

TULSA Water and Sewer Department

SCADA System Improvements

Flow Totalizer Add-On Instruction

FINAL

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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 Flow Totalizer Add-On Instruction (AOI) reads a flow rate and calculates totalized flow volumes. The AOI provides current and previous hourly, daily, monthly, yearly, cumulative, and custom period flow totals. It also converts the flow value into various units of flow. The Flow Totalizer AOI is used within the Analog Flow AOI to provide flow totalization statistics.

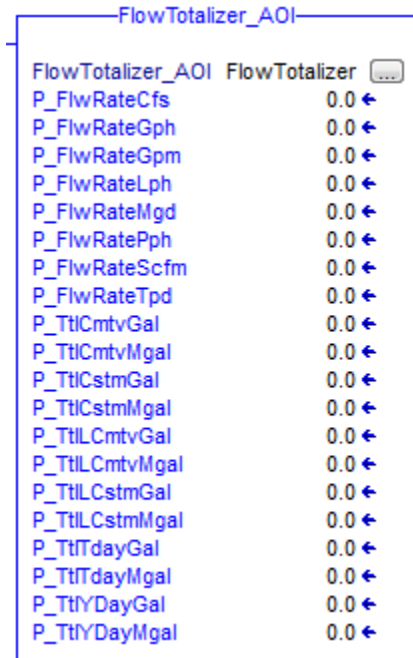


Figure 1-1 Flow Totalizer AOI as it appears in ladder logic

2 FEATURES

2.1 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 2-1 Configuration Tags

Parameter	Data Type	Description	Default Value
C_CstmPerRst	BOOL	Reset flow totalizing for custom period.	False
C_CstmPerStrt	BOOL	Start flow totalizing for custom period.	False
C_DayRst	BOOL	Day trigger to reset the daily statistics, externally mapped from the PLC clock.	False
C_HrRst	BOOL	Hour trigger to reset the hourly statistics, externally mapped from the PLC clock.	False

C_InEngUnits	INT	Flow rate engineering units. 1 = GPM, 2 = GPH, 4 = MGD, 8 = CFS, 16 = SCFM, 32 = tons/day, 64 = liters/hr, 128 = lbs/hr	1
C_MntRst	BOOL	Minute trigger to reset the minutely statistics, externally mapped from the PLC clock.	False
C_MthRst	BOOL	Month trigger to reset the monthly statistics, externally mapped from the PLC clock.	False
C_Permvsv	BOOL	Totalization permissive.	False
C_YrRst	BOOL	Year trigger to reset the yearly statistics, externally mapped from the PLC clock.	False

2.2 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 indicate that the tag is displaying an equipment or instrument status.

Table 2-2 Input Tags

Parameter	Data Type	Description
I_Val	REAL	Scaled flow value mapped into the AOI.
I_ValFit	BOOL	External signal mapped into the AOI for determining if input value is good.

2.3 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 Flow Totalization AOI does not contain any output tags.

2.4 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 2-3 HMI Tags

Parameter	Data Type	Description	Default Value
H_Oos	BOOL	When true, disables alarms and statistics.	False
H_Rst	BOOL	Reset all totalized values.	False

2.5 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 2-4 PLC Logic Tags

Parameter	Data Type	Description
P_FlwRateCfs	REAL	Flow rate displayed in cubic feet per second.
P_FlwRateGph	REAL	Flow rate displayed in gallons per hour.
P_FlwRateGpm	REAL	Flow rate displayed in gallons per minute.
P_FlwRateLph	REAL	Flow rate displayed in liters per hour.

P_FlwRateMgd	REAL	Flow rate displayed in million gallons per hour.
P_FlwRatePph	REAL	Flow rate displayed in pounds per hour.
P_FlwRateScfm	REAL	Flow rate displayed in standard cubic feet per minute.
P_FlwRateTpd	REAL	Flow rate displayed in tons per day.
P_TtlCmtvGal	REAL	Total cumulative gallons.
P_TtlCmtvKgal	REAL	Total cumulative K gallons.
P_TtlCmtvMgal	REAL	Total cumulative M gallons.
P_TtlCstmGal	REAL	Total custom period gallons.
P_TtlCstmKgal	REAL	Total custom period K gallons.
P_TtlCstmMgal	REAL	Total custom period M gallons.
P_TtlHrGal	REAL	Total hourly gallons.
P_TtlHrKgal	REAL	Total hourly K gallons.
P_TtlHrMgal	REAL	Total hourly M gallons.
P_TtlLCmtvGal	REAL	Total last cumulative gallons.
P_TtlLCmtvKgal	REAL	Total last cumulative K gallons.
P_TtlLCmtvMgal	REAL	Total last cumulative M gallons.
P_TtlLCstmGal	REAL	Total last custom gallons.
P_TtlLCstmKgal	REAL	Total last custom K gallons.
P_TtlLCstmMgal	REAL	Total last custom M gallons.
P_TtlLHrGal	REAL	Total last hour gallons.
P_TtlLHrKgal	REAL	Total last hour K gallons.
P_TtlLHrMgal	REAL	Total last hour M gallons.
P_TtlLMthGal	REAL	Total last month gallons.
P_TtlLMthKgal	REAL	Total last month K gallons.
P_TtlLMthMgal	REAL	Total last month M gallons.
P_TtlLYrGal	REAL	Total last year gallons.
P_TtlLYrKgal	REAL	Total last year K gallons.
P_TtlLYrMgal	REAL	Total last year M gallons.
P_TtlMthGal	REAL	Total monthly gallons.
P_TtlMthKgal	REAL	Total monthly K gallons.
P_TtlMthMgal	REAL	Total monthly M gallons.
P_TtlTdayGal	REAL	Total daily gallons.
P_TtlTdayKgal	REAL	Total daily K gallons.
P_TtlTdayMgal	REAL	Total daily M gallons.
P_TtlYdayGal	REAL	Total last day gallons.
P_TtlYdayKgal	REAL	Total last day K gallons.
P_TtlYdayMgal	REAL	Total last day M gallons.
P_TtlYrGal	REAL	Total yearly gallons.
P_TtlYrKgal	REAL	Total yearly K gallons.
P_TtlYrMgal	REAL	Total yearly M gallons.