

# TULSA Water and Sewer Department

## SCADA System Improvements

### Discrete Alarm Add-On Instruction

**FINAL**

PRESENTED TO

**Cindy Cantero**

*City of Tulsa*

*Water Pollution Control*

*175 E 2nd Street, Suite 1400, Tulsa, OK 74103*

PREPARED BY

**Tetra Tech**

*7645 E. 63rd St.,*

*Suite 301*

*Tulsa, Ok 74133*

**P:** *(918) 249-3909*

[www.tetrattech.com](http://www.tetrattech.com)



**TETRA TECH**

**200-11383-19001**

**April 22, 2024**

## CONTENTS

1	INTRODUCTION.....	2
2	TEMPLATE .....	2
3	FEATURES .....	3
3.1	Configuration Tags.....	3
3.2	Input Tags .....	3
3.3	Output Tags.....	4
3.4	HMI Tags.....	4
3.5	PLC Logic Tags.....	4

## List of Tables

Table 3-1	Configuration Tags.....	3
Table 3-2	Input Tags .....	3
Table 3-3	HMI Tags .....	4
Table 3-4	PLC Logic Tags .....	4

## List of Figures

Figure 1-1	Discrete Alarm AOI as it appears in ladder logic.....	2
Figure 2-1	Unscheduled Standard Logic Templates .....	2
Figure 2-2	Standard Template Logic for the Discrete Alarm AOI .....	3

## Revision History

After the Add-On Instruction has been modified or updated, this document should be revised to reflect the changes. The version is broken into two parts: major (**X.0**) and minor (**1.X**). A major version is reserved for adding or removing sections of this document. A minor version is reserved for modifications to existing sections.

Version	Date	Description
1.0	July 9, 2021	AOI created in Studio 5000 Version 21.11, Draft submitted to client
1.0	April 4, 2022	Final submitted to client.

# 1 INTRODUCTION

The Discrete Alarm Add-On Instruction (AOI) reads an input tag and triggers an alarm if the tag value is true for the duration of the alarm delay timer.



Figure 1-1 Discrete Alarm AOI as it appears in ladder logic

# 2 TEMPLATE

Template logic can be found in the Unscheduled Programs/Phases task folder of the Tulsa ControlLogix Standard PLC file. Because the template task is unscheduled, the routines within it do not execute during runtime. The intention of the template routine is to provide a standard logic structure for the AOIs that can be copied into the executable tasks of the MainProgram.

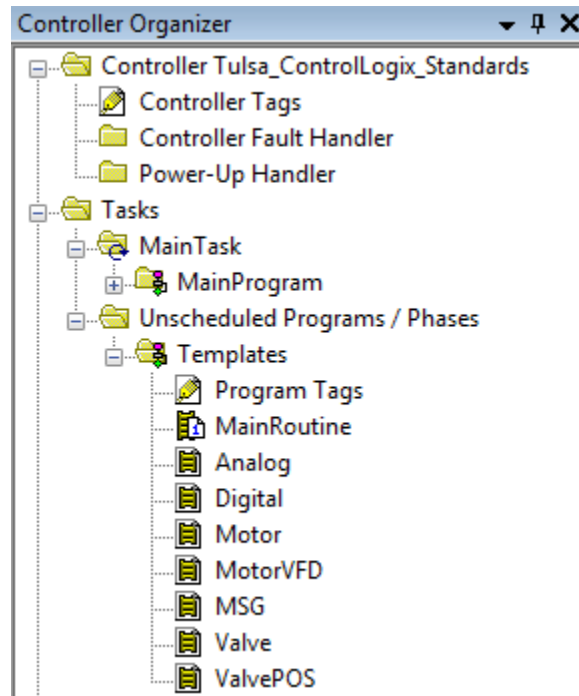


Figure 2-1 Unscheduled Standard Logic Templates

The digital template routine displays the standard logic for using the Discrete Alarm AOI. In the first rung, the alarm input is used to trigger the value input of the AOI.

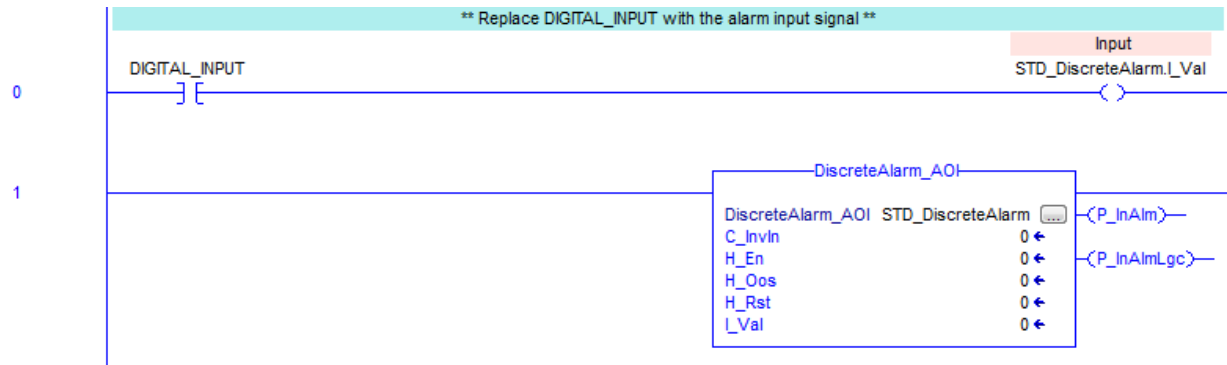


Figure 2-2 Standard Template Logic for the Discrete Alarm AOI

### 3 FEATURES

#### 3.1 Configuration Tags

Configuration tags are inputs to the AOI that are set by the engineer during programming and equipment start-up. A “C\_” prefix is used to indicate that the tag modifies the configuration of an equipment or instrument.

Table 3-1 Configuration Tags

Parameter	Data Type	Description	Default Value
C_Auto	BOOL	Determines if the alarm is in Auto or Manual mode.	False
C_HdshDlyTmSec	REAL	Alarm HMI handshake timer in seconds. Timer is only enabled when C_HdshLgcEn is false.	30
C_HdshLgcEn	BOOL	Alarm HMI handshake logic enable.	False
C_InvIn	BOOL	When true, the alarm input is inverted and alarms when the input is false.	False
C_Pri	DINT	Alarm priority.	300
C_Rst	BOOL	Alarm reset from the logic.	False
C_TypeAuto	INT	Alarm type when the alarm is in automatic mode. 1=permissive, 2=fault, 4=warning.	4
C_TypeMan	INT	Alarm type when the alarm is in manual mode. 1=permissive, 2=fault, 4=warning.	4

#### 3.2 Input Tags

Input tags are inputs to the AOI that are set by the I/O and indicate equipment status. The “I\_” prefix is used to indicated that the tag is displaying an equipment or instrument status.

Table 3-2 Input Tags

Parameter	Data Type	Description
I_Val	BOOL	Alarm input.

### 3.3 Output Tags

Output tags are outputs from the AOI that are used to control equipment. The “O\_” prefix is used to indicate that the tag controls a real-world output within the PLC. The Discrete Alarm AOI does not contain any output tags.

### 3.4 HMI Tags

HMI tags are inputs to the AOI that are set by the operator. The “H\_” prefix is used to indicate that the tag modifies a PLC register from the operator interface.

Table 3-3 HMI Tags

Parameter	Data Type	Description	Default Value
H_AlmDlyTmSec	REAL	Alarm delay timer in seconds.	5
H_En	BOOL	Alarm enable.	False
H_Hdsh	BOOL	Used to indicate that the HMI has received the alarm when C_HdshLgcEn is true.	False
H_Oos	BOOL	Alarm out of service.	False
H_Rst	BOOL	Alarm reset from the HMI.	False

### 3.5 PLC Logic Tags

PLC Logic tags are attributes internal to the AOI. The “P\_” prefix is used to indicate that the tag is modified or calculated within the PLC.

Table 3-4 PLC Logic Tags

Parameter	Data Type	Description	Alarm
P_Hdsh	BOOL	Handshake bit to the HMI.	No
P_InAlm	BOOL	In alarm.	Yes
P_InAlmLgc	BOOL	Alarm indication that is not affected by handshaking.	No
P_InAlmMmtry	BOOL	Momentary alarm indication that is only true for one scan.	No