**SCADA\_SYS\_DI**

**Version History**

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| --- | --- |
| **Version** | **Release Notes** |
| 1.2 | “Initial” release. This UDT name has been used in previous standard revisions but has been modified to conform to the latest PLC Programming Standard. |

**Description**: This UDT is to be used in the evaluation of all discrete IO. It may also be used, with the Region’s permission, for any logic that produces a discrete signal as an output.

**Naming Conventions**

All tags created by programmers using this UDT will use the fully qualified six fragment tag name. This tag is also used as a member of other device UDTs that have discrete IO signals associated with their operation.

**UDT Members**

|  |  |  |  |
| --- | --- | --- | --- |
| **UDT Member** | **Datatype** | **Description** | **Usage** |
| ADDON | Discrete\_Input\_v1 | Discrete Input Evaluation AOI | Calculated state of engineering value from raw signal |
| ENABLE\_CHECK | Enable\_Check\_v1 | Verifies if any of the enable commands for the input are disabled. | Determines the state of the .DS signal |
| NC | BOOL | Normally Closed Status | Set to 1 if the output signal is to be true when the raw signal is false |
| Eng | BOOL | Engineering state of the Input Signal | The .ADDON instruction will manipulate the raw signal to generate the .Eng value based on the configured parameters |
| RE | BOOL | Raw Signal Enable – set to 1 to ensure .Eng value is always 0, regardless of raw value state | Implemented as a command on SCADA dialer pages |
| DE | BOOL | Dialer Enable – allows operators to disable the signal from triggering a dialout | Implemented as a command on SCADA dialer pages |
| SR | BOOL | Supervisor Dialer Enable – Allows supervisors to disable the signal from triggering a dialout | Implemented as a command on SCADA dialer pages |
| DS | BOOL | At least one of .RE, .DE, or .SR is inhibiting full function of the signal | Can be used to create indication on SCADA that at least one signal generation component of the input is disabled |

**AOI**

The AOI will generally only be deployed in the DI\_EVAL routine, with one instruction associated with each digital IO Point. Unless otherwise indicated the only required configuration is for the programmer is to do a search/replace on the UDT tags pre-configured in the block to update the tagname, and set the tag values as appropriate to the application.

| **AOI Parameter** | **Requirement** | **Default Value** | **Description** | **Implementation Guideline** |
| --- | --- | --- | --- | --- |
| Discrete\_Input\_v1 | Mandatory | *tagname*.ADDON | Discrete Input Evaluation AOI | N/A |
| Enable\_Check | Mandatory | *Tagname*.ENABLE\_CHECK | Enable Status AOI | N/A |
| Raw | Mandatory | *Tagname****.***ADDON.Raw | Raw signal state | Must be mapped to a signal outside of the AOI |
| Input\_Invert | Mandatory | *Tagname****.***NC | Normally Closed Status of Signal | N/A |
| Raw\_Enable | Mandatory | *Tagname.*RE | Raw Enable | Hard Code to 0 if tag is to be always enabled |
| Dialer\_Enable | Mandatory | *Tagname.*DE | Dialer Enable | Hard Code to 1 if signal not associated with a dialout |
| Super\_Dialer\_Enable | Mandatory | *Tagname.*SR | Supervisor Dialer Enable | Hard Code to 1 if signal not associated with a dialout |
| Disabled | Mandatory | *Tagname****.***DS | At least one component of signal disabled | Do not use this signal anywhere if operations does not have full control of all enable/disable functions |
| Mask | Optional | *Tagname****.***ADDON.Mask | Inhibits evaluation of the signal based on other process conditions | Use to prevent evaluation of the signal if other signals are already true. For example, many alarms should be masked on the loss of power to prevent overflow of the alarm log. |
| On\_Delay\_Time | Mandatory | Hard code with appropriate number | Time delay before setting eng value true | Time is in Seconds. |
| Off\_Delay\_Time | Mandatory | Hard Code with appropriate number | Time delay before setting eng value false | Time is in seconds. Generally only used with pump running signals. |
| Eng | Mandatory | *Tagname*.Eng | Conditioned Signal Output | N/A |
| Dialer\_Trigger | Optional | *Tagname.*ADDON.Dialer\_Trigger | Used in Dialer Routine to trigger remote alarm annunciation | This tag should only be used if the discrete signal is to be implemented for callout. |

**Typical AOI Operation Description**

The AOI will use the configured time delays to determine how the signal is evaluated. Generally, set the time delays as follows:

Status Input: No Delays

Alarm Input: On Delay Only

Pump Running Input: On and Off Delay

The Raw signal is mapped in the DI\_MAP routine. The value of the NC tag determines if the ENG value is true when the raw signal is true, or is inverted (ENG true when raw signal false). The RE and Mask inputs allow signal processing to be inhibited from SCADA or through pre-programmed conditions in the PLC, respectively. As the value of the raw signal changes, the state of the ENG value will also change appropriate to the configured time delays.

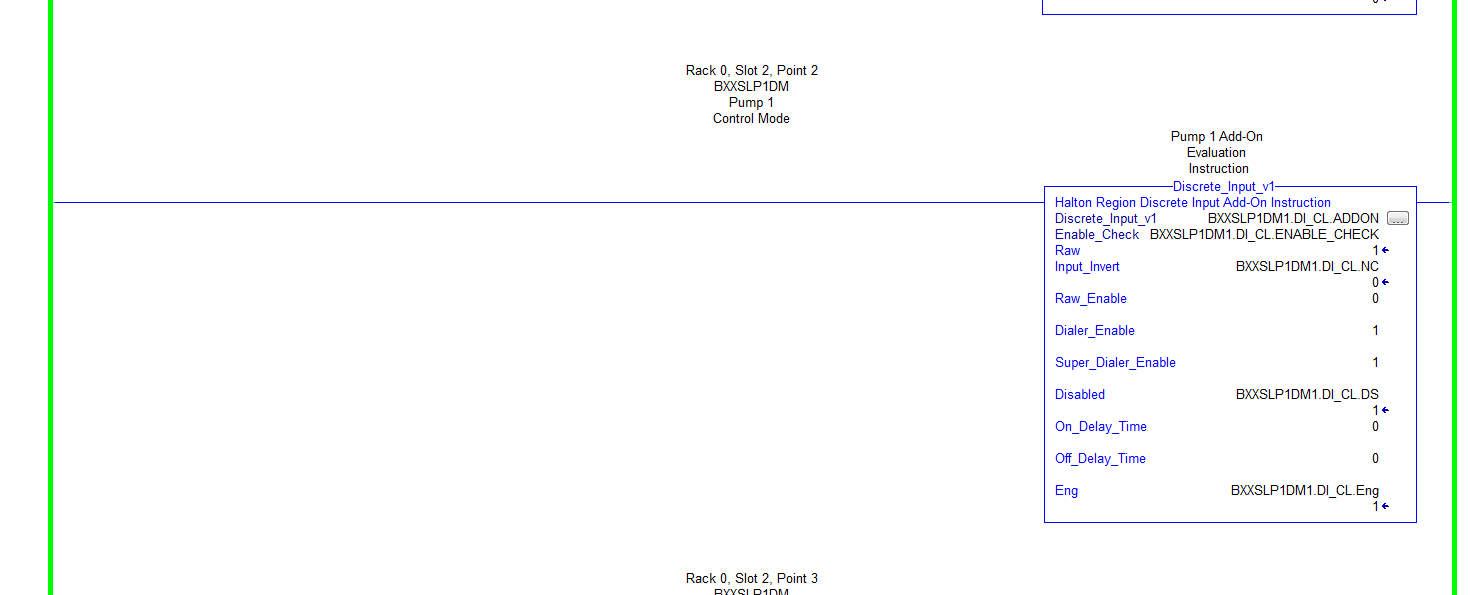
The remaining rungs check the state of the alarm enables to set the indication if any of the alarms are disabled, and will set the dialer trigger bit if the engineering output is true and no dialout inhibit is present.

**Other Uses**

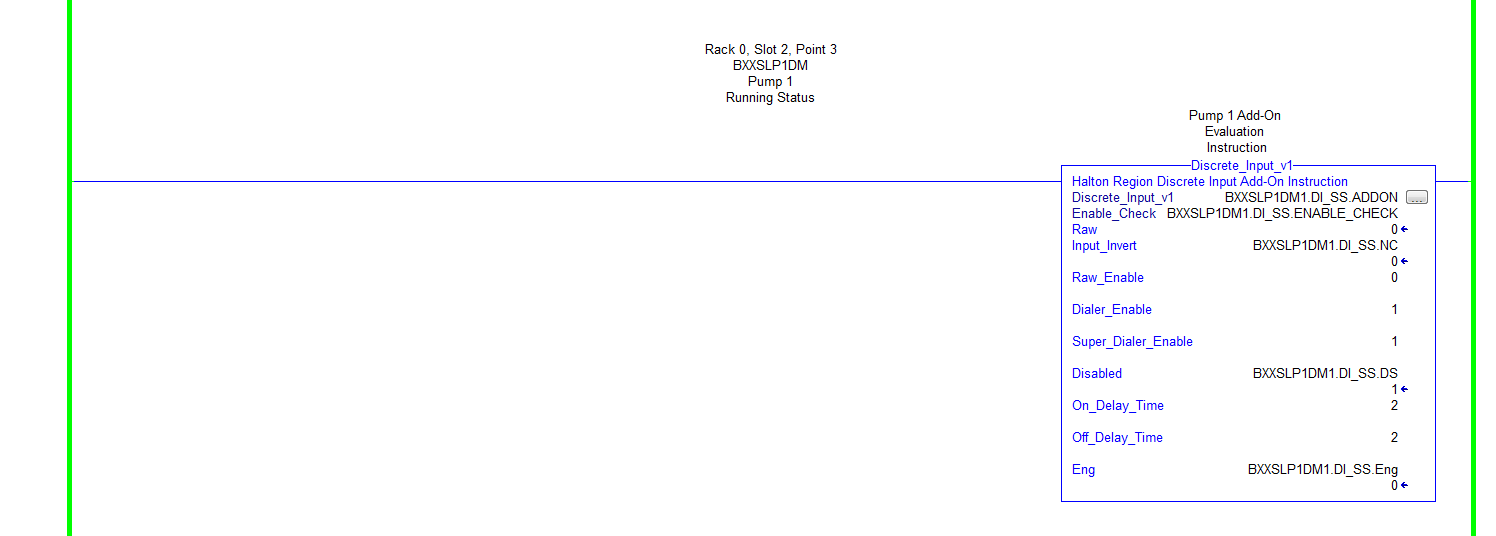
This AOI can be used more generally where a signal or combination of signals can be used to set a raw value that is subsequently conditioned to an engineering value using time delays or signal inversion. For example, in the baseload, this AOI is used to implement security alarms and security functions based on the virtual device states already previously evaluated using the UDT.

**Programming Examples**

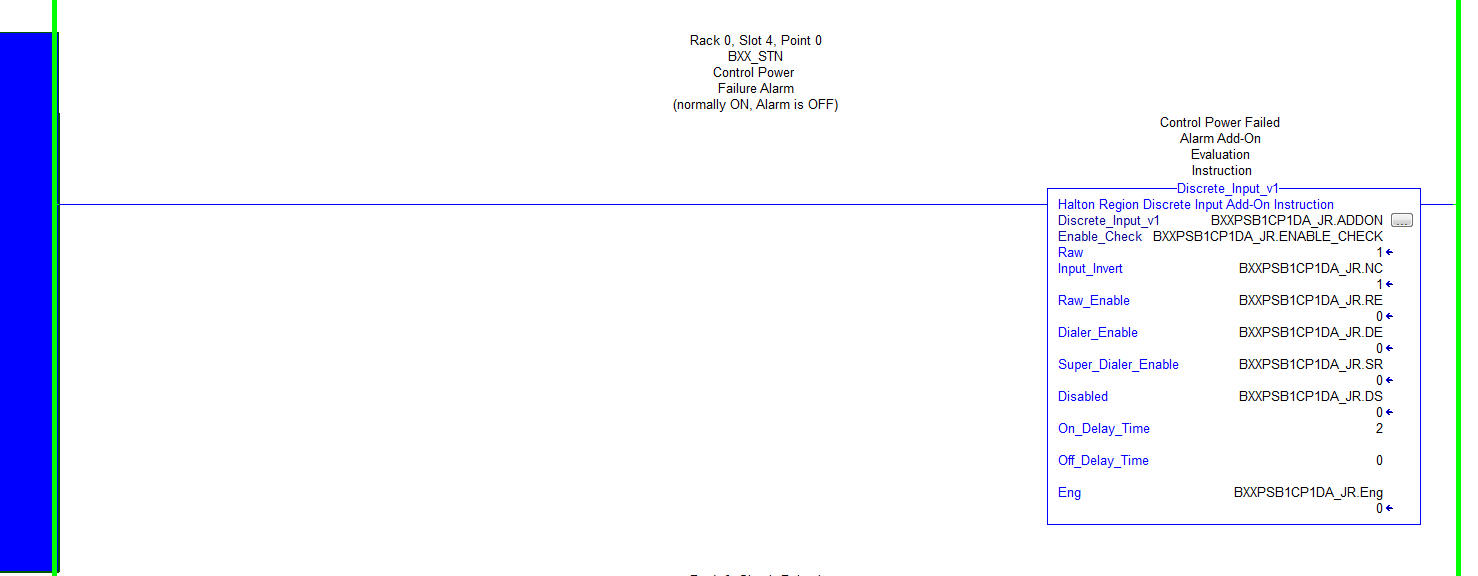
The screenshot below shows the programming for pump control mode. The pump control mode is a child member of the Motor UDT. Control mode is used for status indication only, so all enable signals are hard-coded to prevent unintended operation, and no time delay is used. In this case the raw signal value is not inverted to produce the engineering value as the signal values already have pre-determined meanings as described in the standards.



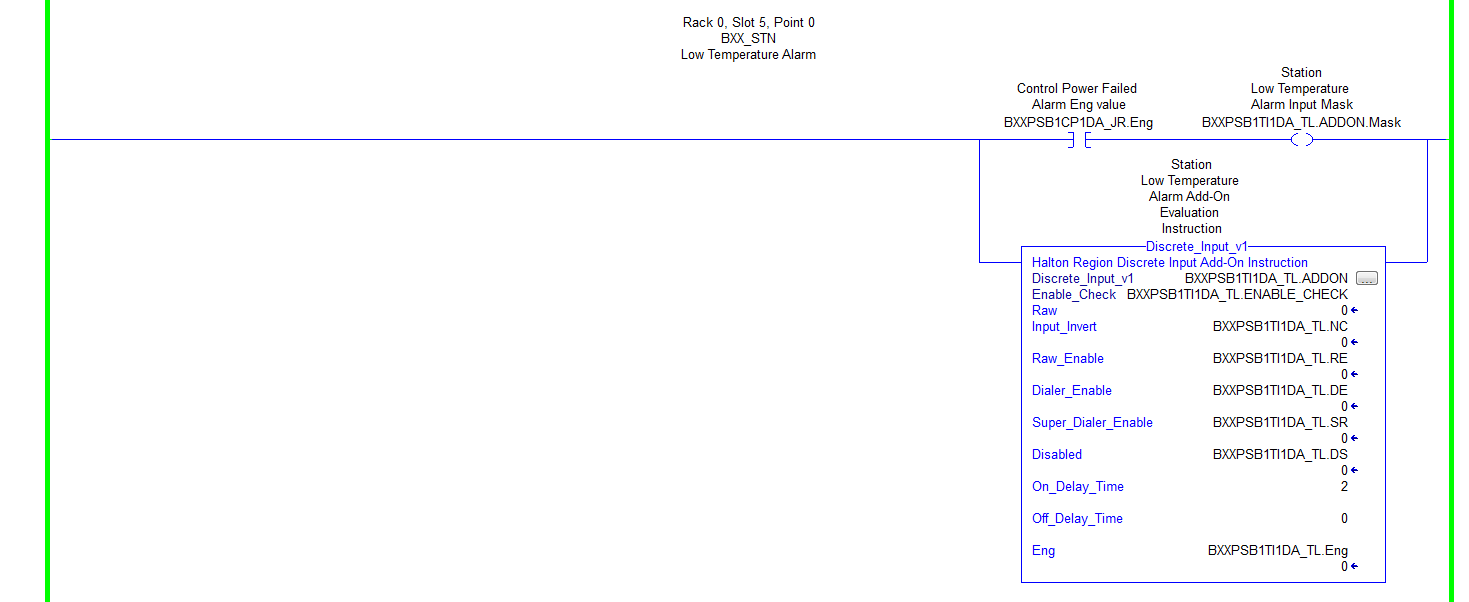
The screenshot below shows programming for pump running. As above this is a child member of the Motor UDT, and we hard code the enable values as these are generally not available for the operator to inhibit. On and Off time delays are used to condition the signal and help prevent nuisance virtual alarms if a pump stops due to another alarm condition (e.g. overload or e-stop).



The screenshot below shows the programming for a Control Power Failure Alarm. The tag name is the fully qualified six fragment tag name for the alarm. In this example, the signal is inverted as the raw signal transitions from 1 to 0 when the power is off, but we want the alarm to transition from 0 to 1 when the power goes off. All enable tags are preserved for use on a dialer enable page, if required. On delay time is used to de-bounce the signal.



The example below shows the implementation of the optional input mask on a branch prior to executing the add-on instruction. In this case, if the control power fails we do not want to evaluate the low temperature alarm, as the temperature sensor no longer functions when control power is lost. This prevents nuisance alarms from filling the HMI screen and allows operations to quickly focus on the true problem.



**HMI Integration**

A standard security status object and dialer alarm object are provided on the “Symbols Library –Misc I” screen in the InTouch baseload. Programmers should perform appropriate substitutions on strings and tags as required for the application. Note that the “Dialer Alarm Enable” window is required to be deployed with the dialer object for the controls to function properly.