USER'S MANUAL

Maxiflex 32SOE
32 Way Sequence-of-Events Input module
User's Manual

SCOPE

This User Manual provides information on how to install, configure and use the Maxiflex 32 Way Sequence-of-Events Input modules.

This manual covers the following product Models:

Model	Description
M1760A	24V Input 32SOE
M1761A	48V Input 32SOE

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The pdf file is named UMM176xR07.pdf

REVISION HISTORY

Date	Revision	Comments
October 2006	1	Initial Issue
October 2006	2	Split configuration section into Configuration and Module operation
October 2006	3	Added Terminal Board pictures
October 2006	4	Improved sense description, “Abnormal” terminology changed to “Alarm”
January 2007	5	Added Debounce figure.
August 2014	6	Updated supported CPUs, inhibit description and ON/OFF delay timers description.
October 2014	7	Corrected section 7.4. Updated figure 13.

Table of Contents

1. Introduction

The M176x 32 Way sequence-of-Events (32SOE) module is an intelligent input module in the Maxiflex range of products

The 32SOE plugs into any I/O slot on a Maxiflex base and monitors its field inputs, making the input status (On or Off) and time of input change (Event) available to the CPU.

The input status may be accessed by the entire range of Maxiflex P3 CPU's; however the change of state event information is only available to CANbus enabled P3 CPU's. Input status is accessed via the Data Interchange table (DIT) while Change of State (COS) events are streamed via the high speed CANbus to the P3 CPU and then up to an OPC server. The CANbus enabled P3 CPU's also support interrupt access to the I/O of the 32SOE which insures the user that quick input changes are always detected by user applications.

Compatible P3 CPU's:

M1260E
M1260F
M1261E
M1261F
M1262F
M1262G
M1267B
M1267C
M1265A
M1265B

2. Specifications

Functions		
Input Contact Bounce Filtering	Selectable from 0 to 1000ms for the entire module	
Delay Timers	On delay and off delay individually settable from -100ms to 3276ms per input	
Input Inhibit	Ability to inhibit inputs from producing change of state events	
Chatter filter	Selectable chatter filter from 0 to 65534ms that detects inputs chattering and prevents these events being queued.	
Event Buffer	9362 event buffer on the module.	
Inputs		
Number and type	32 Digital inputs. Use with Terminal Board Model C6332A for dry contacts (see wiring diagrams for contact wetting voltage options)	
Isolation	100% tested to 2500Vac, 50/60Hz for 1 minute all inputs to logic	
Insulation Resistance	1000MΩ min. at 500Vdc	
Input time stamp resolution	1ms	
Minimum guaranteed recognisable pulse	600us	
Maximum guaranteed rejected pulse	150us	
Indication	32 green LED's light to indicate the on state of each input.	
Model	**M1760A**	**M1761A**
Nominal Wetting Voltage	24Vdc	48Vdc
Guaranteed On Voltage	9 – 30Vdc	30 – 60Vdc
Input Current over voltage range	1.5 – 8mA (6mA nominal at 24Vdc)	1.5 – 4mA (3mA nominal at 48Vdc)
Guaranteed Off Voltage	< 4Vdc	<8Vdc
Guaranteed Off Current	< 0.3mA	<0.3mA
Input Termination		
Termination Method	37 pin Sub-Miniature D connector on front of 32SOE module secured with two screws. Use with cable model C1467A and 32SOE Remote Terminal Board model C6332A Screw clamp Terminal Blocks on C6332A accept input wiring. (Two terminals per input)	
Wire Size (C6332A)	2.0mm^2 maximum may be terminated on the C332A Field Inputs.	
Maxiflex Installation		
Mounting	Installs into any I/O module slot of "B" version or later Maxiflex bases. (i.e. Maxiflex base models M1021B, M1022B, M1023B, M1031B or M1032B)	
Hot Swap	Module may be removed and inserted whilst the system is powered and running. CAUTION: Always take the proper precautions when working on live systems to ensure safe intervention.	
Logic Power Consumption		
From Logic Power Supply	200mA from 5Vdc max. 0mA from 12Vdc	
Environmental		
Operating Temperature	-25°C to +60°C (-13°F to +140°F)	
Storage Temperature	-40°C to +70°C (-40°F to +158°F)	
Safety	EN 60950:1995	
Emissions	EN 55011; EN50081-2:1994 Group I, Class A; EN50082-2	
Immunity – ESD	IEC 61000-4-2:1995, level 3	
Immunity – RF Fields	IEC 61000-4-3:1995, level 3	
Immunity – Fast Transients	IEC 61000-4-4:1995 1 kV – input/output lines	
Humidity	95% max. at 40°C (104°F) non-condensing.	
Protection	Electronics conformally coated	
Mass		
Mass	270g (9.6oz) Excluding Packaging; 360g (12.7oz) Including Packaging	

Ordering Information

Order Code	Description
M1760A	Maxiflex 32 way Sequence-of-Events module 24Vdc (9-30Vdc)
M1761A	Maxiflex 32 way Sequence-of-Events module 48Vdc (30-60Vdc)
Accessories	
C6332A	32SOE Terminal Board
C1467A-x	Maxiflex 32SOE Field Input Cable with DB37 Male on one end and DB37 Female on the other end. Connects Maxiflex 32SOE module to C6332A Terminal Board x = length in metres. C1467-2 (2 metre length) is standard. Other lengths made to order

3. General Description

This Manual covers 2 models of 32SOE. Both models look identical to the picture in Figure 1 except for the Model number on the front panel.

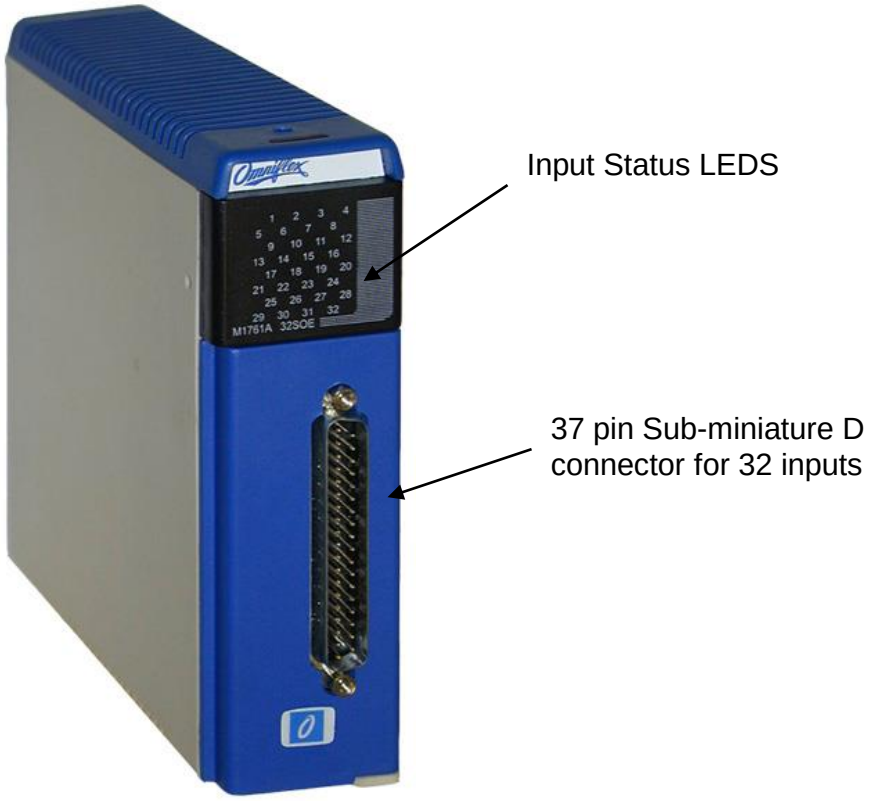

Figure 1 – M1760A / M1761A 32SOE module

3.1 Front Panel LED indicators

The 32SOE has 32 green LED's on its front panel. These LED's show the current state of the input. The LED is on when a field voltage is applied to the input, i.e. a closed contact.

3.2 Input connector

The input connector is used to connect the 32SOE to the field wiring through a multicore cable (Model C1467A) and remote terminal board (Model C6332A). A picture of the multicore cable and terminal board are shown in figure 2 and 3 respectively.

Figure 2 – Multicore cable (C1467A)

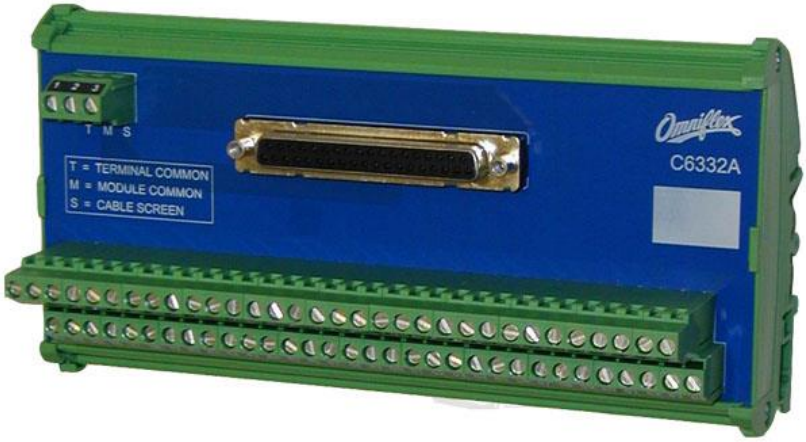

Figure 3 – Terminal board (C6332A)

4. Installation

4.1 Installing the 32SOE on the Maxiflex Base

Install the 32SOE into one of the IO positions on a Maxiflex base. Refer to the Maxiflex bases General Instructions (PN 98-8952-930-XXX) for more detail on base layout, module insertion and module removal.

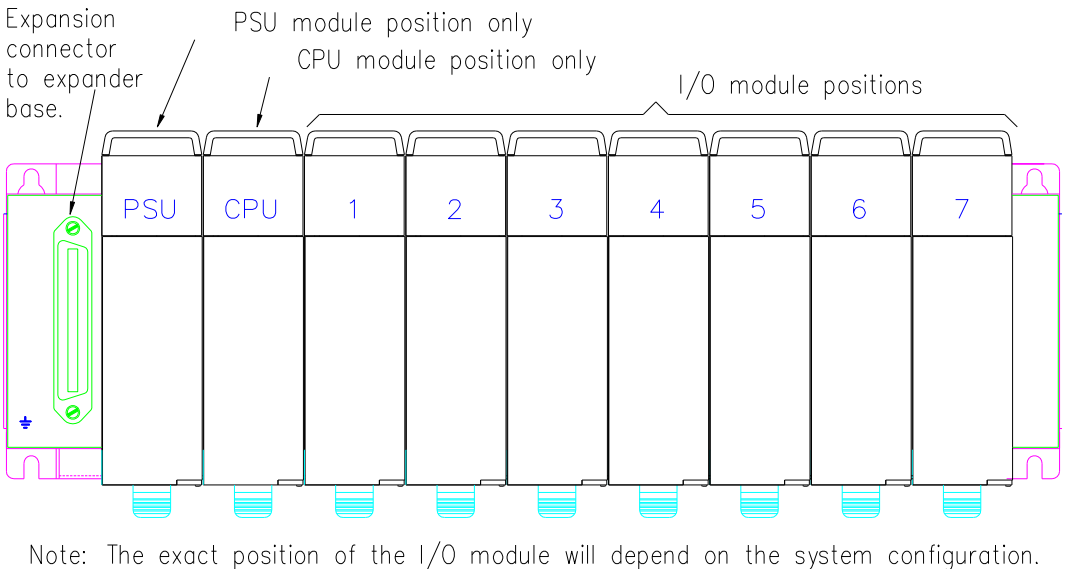

Figure 4 – 32SOE positioning in the Maxiflex rack

4.2 Connecting 32SOE's to terminal boards

The 32SOE module is connected to the field wiring through a multicore cable (Model C1467A) and remote terminal board (Model C6332A). The screen connection should be wired to earth for EMC prevention. The Terminal and Module Common connections on the terminal board are either wired together or to a supply depending on your input. Figure 7 and 8 show wiring for potentially free and field powered contacts. Any unused inputs should be wired to the common line and not left floating.

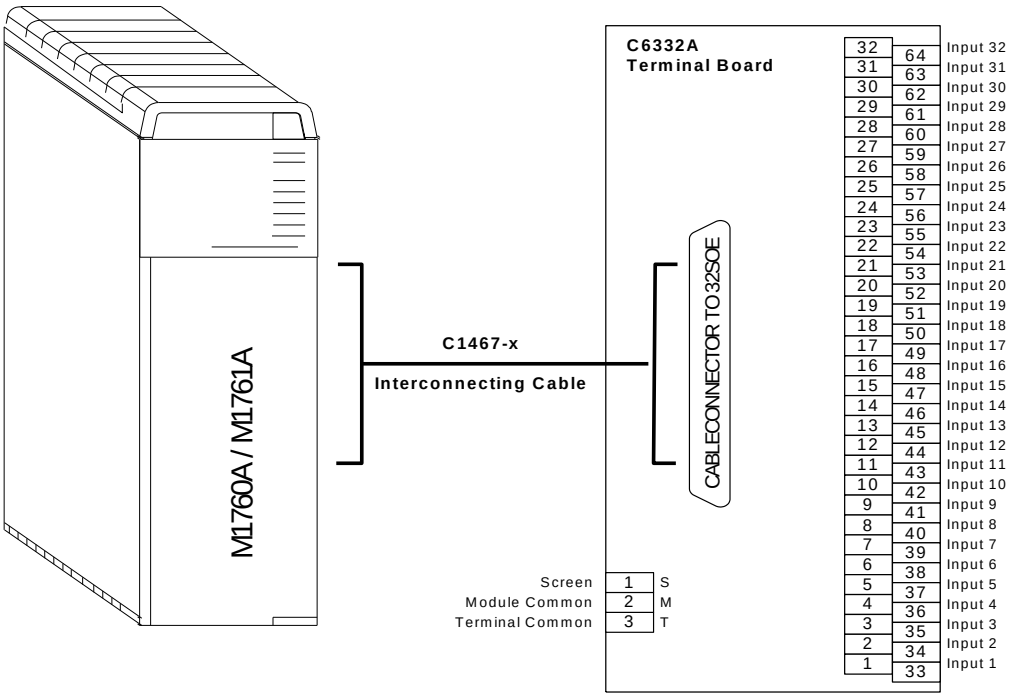

Figure 5 – 32SOE connection to Terminal Board

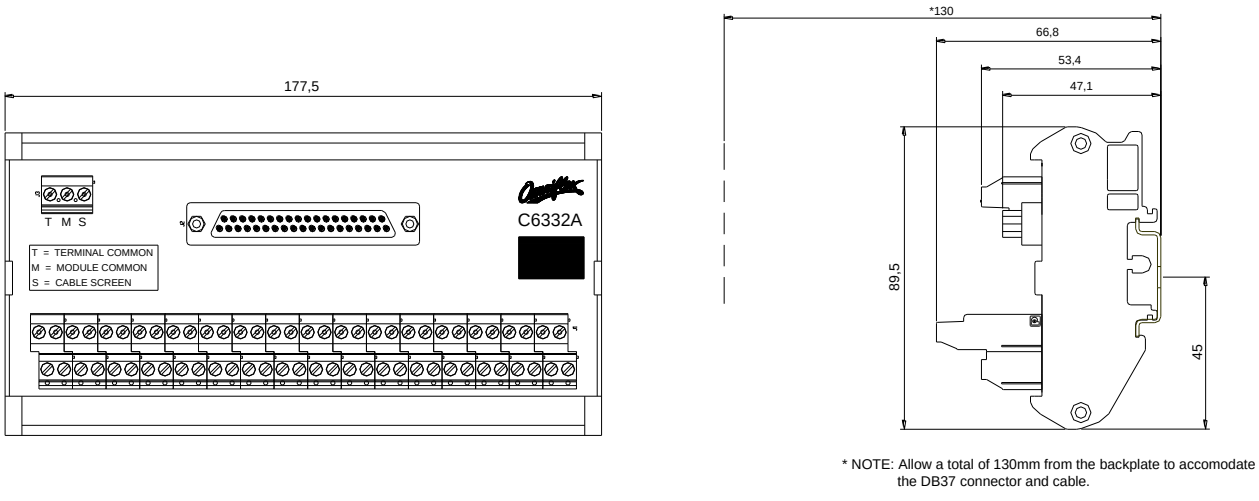

Figure 6 – Terminal Board dimensions

4.3 Connecting terminal boards to field wiring

The terminal boards can be connected to two different types of field contacts:

4.3.1 Potentially free Field Contacts

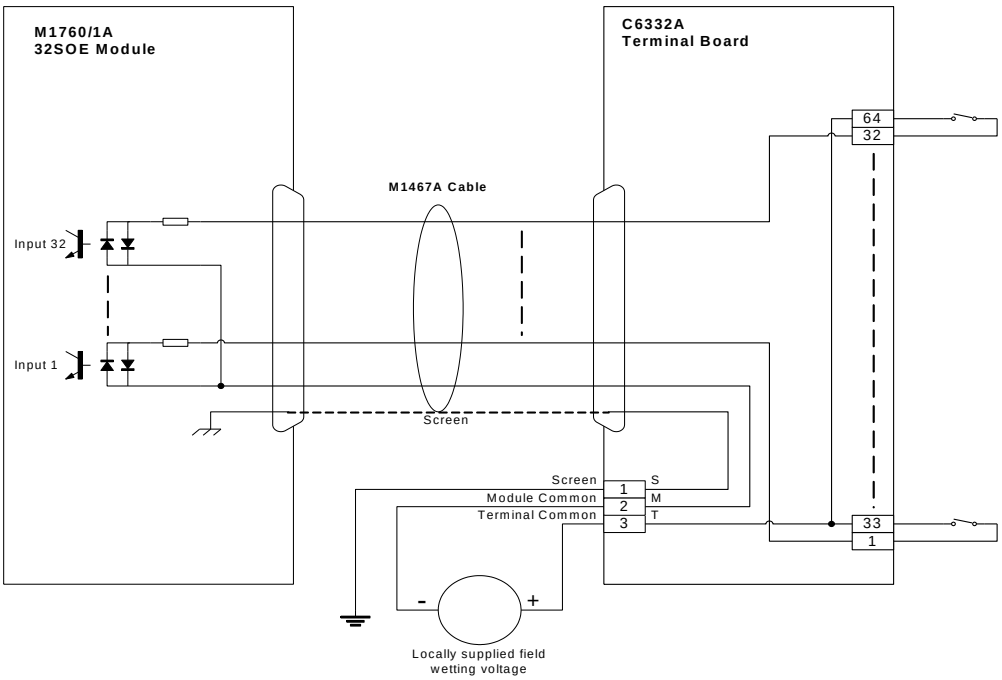

Figure 7 – Wiring of Potentially free field contacts to Terminal Board

4.3.2 Field powered inputs

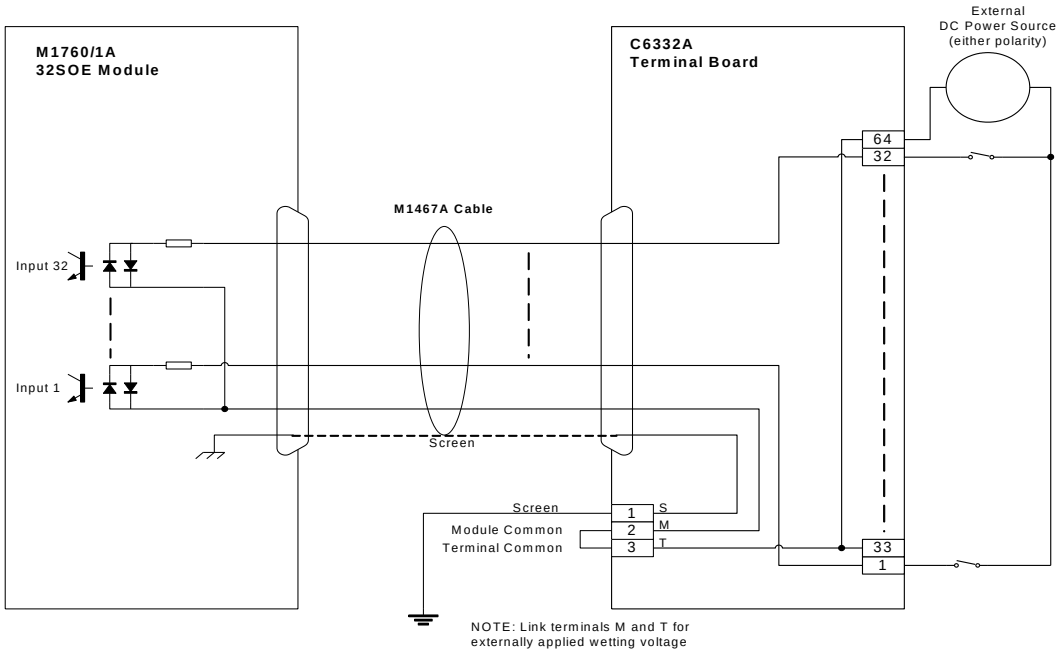

Figure 8 – Wiring Field powered inputs to the Terminal Board

5. Configuration

Configuration of the 32SOE is done through the Local CPU using Omniset or Omniset Pro and a P3 template file. Once the 32SOE is placed in the Maxiflex base, the Local CPU needs to be configured for the installed 32SOE module. Figure 7 shows the P3 being configured for a 32SOE module.

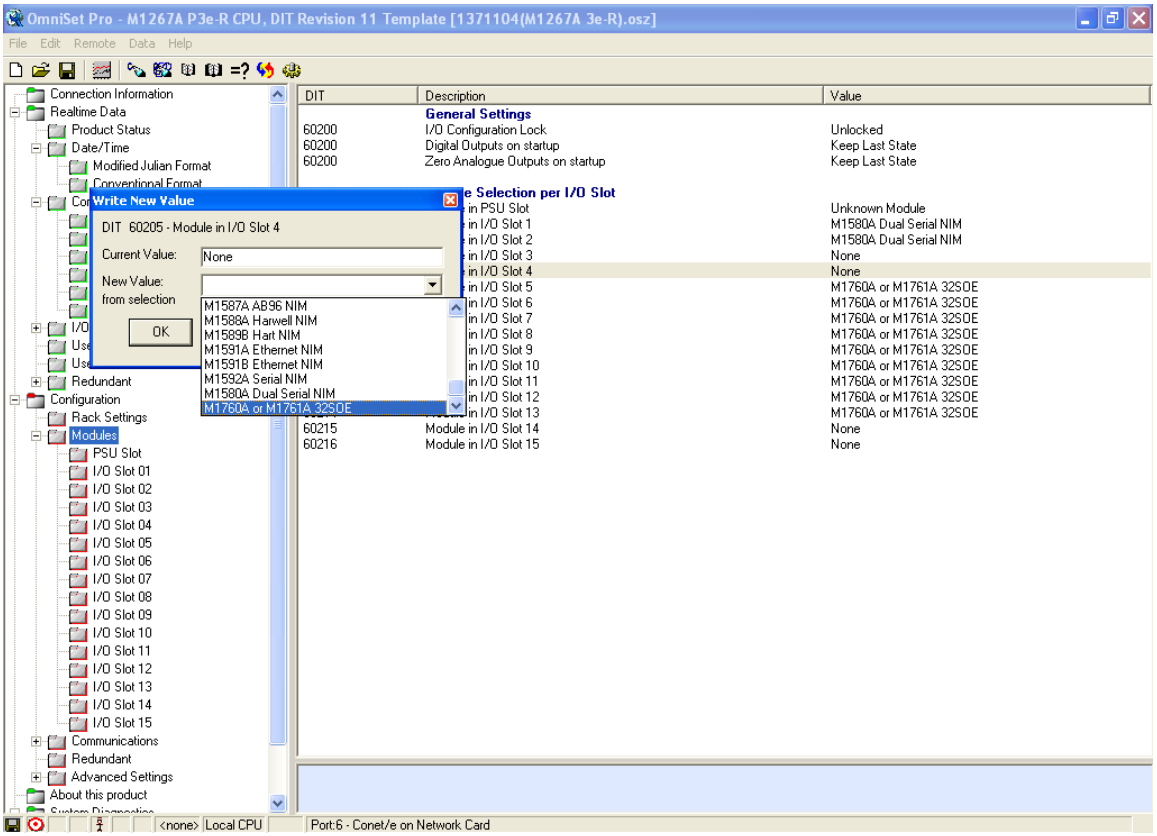

Figure 9 – Configuration of the P3 for a 32SOE

Once the P3 has been configured for a 32SOE the 32SOE itself can be configured by selecting the configured slot in the modules section. The 32SOE's configuration can be broken down into two major groups; Module configurations and Input configurations. The module configurations are Chatter, Debounce and Queue type. The input configurations are Sense and Debounce. These configurations can be seen below in figure 8

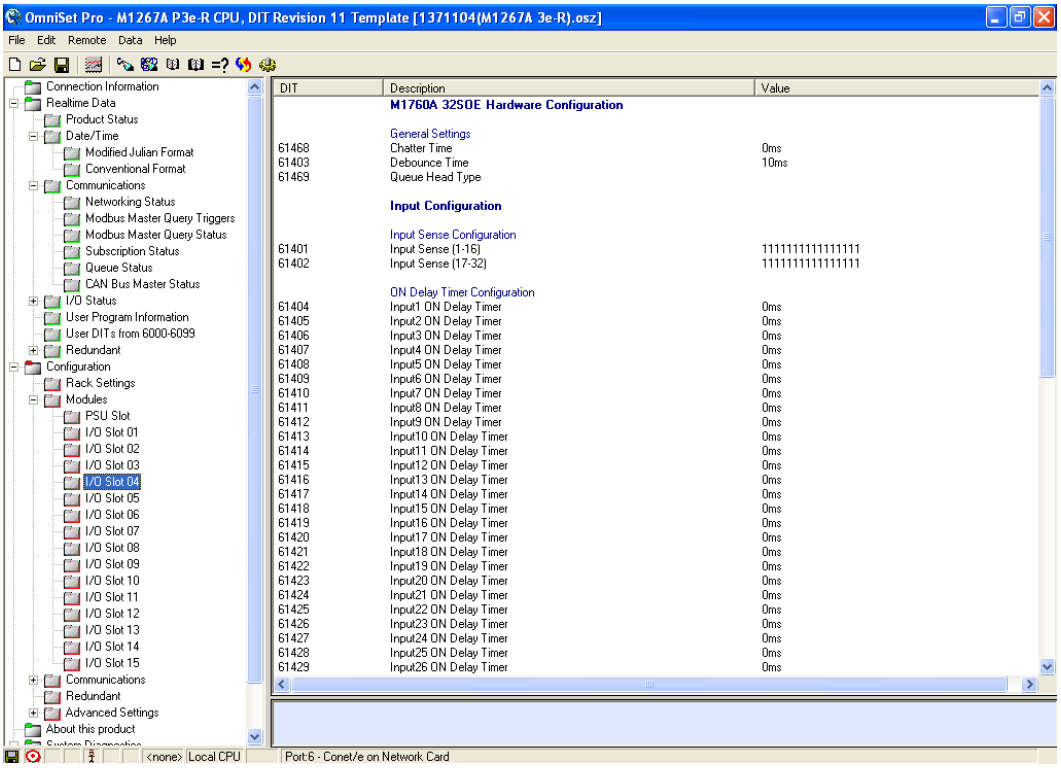

Figure 10 – 32SOE configuration

6. Realtime Input/Output Data

Various types of Realtime Input/Output Data are available to the user through the Local CPU using Omniset Pro. Below is a screen grab of the Digital Inputs for a 32SOE module in Slot 4.

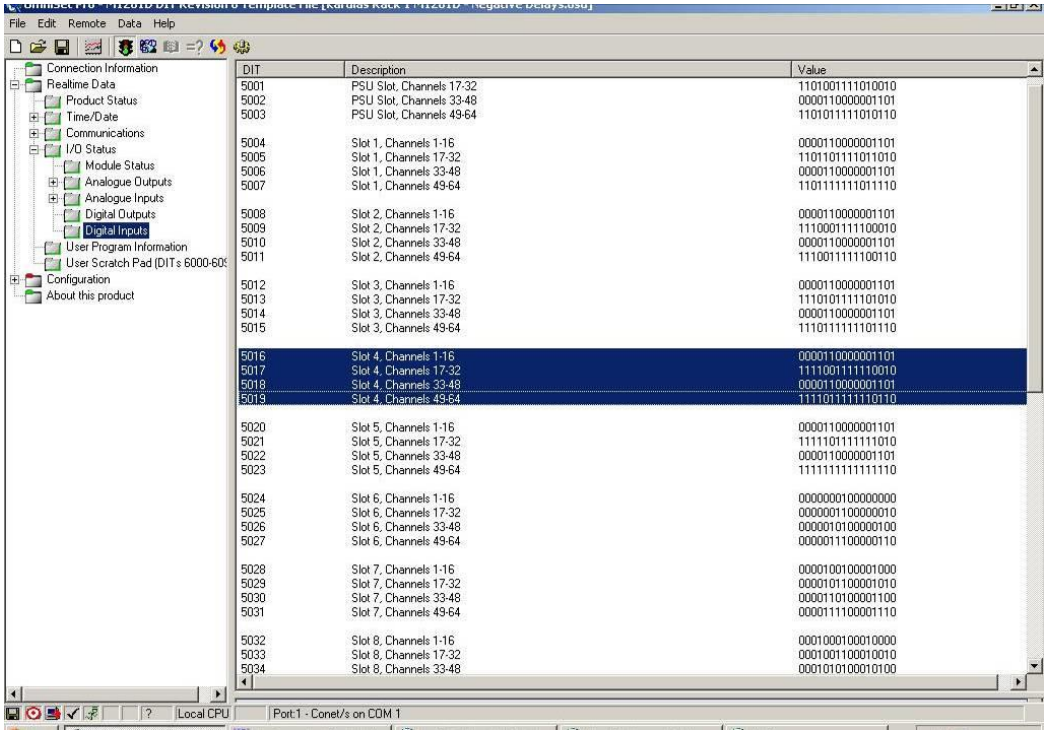

Figure 11 – Digital Inputs Status

6.1 Digital Input Status

The Digital Inputs seen on the Local CPU using Omniset Pro are an indication of the current input status for the 32SOE module. This input status is generated after Spike and Debounce filtering and after the Delay timing. Channels 1-32 represent the actual digital inputs on the 32SOE with a 1 representing an Alarm condition and a 0 representing a Normal condition. Channels 33-64 are unused.

6.2 Input Inhibits

The user has the ability to temporarily Inhibit (Ignore) an input so that repairs/testing may be done to field equipment tied to that input without the generation of events. To inhibit an input one simply writes a “1” into the digital output section for that given input and slot. Inhibits are temporary and are disabled when ever the module is power cycled.

In the case of the field input being in the abnormal state when the inhibit for that input is set, then the status of that input reported to the Maxiflex CPU and supervisory system (e.g. Omni4000) will be changed to normal.

Should the field input be abnormal when the inhibit is cleared, then the status of that input reported will return to abnormal.

6.3 Queue Flushing

The user can flush all events stored in the event queue on the 32SOE module by setting Channel 33 to “1” in the modules Digital Output.

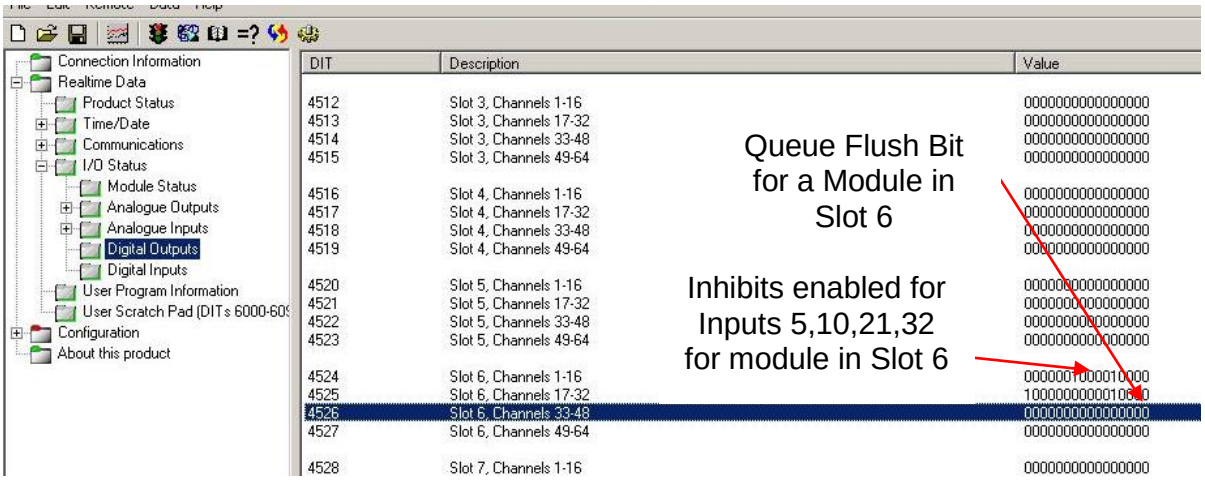

Figure 12 – Digital Outputs showing Inhibits and Queue Flushing

Slot x Channels 1 - 16

Bit #	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Input #	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

7. Module Operation

This section gives a description of the operation of the 32SOE module and explains the operation of the different subsystems on the 32SOE. Figure 11 shows the signal flow inside the 32SOE.

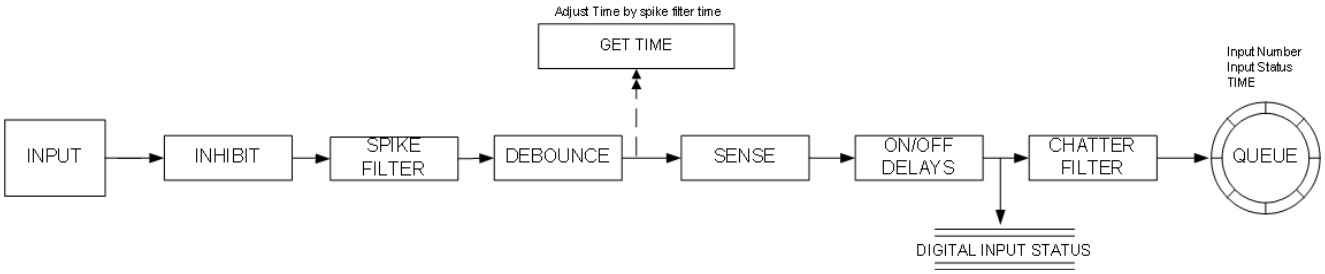

Figure 13 – 32SOE signal flow

7.1 Spike Filter

The Spike filter is designed to prevent noise from generating events on the inputs of the 32SOE. Any pulses with a width of less than 150us are guaranteed to be rejected by the spike filter, and any pulses with a width greater than 600us are guaranteed to be allowed through. Pulses between 150us and 600us result in non deterministic behavior.

7.2 Debounce Filter

The input debounce filter is a software filter designed to provide for inputs which have contact bounce problems. Once a change of state for a particular input is detected, the inputs state is ignored for the configured debounce period. Once the debounce period is up the input state is then monitored again. The debounce filter can be configured to be between 0 to 1000ms in 1ms increments. Setting the debounce filter to 0ms disables it.

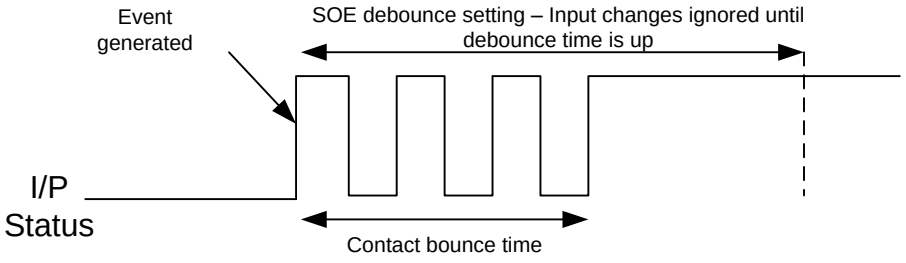

Figure 14 – Debounce operation

7.3 Input Inhibits

The input Inhibit temporarily ignores an input so that repairs/testing may be done to field equipment tied to that input without the generation of events. The Inhibits should not be used to permanently ignore unwired inputs. The unused inputs should rather be wired to the common line.

7.4 Sense

The Sense setting on the 32SOE module is used to configure what a “Normal” or “Alarm” input state is. If the Sense bit for a particular input is set to “1”, that input will be configured as “Normally Open”, meaning that a closed contact (Applied field voltage) will be deemed as an “Alarm” condition. Setting a Sense bit for a particular input to “0” will result in the input being configured as “Normally Closed”, meaning that a closed contact (Applied field voltage) will be deemed as a “Normal” condition

Input Contact	LED	Sense Bit	DIT Bit	Condition
Open	OFF	1	0	Normal
Closed	ON	1	1	Alarm
Open	OFF	0	1	Alarm
Closed	ON	0	0	Normal

7.5 Chatter Filter

The Chatter filter is a software filter used to eliminate problems cause by chattering inputs (faulty inputs that change state spuriously and overburden the system with useless change-of-state information). Consider a particular input. If five changes of state (COS) occur on this input, and the time between each successive change of state is less than the “chatter time”, then this input is deemed to be chattering. This means that subsequent change-of-state information relating to the input will not generate any events. Once the input is deemed to be Chattering and is disabled, it will remain disabled until no changes of state occur for at least twice the “Chatter time”. When the input is then re enabled the last discarded change of state, if any, is placed into the Queue to ensure the status of the input is always at the correct state after an input has “chattered”. An example is shown below with a chatter setting of 1.2s.

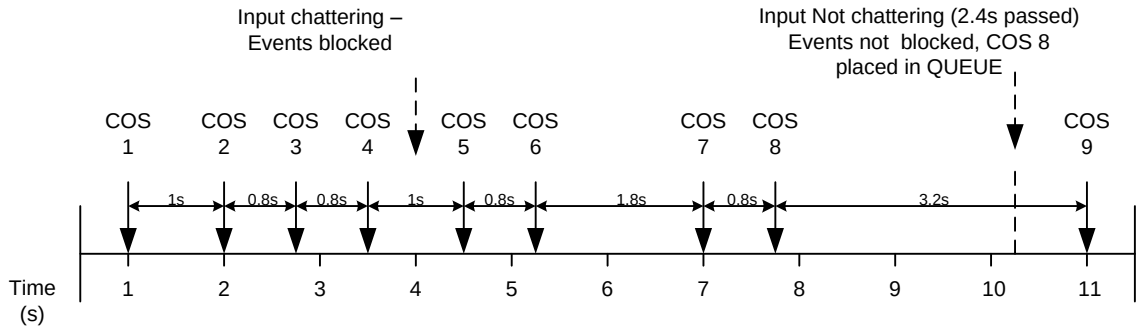

Figure 15 – Chatter Filter operation

Note that COS 1,2,3,4,5 are five changes of state which occur such that the time between successive changes of state is less than the “chatter time”. As a result the input is deemed to be chattering after COS 5. Since the input is now chattering, COS 6,7,8 are ignored. After twice the chatter time (shown by the dashed line), the input is re enabled and COS 8

is placed in the Event queue. The Chatter filter can be configured to be between 0 and 65534ms in 1ms increments.

7.6 On/Off Delays

Delays can be broken up into two major functions, Negative and Positive delays. Positive delays are used to block events from being generated due to transient plant conditions and can be configured to be between 0 and 3276ms for each input. Negative delays are used to tune your system and compensate for relay delays and can be configured to be between 0 and -100ms for each input.

7.6.1 Positive On Delays (Into Alarm)

A positive On delay blocks Normal to Alarm events from being generated until the input has remained at the new state for the duration of the delay setting. If the input remains at the Alarm state for longer than the delay time an event is generated with an event time equal to the time when the input changed, not the time at which the 32SOE generated the event.

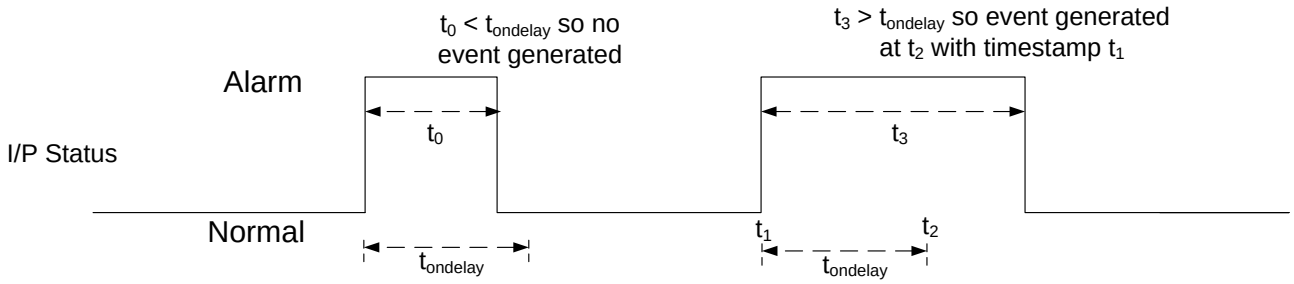

Figure 16 – Positive On Delay operation

7.6.2 Positive Off Delays (Return to Normal)

Positive Off delays work in the exact same manner as positive On delays except they work on Alarm to Normal transitions.

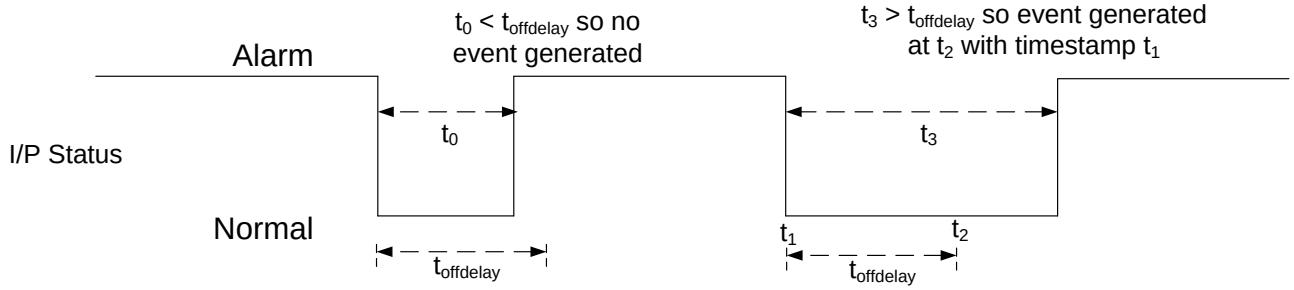

Figure 17 – Positive Off Delay operation

7.6.3 Negative Delays (Contact lag compensation)

Negative delays compensate for delays in the signal path. This is helpful in tuning your system to compensate for different relay open/close times. An event is generated as soon as the input changes, however the events time is backdated by the negative delay setting. For example, if one had two signal paths, one with a delay of 2ms and the other with a delay of 5ms, the path with a 5ms delay can have a delay setting of minus 5ms while the 2ms path can have a delay setting of minus. If a signal is now simultaneously applied to both of these paths, the 32SOE will timestamp these inputs with the same time.

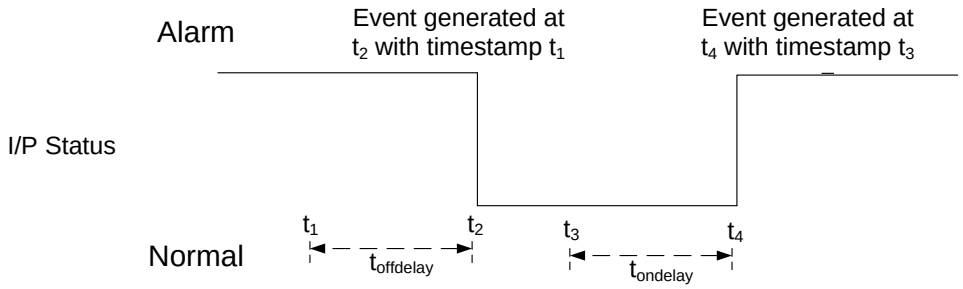

Figure 18 – Negative delay operation

7.7 Queue Head type

The 32SOE module has an event Queue which can hold 9362 events. This Queue can be configured to have a Master or a Slave head. If the Queue becomes full a master head will discard any new events while a slave head will discard old events to make space for any new events. The recommended setting is Slave as this allows new events to be processed, discarding the oldest events in the Queue.