MODEL 5100 VOTING LOGIC MODULE

DESCRIPTION

The SST Model 5100 Multi-Input Voting Logic Module is used to monitor the status of up to 14 different points in a hazard zone, and report when a selectable number of these points is in an alarm condition. The 14 inputs on the Model 5100 Module are normally fed from the alarm outputs of other modules in the NOVA-5000 System. The module provides two solid state outputs. One output is energized when **any one (1)** of the inputs is in alarm. The second output is energized when **two (2) or more** are in alarm. For hazard zones that consist of more than 14 alarm points, two or more Voting Logic Modules may be connected together in *cascade mode,* so that even the largest zones can be voted.

! If the Voting Modules are *not cascaded*, the voted output may be set to require **three (3), four (4), or five (5)** inputs in alarm to energize the voted output.

A digital readout on the front panel indicates the quantity of points that are in alarm at any time. As long as there are no alarms, this readout will be blanked (turned off). When the first input point goes into alarm, the readout will display the digit **"**, indicating that one point is in alarm. The displayed number increases from **2 to 14** as additional alarms are detected.

In the normal configuration, the voting module accepts inputs from 14 sources. For smaller systems, the Model 5100 Voting Module can be reconfigured into two separate channels, each one having **six (6)** inputs.

LOGIC DIAGRAMS

Figure 5100-1 shows, in simplified form, the internal logic in the Voting Module for both the one-channel and two-channel configurations.

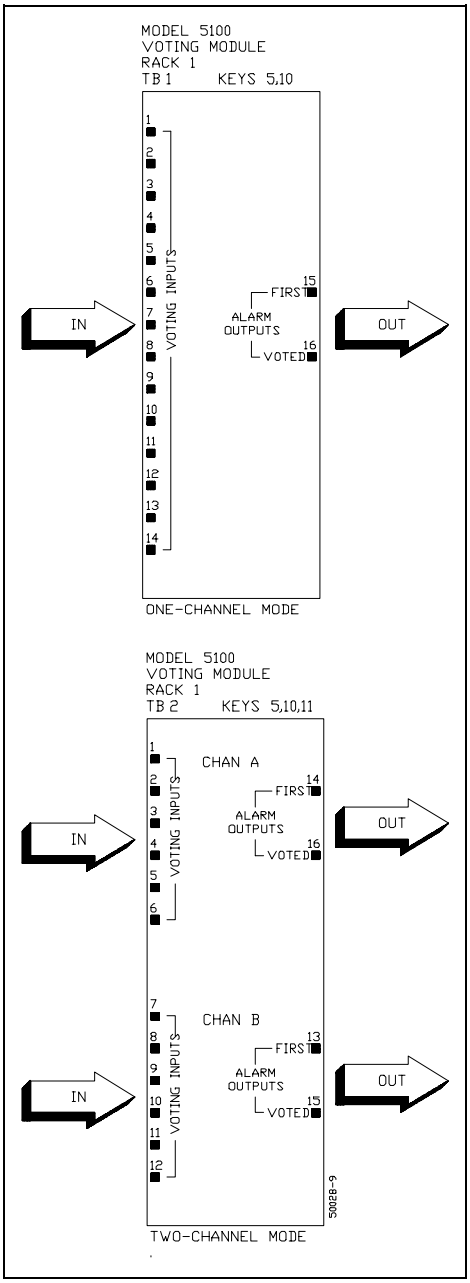

Figure 5100-1 Logic Diagrams

INPUT/OUTPUT CONNECTIONS

All connections are made to the terminal block associated with the module on the back of the Model 5300 Module Mounting Rack. Each available signal is described below.

Alarm Inputs — Terminals 1 through 14 (1 through 12 in two-channel mode)

The alarm inputs are electrically Standard Logic Inputs, as described in section 5000 of this manual. This means that short circuits to 0 VDC, sinking of 1.1 mA or applying voltages below 3 VDC activate the input while voltages greater than 8 VDC or open circuits deactivate the input. Disconnected, i.e. open, alarm inputs are automatically pulled up to the positive power supply voltage (24 VDC) via 33 kOhm resistors. The alarm inputs incorporate filtering to eliminate response to noise transients and spikes. Although the filtering and sampling technique used by the Model 5100 Voting Logic Module provides some protection against EMI (electromagnetic interference), connecting the alarm inputs directly to field devices is not recommended. If the wires are very long and/or intensive interference from transformers, high voltage cabling, high power switching devices etc. is encountered, false alarms or, worse, suppression of alarms may occur.

Alarm Outputs —- terminals 15 and 16 (13 through 16 in two-channel mode)

First alarm and Voted alarm outputs are provided for each channel.

The FIRST ALARM outputs are activated when **any one** alarm input is active. These outputs may be connected to an alarm input on another Model 5100 Voting Logic Module when modules are cascaded.

The VOTED ALARM outputs are activated when the number of alarm inputs per channel is **equal to or greater than** the voting criteria. These outputs may be connected in parallel with voted outputs on other Voting Logic Modules when multiple voting modules are used.

All solid state outputs are open collector current sinks suitable for up to 300 mA current at 1.2 volts maximum and are not latched, i.e. they go inactive whenever the corresponding alarm condition disappears.

Outputs to the Module Rack Back Plane Buses

A FAULT PULSE is generated whenever an internal fault or power fault is detected in the module. An ALARM PULSE is generated whenever an increase in the number of alarms occurs, if this option is selected.

MODULE SETUP INSTRUCTIONS

Use Dual-In-Line switch (DIP) S1 on the module to program the operating modes. Each position of the switch is labeled on the board. The label “OPEN” or “OFF” on the switch indicates the OFF position. DIP switch S2 on the module is provided for future enhancements. Any settings on this switch are ignored.

Setting Numeric Display for Latching/Non-Latching Operation

The latching characteristics of this display may be set, using DIP switch sections 1 and 2. “Latching” means that the maximum number of points that have reported an alarm since the module was last reset is displayed even if the alarm condition disappears.

! These settings only apply to the numbers displayed on the digital display. The FIRST and VOTED alarm outputs of the module are always non-latching.

Non-Latching Mode

Set S1-1 and S1-2 off. No readout numbers are latched, i.e. the readout always displays the number of alarm input points currently in alarm and goes back to blank display after the alarm condition disappears.

Latch Voted Alarms only

Set S1-1 on and S1-2 off. In this mode only alarm numbers equal or greater than the programmable alarm threshold (PAT) are latched.

Latch All Alarms

Set S1-1 and S1-2 on. All alarm numbers greater than zero are latched, i.e. even the occurrence of first alarms is latched.

Setting the Module to Cascade Mode

! Cascade Mode automatically selects the programmable alarm threshold (PAT) for **two (2)** inputs in alarm. PAT setting of 3 or four are not permitted in cascade mode.

With section 3 of S1 ("CASCADE") the function of the alarm input 14 (or inputs 6 and 12 in the two-channel mode) is defined. In the NON-CASCADE mode (S1-3 “OFF”) input 14 is used as a normal alarm input, just like the alarm inputs 1 through 13. In the CASCADE mode (S1-3 “ON”) alarm input 14 (or inputs 6 and 12 in the two-channel mode) is used to connect the solid state FIRST ALARM output of another Model 5100 module. In this case the signal received on alarm input 14 (or 6 and 12) is not evaluated for display on the digital readout since the other Model 5100 module provides the proper readout anyway.

Figure 5100-2 shows an example for the suggested wiring of two voting modules in cascade mode. In this example 20 alarm sources have to be monitored. Sources 1 through 13 are wired to the alarm inputs of voting module 1, which is operated in normal mode. Sources 14 through 20 are wired to the alarm inputs of voting module 2, which is operated in cascade mode. The first alarm solid state output of voting module 1 is

connected to the cascade input (alarm input 14) of voting module 2. The voted alarm solid state outputs of both voting modules are connected to form a “wired logical OR” function with respect to the overall outputs, i.e. either solid state output can activate the overall output. The operation of this circuit is as follows:

- With no alarm sources active, neither first alarm nor voted alarm solid state outputs are activated. The overall outputs remain inactive. The readouts of both modules remain blank.
- With alarm source 3 active, voting module 1 activates its first alarm solid state output and displays “01” on its readout. Voting module 2 detects the first alarm on its cascade input, and activates its first alarm output. The display on Voting module 2 will remain blank, unless the display is set for latching. The overall first alarm output is activated.
- With alarm sources 3 and 10 active, voting module 1 activates its first alarm solid state output and its voted alarm solid state output. Module 1 displays “02” on its readout.
- With alarm sources 16 and 20 active, voting module 2 activates its first alarm and voted alarm solid state outputs. This activates the overall first alarm and voted alarm outputs. Module 2 displays “02” on its readout.
- With alarm sources 3 and 18 active, voting module 2 activates its voted alarm solid state output since its cascade input is activated by the first alarm solid state output of voting module 1. This activates the overall first alarm and voted alarm outputs.

Setting the Alarm Pulse Mode

The inputs to the Model 5100 Voting Logic Module are normally fed from the alarm outputs of other NOVA-5000 modules. In this case, these other modules will provide any required system alarm output capabilities. In some cases, the Model 5100 Module may

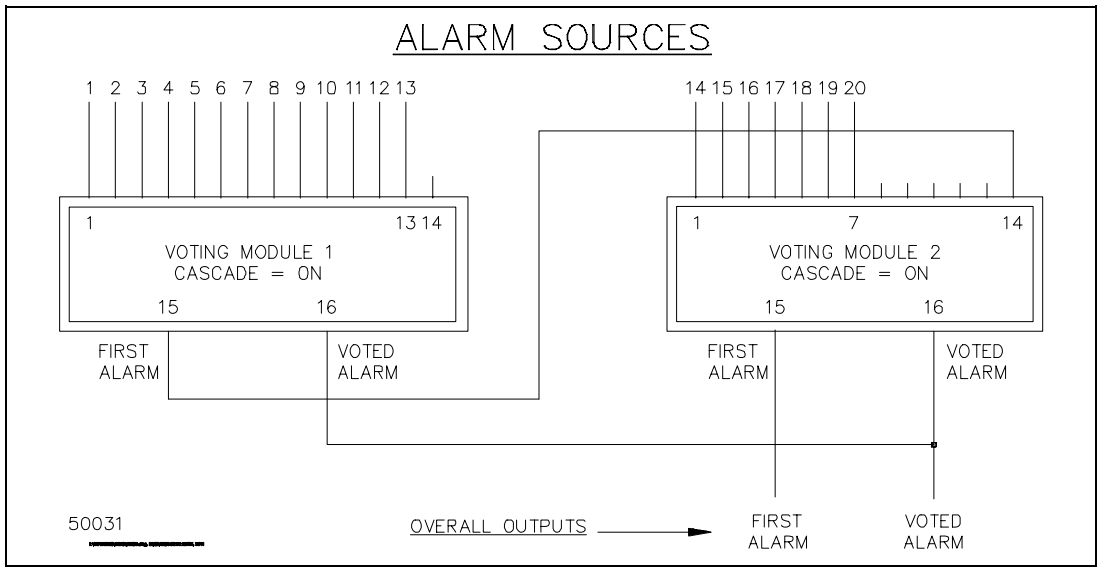

Figure 5100-2 Wiring Method to "Cascade" two Modules

be triggered by contact closures in external alarm or process monitoring devices. In this case, the Model 5100 Module generates a short pulse signal which is transmitted on the back plane system alarm bus every time the displayed number on the digital readout **increases**, thus alerting personnel to the increased hazard.

Use section 4 of DIP switch S1 ("ALM PLS") to set the alarm pulse generation. In the “OFF” position no alarm pulse will be generated on the back plane bus. In the “ON” position an alarm pulse will be generated whenever the number of detected alarms increases.

Setting one- or two-channel Operating Mode

Set section 5 of DIP switch S1 ("ZONES") for one-channel or two-channel operating mode. In the “ON” position the module operates in the one-channel mode; all 14 inputs are voted. In the “OFF” position the module operates in the two-channel mode; two independent groups of 6 inputs are voted.

Setting the Programmable Alarm Threshold (PAT) for Voting

The switch sections 6 and 7 of S1 ("PAT A" and “PAT B”) define the programmable alarm threshold. The module’s Voted Alarm Output is activated whenever the number of inputs in alarm is equal to or greater than the PAT. In two-channel mode operation the number of alarms applies per channel. The following table shows the PAT resulting from the setting of the DIP switches PAT A and PAT B:

S1-6	S1-7	PAT (Number of inputs in alarm)
OFF	OFF	2 or more
ON	OFF	3 or more
OFF	ON	4 or more
ON	ON	5 or more

! If the Voting Module is set for Cascade Mode, the settings on these switches have no effect. Cascade Mode automatically sets the PAT to two (2); the voted output(s) will be energized when 2 or more inputs are in alarm.

Setting DIP Switch S2

This switch is reserved for future use. Any settings on it are ignored by the Voting Module.

Module keying

Before installing each Model 5100 Voting Logic Module into the wired slot in the mounting rack, be sure that the snap in covers have been installed at keying locations 5 and 10 of the rack keying strip. See “Module Keying Instructions” in the mounting rack section of this manual for complete details. Don’t forget to use the Optional Keying Locations if you are not setting the DIP switches on all your Voting Modules identically.

! Installation of the keying system is very important. A module can be permanently damaged if it is plugged into a slot which is wired for a different type of module.

Modules may be inserted into or unplugged from the rack at any time, even with the power on. This will not damage the modules nor generate any false alarms, but will of course

generate a fault alarm. If you are inserting a replacement module, the DIP switch settings of that module must duplicate those of the original module to ensure identical operating modes.

OPERATING INSTRUCTIONS

During normal operation the Model 5100 Voting Logic Module requires no operator interaction. Alarms and faults are automatically displayed and the module automatically reacts to ACKNOWLEDGE, RESET and LAMP TEST signals provided by the back plane bus.

Power Lamps (Green and Yellow)

The GREEN POWER LED is illuminated continuously when both 24 VDC supply inputs are within the expected range. This LED is off if an internal fuse blows, or power is lost on either 24 VDC input.

! A blinking green POWER LED along with interruption of the fault loop indicates that the microprocessor in the Voting Module encountered problems and performed a self-reset. If this occurs frequently, the module should be replaced.

The YELLOW POWER LED starts blinking whenever either of the 24 VDC inputs from the power supply is not within the expected range. When the power fault is acknowledged, the blinking becomes steady. When the power fault condition disappears, the POWER FAULT LED is automatically switched off.

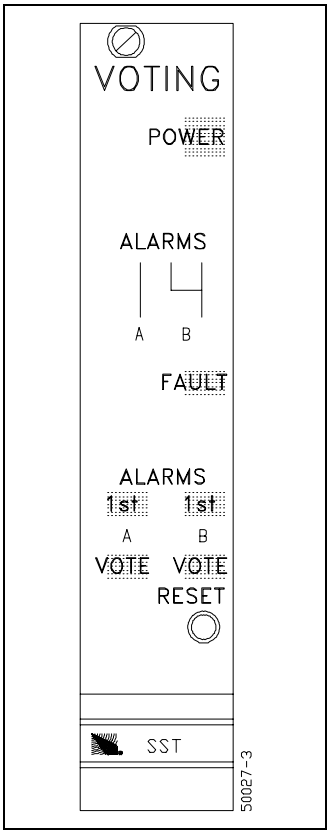

Figure 5100-3 Front Panel

Alarms Digital Readout

The digital readout displays the number of activated alarm inputs. This number may vary between 1 and 14 or between 1 and 7 in the two-channel mode. The number “0” i.e. no alarms detected) is not displayed. In two-channel mode, the left hand digit indicates the number of alarms on channel A, and the right hand digit indicates the number of alarms on Channel B.

In the CASCADE mode the display can only vary between 1 and 13 (or 1 and 5 in the two-channel mode) because the alarm input 14 (or 6 and 12 in the two-channel mode) is used as the cascade input.

Fault Lamp (Yellow)

The FAULT LED indicates an internal failure in the module. This can be due to the following conditions:

- The internal self test has detected a fault in the internal components,

- One of the solid state alarm outputs should be energized, but the output voltage at the corresponding terminal is not in the desired range (this can be due to external short circuits or driver chip failure).

When the hardware fault is acknowledged with the ACKNOWLEDGE signal of the back plane bus, the blinking of the FAULT LED is switched to constant light. If the fault condition disappears now, the FAULT LED is switched off.

First Alarm Lamps (Red)

The “1st” alarm LED illuminates whenever one or more alarm inputs are activated. The LED blinks until acknowledged. A reset signal from the NOVA-5000 System or the reset button on the module front panel extinguishes the first alarm lamp.

Voted Alarm Lamps (Red)

The LED marked “VOTE” starts to blink when the number of inputs in alarm equals the programmed criteria (2, 3, 4 or 5 alarms). The blinking is converted to constant light when the back plane bus ACKNOWLEDGE signal is activated. Provided no alarm conditions are pending, all VOTED ALARM LEDs are switched off when the back plane bus RESET signal is activated or when the reset button on the module is pressed.

Reset Pushbutton

This button may be pressed for individual reset of alarms or for testing the LEDs and readout on the front panel of the Voting Logic Module. Pressing the reset button clears the numbers on the readout and the fault and alarm LEDs, provided the corresponding alarm or fault conditions are no longer active. If alarm or fault conditions are still pending after the reset pushbutton has been pressed, they will be reinitiated.