

Scheduled Pumps, On/Off

Example Implementation with Lonix Technologies

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1 Introduction

This document presents an implementation example for scheduled On/Off pumps using Lonix technologies. The controls are done using Lonix Modules, and system design and configuration utilizes the Lonix Project Creation Tool (PCT).

2 Scheduled pumps (on/off) example

This chapter introduces the control diagram and the functional description of scheduled On/Off pumps. This example is quite simple and is meant only to demonstrate the use and configuration of the respective module. Please refer to other example with VFD controlled pumps.

2.1 CONTROL DIAGRAM

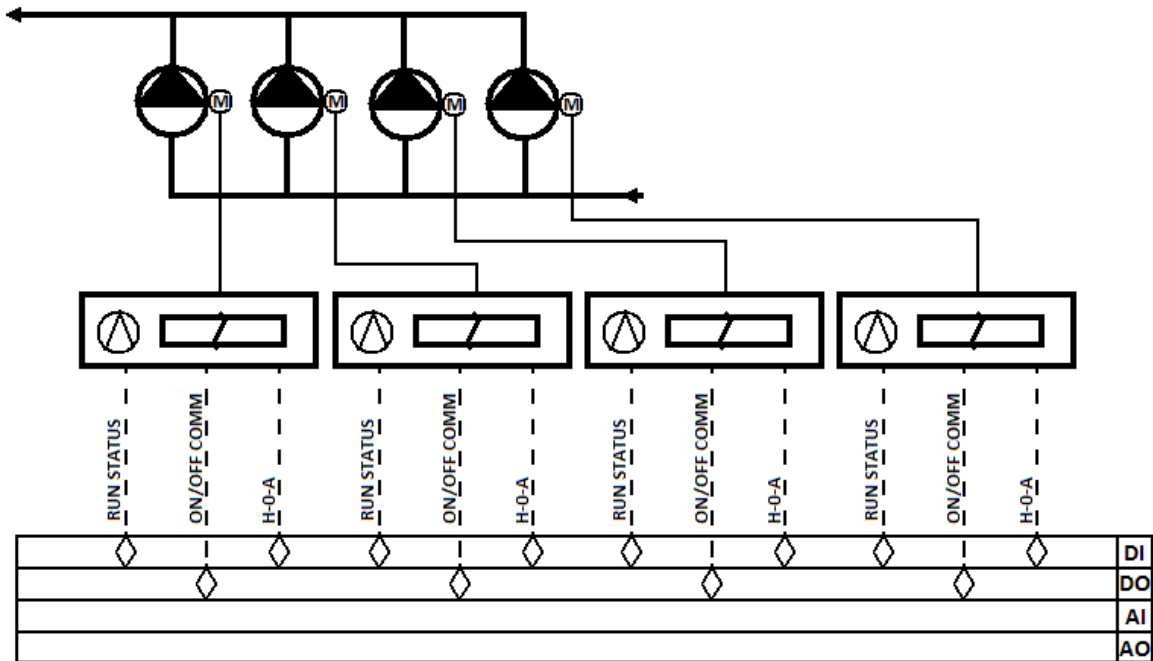


Figure 1. Control diagram of a simple pump set

This example diagram shows four On/Off type pumps. Run status and Hand/OFF/AUTO information is available through the starter panel. The pumps are controlled through relays. The example system consists of four pumps: Two of the pumps should be running at any one time while two others are on reserve. The Lonix Duty Cycle Module (DCM) schedules the pumps so that the cumulative run time of each pump is approximately the same. If a pump fails then it is taken off the duty cycle. In this example the pumps are controlled on an On/Off basis.

2.2 FUNCTIONAL DESCRIPTION

The pump set is responsible for example the circulation of water in a radiator network. To achieve this, only e.g. two pumps need to be running simultaneously. For malfunctions there are two additional pumps, and to balance the run times the two pumps that should be always on are alternated so that the run times of each pump stays approximately the same. The pumps that have

the least amount of running time get the running permission first. For example first pumps 1 and 2 are running, after the desired duty cycle time has passed, these two are stopped, and pumps 3 and 4 start to run. After another duty cycle has passed, pumps 3 and 4 are stopped, and pumps 1 and 2 start to run again, and so on.

If the DCM fails to receive a run status feedback from a pump that should be running, the pump is regarded as broken and it is taken off the duty cycle list. Setting the module's corresponding nviAuto-variable to zero cancels the fault status, and once it is set back to a non-zero value the pump is taken back to the duty cycle. This is achieved easily with the H-0-A switches in the starter panel.

3 Solution with Lonix technologies

This chapter shows an example implementation using Lonix Modules and Lonix PCT. The following figure is a screenshot produced from Lonix PCT.

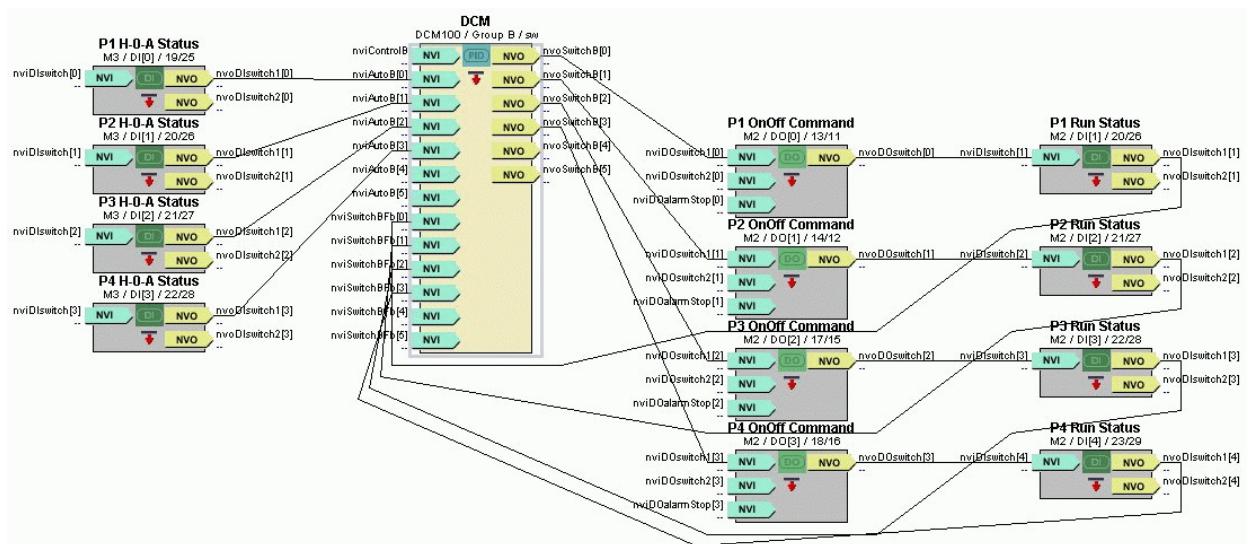


Figure 2. Pump set

Figure 2 shows an example implementation of a pump set that consists of 4 pumps. The pumps are operated on an On/Off basis and controlled through relays. Note that the nviControl-variable must not be bound to anything when On/Off operation is used.

The DCM object is bound to a DO object controlling a relay that supplies power for a pump. The run status indication informs the DCM that a pump is running. This DI object is also responsible for creating an alarm in fault situations by comparing the state of the DO object and the run status signal from the starter panel. If the DCM does not receive a run status indication when a pump should be running, the pump will be regarded as broken and the DCM will not try to use that pump until the corresponding nviAuto-variable is set to zero, and then back to a non-zero value.

Usually the pumps can be operated manually as well, and H-0-A signals should be available. These are connected to DI objects that inform the Lonix Duty Cycle Module if a pump is in AUTO mode and thus part of the duty cycle. The starter panel should be equipped with H-0-A switches for each pump, which are very useful when a pump is malfunctioning. By switching the pump manually off informs the DCM that a pump is no longer part of the duty cycle. When the pump is fixed and it is set back to AUTO mode DCM resets the error status for that pump and takes it back to the duty cycle.

The Lonix Duty Cycle Module can handle two pump sets with a maximum of six pumps in each set. The duration of a duty cycle can be configured with one hour accuracy. Other parameters that can/need to be configured is the maximum number of pumps running simultaneously and the time DCM will wait for a run status feedback signal before a pump is considered to be broken. The number of pumps that are part of the duty cycle is determined by providing a non-zero value from H-0-A switch to corresponding network variable nviAutoA[0]..[5] or nviAutoB[0]..[5].

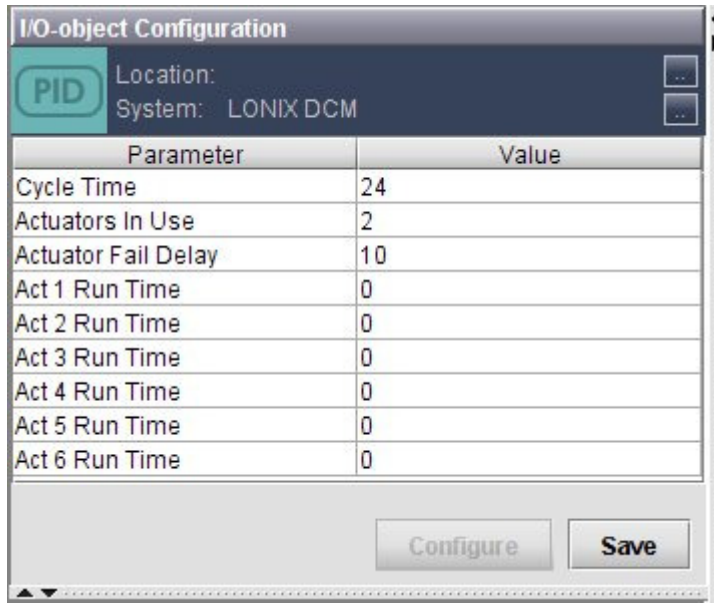


Figure 3. Configuration of the DCM object

Figure 3 shows an example configuration of a DCM object in PCT. In this case the cycle time is set to 24 hours and the maximum number of pumps running simultaneously is two (out of four). Actuator Fail Delay is the time that DCM will wait for a run status feedback signal, until that particular pump is regarded malfunctioning. It is now set to 10 seconds. The run times for each pump are stored in the Run Time variables and can be changed freely as well.

If the system needs to be tested the duty cycle time can be set to 30 seconds by entering "TEST" to the nciPositio-variable of the duty cycle module. This needs to be done with a LON network management tool such as NL220.

4 Required devices

This chapter lists the required devices for the example implementation.

Table 1. I/O objects

I/O type	Amount
DI	8
DO	4
AI	0
AO	0
PID	0
DCM Group	1

As you can see in the above table, you will need one (1) Lonix Duty Cycle Module DCM and two (2) Lonix Digimodules 5400P.

Table 2. Lonix Modules

Module Type	Description	Units
Lonix Digimodule 5400P	5 DI, 4 DO, 2 PID	2
Lonix Duty Cycle Module DCM	2 DCM Groups (A & B)	1

Details of the suggested products are available at www.lonix.com.