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1. Communicate the relay:

First of all connect the relay to PC through RS232 cable

Double click on Micom S1 studio icon on desktop, following screen will come

Accept the agreement and click on OK
Welcome to MiCOM S1 Studio.

MiCOM S1 Studio enables you to manage the MiCOM devices on your system. The program allows you to build a list of devices and organize them in the same manner as they physically exist in a system. Settings parameters can be created for each device and uploaded.

MiCOM S1 Studio suits both users seeking basic functionality as well as advanced users requiring a broad range of options.

Features include:
- Sending settings to a device
- Extracting settings from a device
- Event and fault record management and analysis
- Real-time measurement visualisation

Click on new system

Write project name and press ok

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Prepared By: Engr. Nazir Hussain, Testing Engr SEP (AL GIHAZ)
Click on front port

Write relay name or project identification

Then press finish

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right click on setting to extract the setting from the relay
2. Settings:

Welcome to MiCOM S1 Studio.

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Learn more...

go to configuration to enable the function
enable the AR function by double click

go to group 1
then go to AR setting

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now save the settings by click on save

now for psl mapping double click on psl 000

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3. PSL Mapping:

- To give the breaker status, click on output signal and put the psl in front of input L1.
- Select DDB 424 for CB status and press ok.

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to connect DDB424 to input L1 click on link
then click on L1
now connect the link to DDB424 by clicking here

Initiate Breaker Fail. and Autoreclose (if enabled)

Similarly for AR external initiation take output signal and select external trip 3 ph(DDB 534) and connect any opto input e.g L9

External Trips: Initiate Breaker Fail. and Autoreclose (if enabled)
for AR close command select auto close (DDB 854) by click on input signal

then connect these by click on link

to activate relay output select output R1 by click on contact conditioner

map LEDs for indication

select the signal what we want to see in LEDs by click on input signal eg AR 3p in progress

for LEDs click on LED conditioner

now connect it by link
now save the changes by click on save

to send the settings to the relay right click on device and click on send

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select the settings file and click on send
4. **Injection Through Freja 300:**

According to the setting done in relay we have to make sequence in Freja General page

For example our settings in relay are as follows:

- Dead time for 1\textsuperscript{st} shot $t_{D1} = 300$ ms
- Dead time for 2\textsuperscript{nd} shot $t_{D2} = 3$ sec
- Dead time for 3\textsuperscript{rd} shot $t_{D3} = 3$ sec
- Dead time for 4\textsuperscript{th} shot $t_{D4} = 3$ sec
- Reclaim time = 180 sec

First of all, we would activate two binary outputs from general configuration page of Freja Win (software). One for breaker status and another for AR initiation.

Here for breaker status we have taken 52B auxiliary contact i.e. when binary output is open it will show breaker closed and when BO is closed then it will show breaker open.

In first stage we should give breaker closed (BO1 open) status without initiation (BO2 open) for more than 5 secs.

In second stage breaker closed (BO1 open) and AR initiation (BO2 closed) for 20 or 30 ms.

In third stage breaker open (BO1 closed) and BO2 open for the time as long as $t_{D1}$ setting time.

After expiring the dead time 1, in fourth stage breaker closed (BO1 open) and BO2 open

For complete four shots set the steps according to the settings.
We can easily understand the step setting by freja Win page:

Double click on Freja Win icon to open the freja software the following screen will appear.

![Freja Win Software Interface]

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select BI 1 for taking close command

select BO 1 for breaker status

select BO 2 for AR initiation

then go to sequence page

click here to make sequence for binary outputs

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make sequence as per settings here for four shots sequence have been made

After making sequence click on close

select here 5 stages for 4 shots

give time as per BO status and stages

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5. Dead Times Test:

- For the dead time of first shot $t_{D1}$ set the Binary Output list up to 4 no. Number of stage should be two.

In first stage time should be equal to the time for how long breaker is closed i.e. 7050ms in our example.

In second stage time should be more than $t_{D1}$

Now start the test. The trip time will come in second page, this is the dead time for 1 shot ($t_{D1}$)

- Dead time for second shot:
  Set the Binary Output list up to 7 no. Number of stage should be three.
  Keep the timing of stage 1 and stage 2 same
  In third stage time should be more than $t_{D2}$ plus the time the breaker is in closed position after first shot.

Now start the test. Trip time will come in 3rd stage.
Dead time 2 would be trip time in 3rd stage minus the time, breaker is in closed position after 1st shot.

$$t_{D2} = (\text{Trip time in 3rd stage}) - (\text{The time, breaker is in closed state after 1st shot})$$

- Dead time for third shot:
  Set the Binary output list up to 10 no. Number of stage should be four.
Keep the time of stage 1, 2 and 3 same
In 4th stage time should be more than tD3 plus the time the breaker is in closed position after second shot.

Now start the test. Trip time will come in 4th stage
Dead time 3 would be trip time in 4th stage minus the time, breaker is in closed position after 2nd shot.

$tD3 = (\text{Trip time in 4th stage}) - (\text{The time, breaker is in closed state after 2nd shot})$.

- Dead time for fourth shot:

Set the Binary output list up to 13 no. Number of stage should be five.

Keep the time of stage 1, 2, 3 and 4 same
In 5th stage time should be more than tD4 plus the time the breaker is in closed position after third shot.

Now start the test. Trip time will come in 5th stage
Dead time 4 would be trip time in 4th stage minus the time, breaker is in closed position after 3rd shot.

$tD4 = (\text{Trip time in 5th stage}) - (\text{The time, breaker is in closed state after 3rd shot})$.
6. Reclaim time Test:

For reclaim time go to psl setting and select CB succ 3p AR and connect it to any relay output to stop the freja as shown in below pic.

Send the setting to the relay.

- In freja keep the binary output up to 13 no
  Select the six number of stages
  Keep all five stages unchanged in above testing.
  Time of sixth stage should be more than reclaim time setting
First connect relay output 1 (which has assigned for AR close command) to the binary input 1 of the freja as already connected in previous dead time test. Also take relay output 3 (which has assigned for AR successful close) and keep out of the freja.

Now start the test, when test will come in 6th stage remove relay output 1 from binary input 1 of the freja and connect relay output 3 to binary input 1 of the freja. After expiring of reclaim time AR successful close will come and freja will stop. Time in 6th page would be the reclaim time.

Thank you