TT191201-FUP-Sequencing Module for 4 Devices (Simple)

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	It is not part of the official documentation of DEOS AG and does not claim to be complete.
	The article is intended to support the solution of a similar problem.
	If you have any questions, comments or additions, please contact DEOS AG Support.
Title	FUP - Sequencing Module for 4 Devices (Simple) (TT191201)
Object	FUP
Reference version	2
Date	12.2019
Author	EK
Goal	To perform sequencing control of up to 4 equipment (e.g. chillers)

Content:
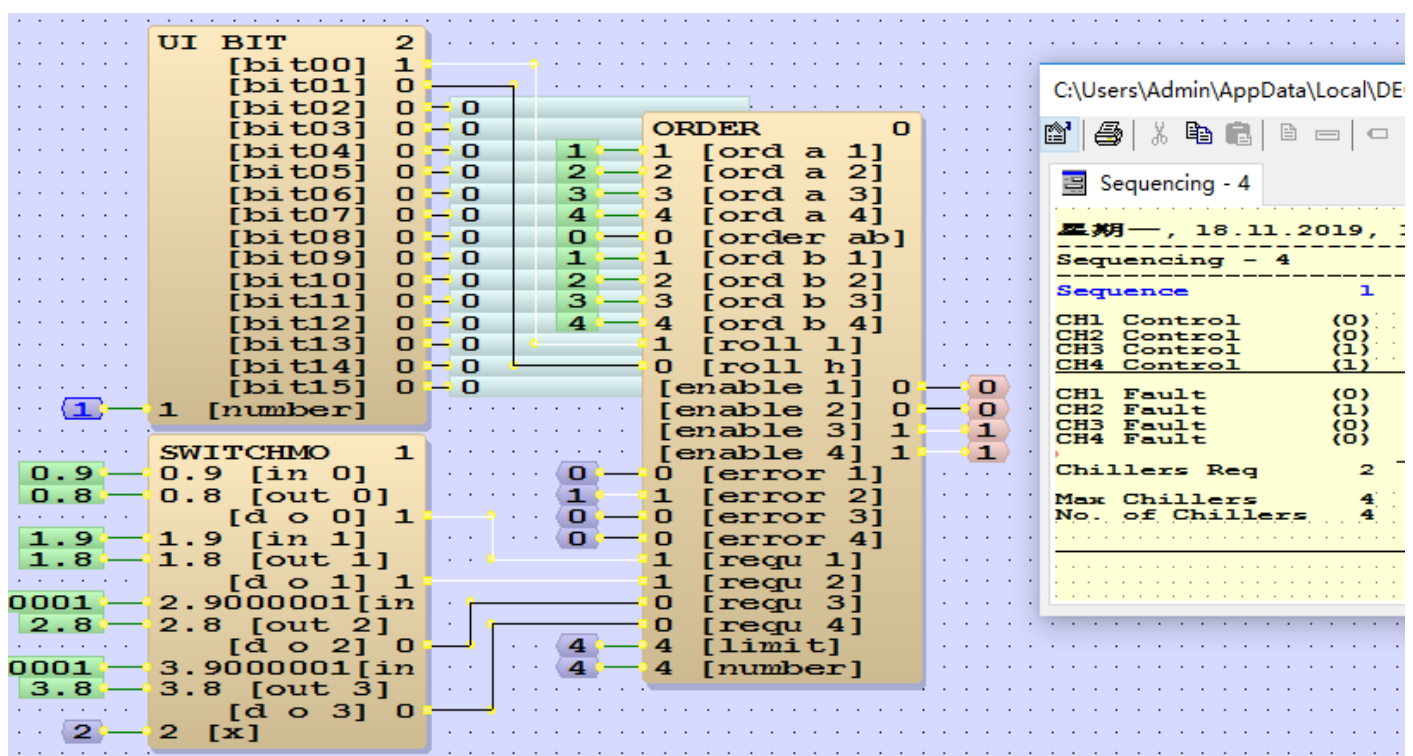
TT191201-FUP-Sequencing Module for 4 Devices (Simple)

1. To perform sequencing control of 4 equipment (e.g. chillers), we can simply use the "ORDER" module in FUP, which provide a simple switching of chillers based on different criteria
2. First create a new FUP page call "seq4.f" and add the below logic. I03 is max. chiller can run, I06 is total no. of chillers, I04 is sequence no. and I05 is no. of chillers required
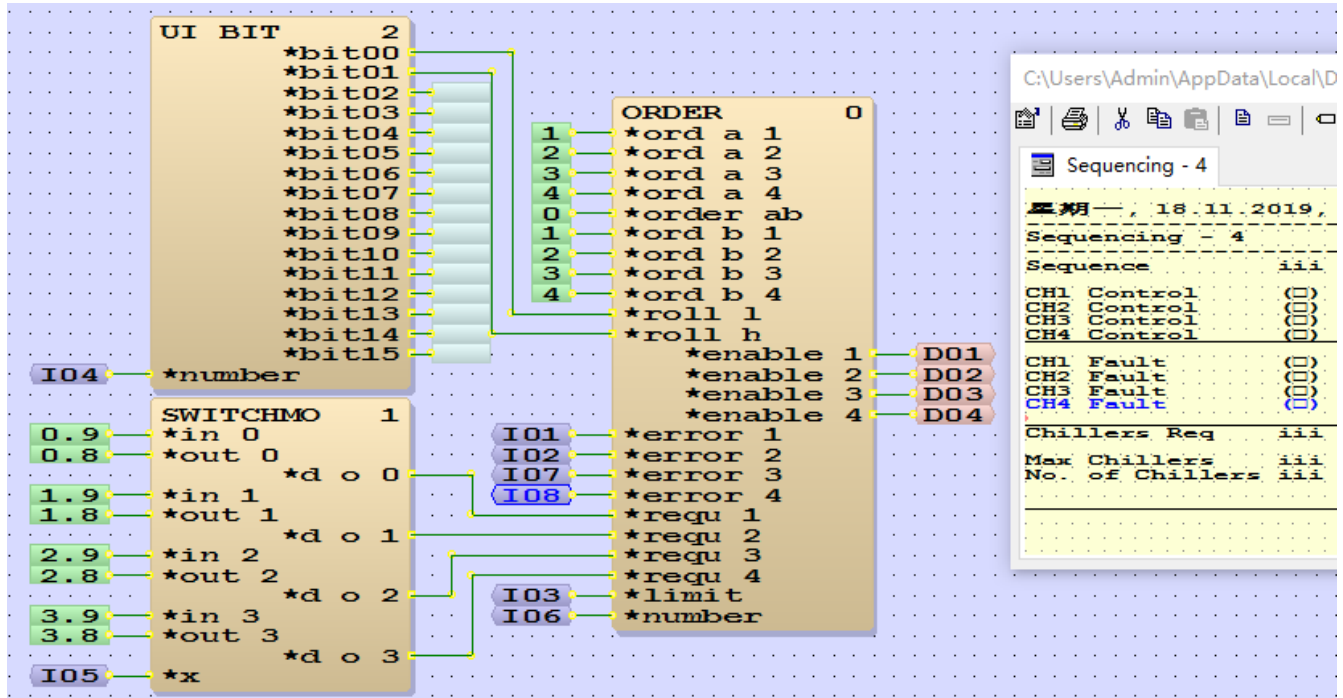
3. This program control up to 4 chillers in sequence. You can try it by simulation
    a. Set I03, I06 to 4, I04 to 0 and I05 to 1, then Chiller 1 will turn on
    b. If more chiller is required, then set I05 to 2, and Chiller 2 will turn on
    c. If Chiller 2 is fault, then it will turn off, and Chiller 3 will turn on
    d. If you want to change sequence, set I04 to 1, and Chiller 1 will turn off, and Chiller 4 will turn on
    e. If Chiller 2 fault is clear, then Chiller 3 will turn off, and Chiller 2 turn on again
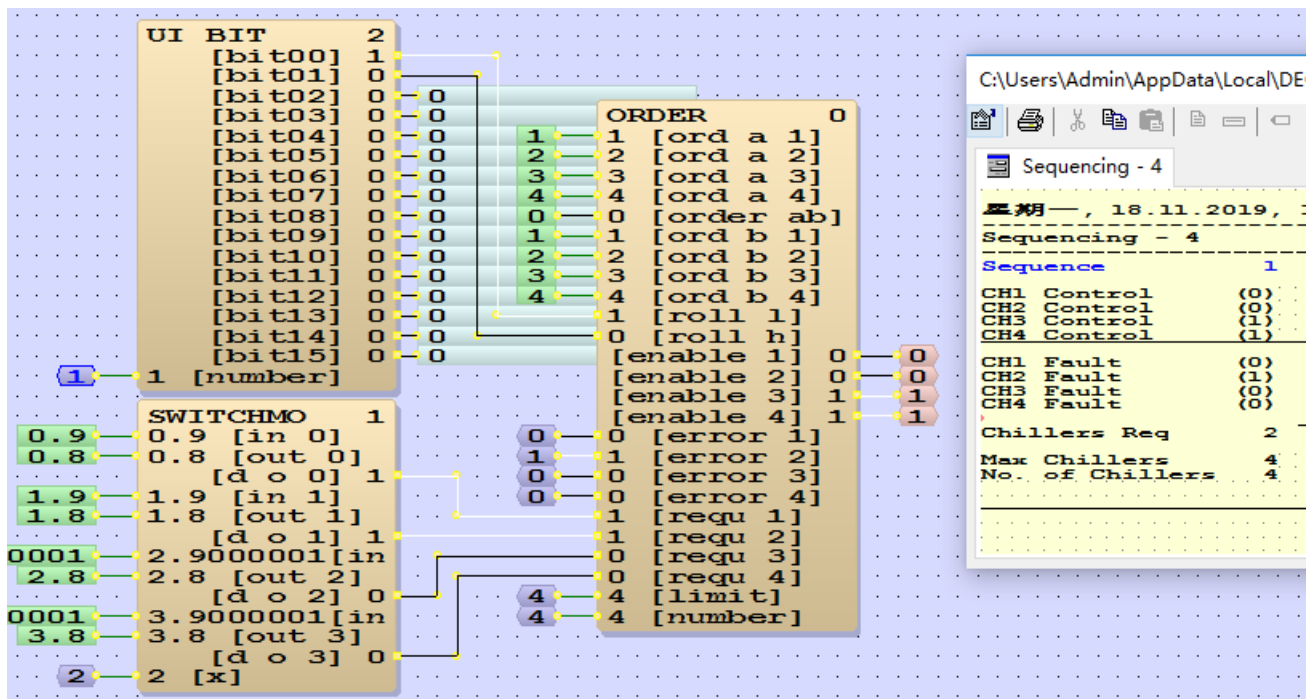
4. You can find the help text of the module for detail explanation of the functions
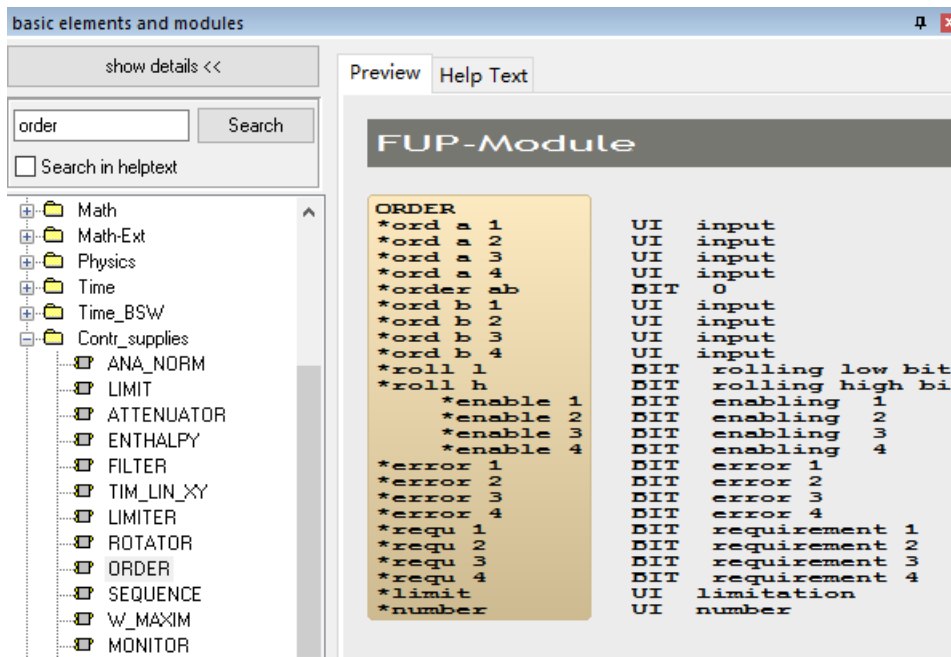
5. The order of the chiller sequencing is set like this. In this example, if sequence is 0, then the order is 1-2-3-4. If sequence is 1, then the order is 2-3-4-1, etc. You can change the order as you like, for example, using time schedule
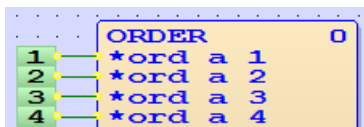
6. The "SWITCHMO" module is used to convert the chiller requirement (from 0-4) to 4 digital outputs. For example, if I05 is 2, then "requ_1" and "requ_2" will become 1, i.e. to turn on 2 chillers. Set it to 0 to turn off all chillers
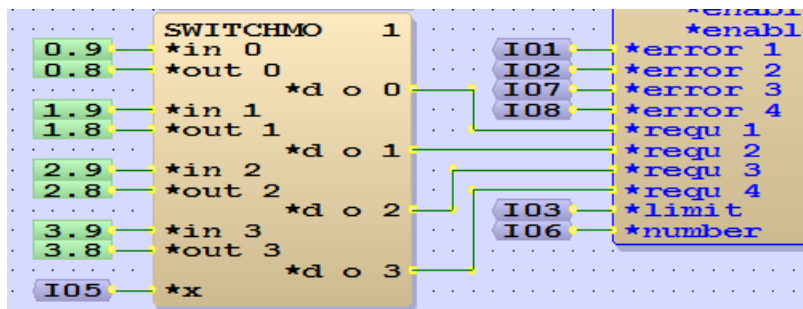
7. The "number" input is to set the number of chillers in the plant. If you only have 3 chillers, set it to 3 and then the order will become 1-2-3-0 automatically. D04 will always be 0
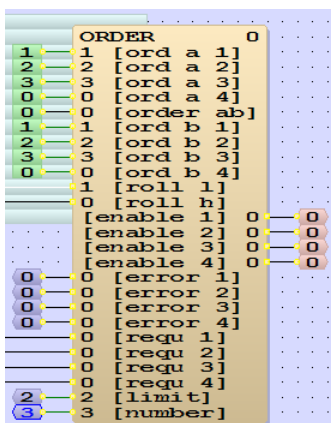
8. The "limit" input is the set the maximum number of chillers to turn on. If you set it to 2, then only 2 chillers can be turn on, the 3rd chiller is only for standby (e.g. when one chiller is fault)

```
UI BIT        2                                              C:\Users\Admin\AppData\Local\D
    [bit00]   0                      ORDER          0
    [bit01]   0                                                Sequencing - 4
    [bit02]   0 - 0
    [bit03]   0 - 0             1 - 1 [ord a 1]              星期二, 19.11.2019,
    [bit04]   0 - 0             2 - 2 [ord a 2]              Sequencing - 4
    [bit05]   0 - 0             3 - 3 [ord a 3]
    [bit06]   0 - 0             0 - 0 [ord a 4]              Sequence          0
    [bit07]   0 - 0             0 - 0 [order ab]
    [bit08]   0 - 0             1 - 1 [ord b 1]              CH1 Control      (0)
    [bit09]   0 - 0             2 - 2 [ord b 2]              CH2 Control      (1)
    [bit10]   0 - 0             3 - 3 [ord b 3]              CH3 Control      (1)
    [bit11]   0 - 0             0 - 0 [ord b 4]              CH4 Control      (0)
    [bit12]   0 - 0             0   [roll l]
    [bit13]   0 - 0             0   [roll h]                 CH1 Fault        (1)
    [bit14]   0 - 0                 [enable 1] 0 - 0         CH2 Fault        (0)
    [bit15]   0 - 0                 [enable 2] 1 - 1         CH3 Fault        (0)
 0 - 0 [number]                     [enable 3] 1 - 1         CH4 Fault        (0)
                                    [enable 4] 0 - 0
 SWITCHMO      1            (1) - 1 [error 1]                Chillers Req       3
0.9 - 0.9 [in 0]            0 - 0 [error 2]                  Max Chillers       2
0.8 - 0.8 [out 0]          0 - 0 [error 3]                   No. of Chillers    3
       [d o 0] 1            0 - 0 [error 4]
1.9 - 1.9 [in 1]                 1 [requ 1]
1.8 - 1.8 [out 1]                1 [requ 2]
       [d o 1] 1                 1 [requ 3]
0001 - 2.9000001[in              0 [requ 4]
2.8 - 2.8 [out 2]          2 - 2 [limit]
       [d o 2] 1           3 - 3 [number]
0001 - 3.9000001[in
3.8 - 3.8 [out 3]
       [d o 3] 0
 3 - 3 [x]
```
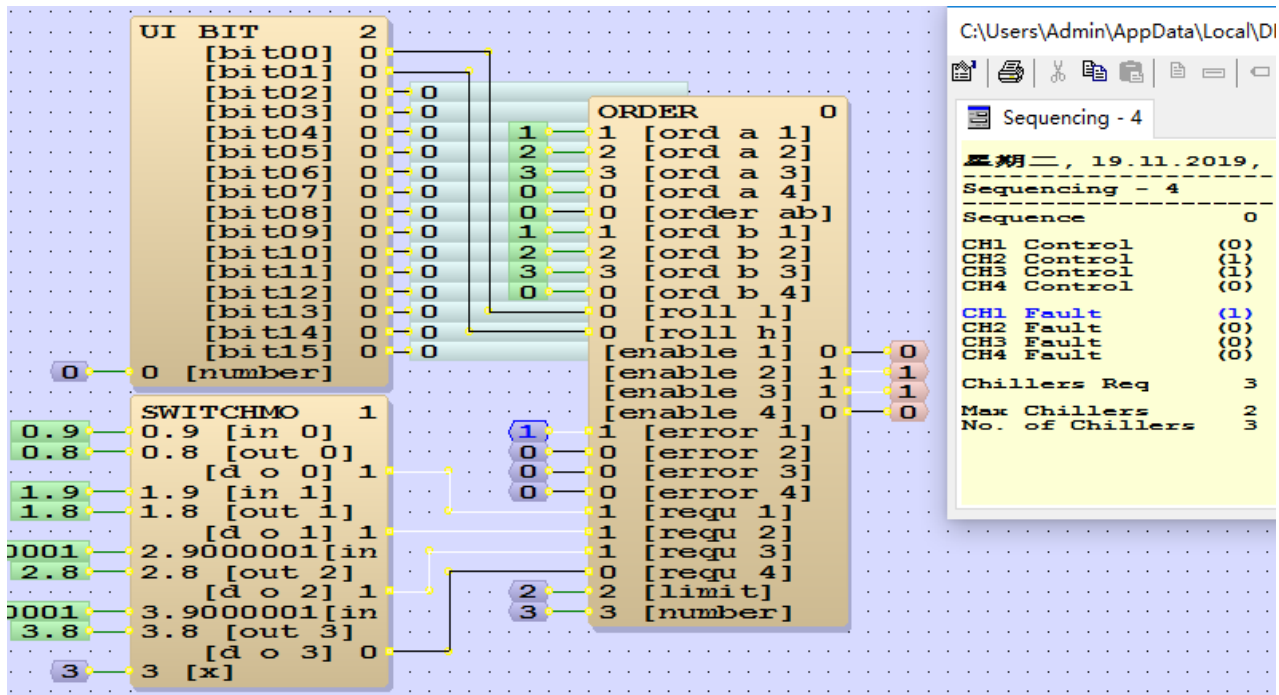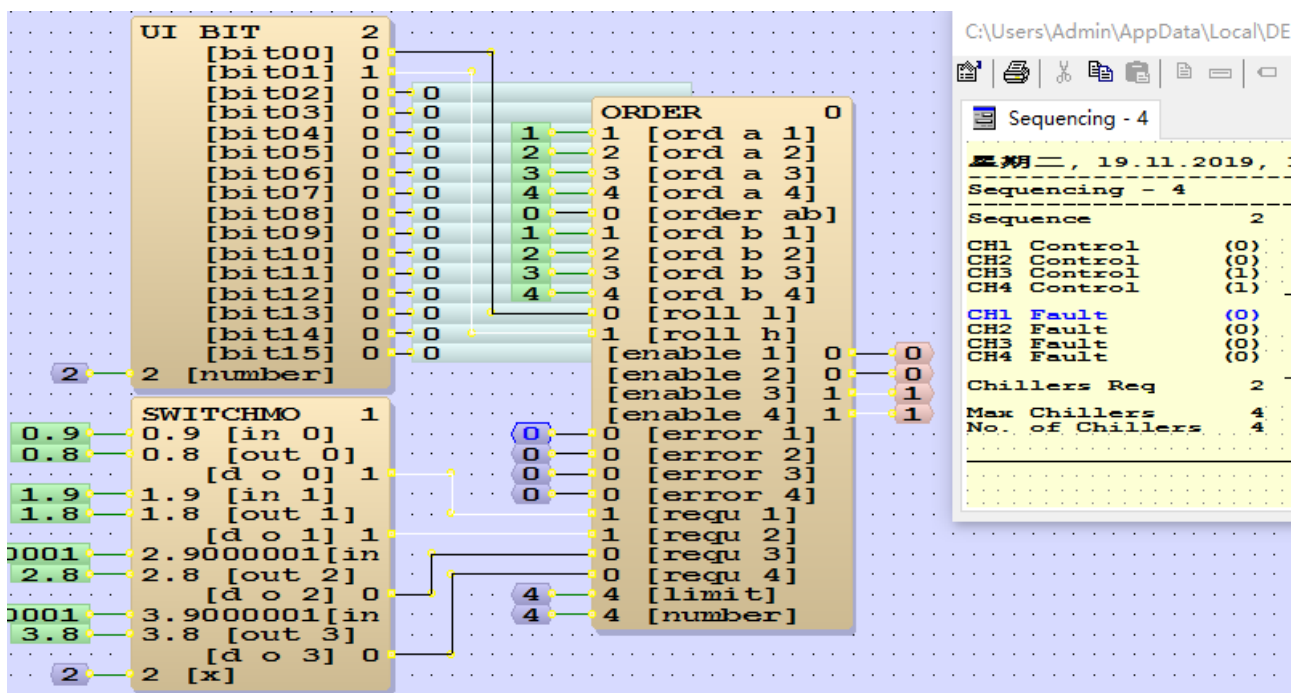
9. In the below example, the sequence is 2 (3-4-1-2), and therefore chiller 3 and 4 is turn on when the chiller requirement is 2

```
UI BIT        2                                              C:\Users\Admin\AppData\Local\DE
    [bit00]   0                      ORDER          0
    [bit01]   1                                                Sequencing - 4
    [bit02]   0 - 0
    [bit03]   0 - 0             1 - 1 [ord a 1]              星期二, 19.11.2019,
    [bit04]   0 - 0             2 - 2 [ord a 2]              Sequencing - 4
    [bit05]   0 - 0             3 - 3 [ord a 3]
    [bit06]   0 - 0             4 - 4 [ord a 4]              Sequence          2
    [bit07]   0 - 0             0 - 0 [order ab]
    [bit08]   0 - 0             1 - 1 [ord b 1]              CH1 Control      (0)
    [bit09]   0 - 0             2 - 2 [ord b 2]              CH2 Control      (0)
    [bit10]   0 - 0             3 - 3 [ord b 3]              CH3 Control      (1)
    [bit11]   0 - 0             4 - 4 [ord b 4]              CH4 Control      (1)
    [bit12]   0 - 0             0   [roll l]
    [bit13]   0 - 0             1   [roll h]                 CH1 Fault        (0)
    [bit14]   0 - 0                 [enable 1] 0 - 0         CH2 Fault        (0)
    [bit15]   0 - 0                 [enable 2] 0 - 0         CH3 Fault        (0)
 2 - 2 [number]                     [enable 3] 1 - 1         CH4 Fault        (0)
                                    [enable 4] 1 - 1
 SWITCHMO      1           (0) - 0 [error 1]                 Chillers Req       2
0.9 - 0.9 [in 0]           0 - 0 [error 2]                   Max Chillers       4
0.8 - 0.8 [out 0]          0 - 0 [error 3]                   No. of Chillers    4
       [d o 0] 1           0 - 0 [error 4]
1.9 - 1.9 [in 1]                 1 [requ 1]
1.8 - 1.8 [out 1]                1 [requ 2]
       [d o 1] 1                 0 [requ 3]
0001 - 2.9000001[in              0 [requ 4]
2.8 - 2.8 [out 2]          4 - 4 [limit]
       [d o 2] 0           4 - 4 [number]
0001 - 3.9000001[in
3.8 - 3.8 [out 3]
       [d o 3] 0
 2 - 2 [x]
```

10. Chiller 1 will turn on when requirement goes up to 3. Chiller 3 will turn off when it is fault, and Chiller 2 turn on automatically

```
Sequence          2          Sequence          2

CH1 Control      (1)         CH1 Control      (1)
CH2 Control      (0)         CH2 Control      (1)
CH3 Control      (1)         CH3 Control      (0)
CH4 Control      (1)         CH4 Control      (1)

CH1 Fault        (0)         CH1 Fault        (0)
CH2 Fault        (0)         CH2 Fault        (0)
CH3 Fault        (0)         CH3 Fault        (1)
CH4 Fault        (0)         CH4 Fault        (0)

Chillers Req       3         Chillers Req       3

Max Chillers       4         Max Chillers       4
No. of Chillers    4         No. of Chillers    4
```