive modeling capabilities and additional important features besides the computation of transients.
Operating Principles of ATP...

- Basically, trapezoidal rule of integration is used to solve the differential equations of system components in the time domain.
- Non-zero initial conditions can be determined either automatically by a steady-state, phasor solution or they can be entered by the user for simpler components.
- Symmetric or unsymmetric disturbances are allowed, such as faults, lightning surges, any kind of switching operations including commutation of valves.