Commander Logic

Customizing Sentry IT Controller Logic

Safety Note

- Commander Logic changes may impact the safety performance of the Sentry IT Controller
- These instructions are intended to aid knowledgeable system integrators
- Changes to the logic and functionality of the Sentry IT Controller is the sole responsibility of the person(s) making the changes. Sierra Monitor Corporation is not liable for any loss or damage these changes might create.

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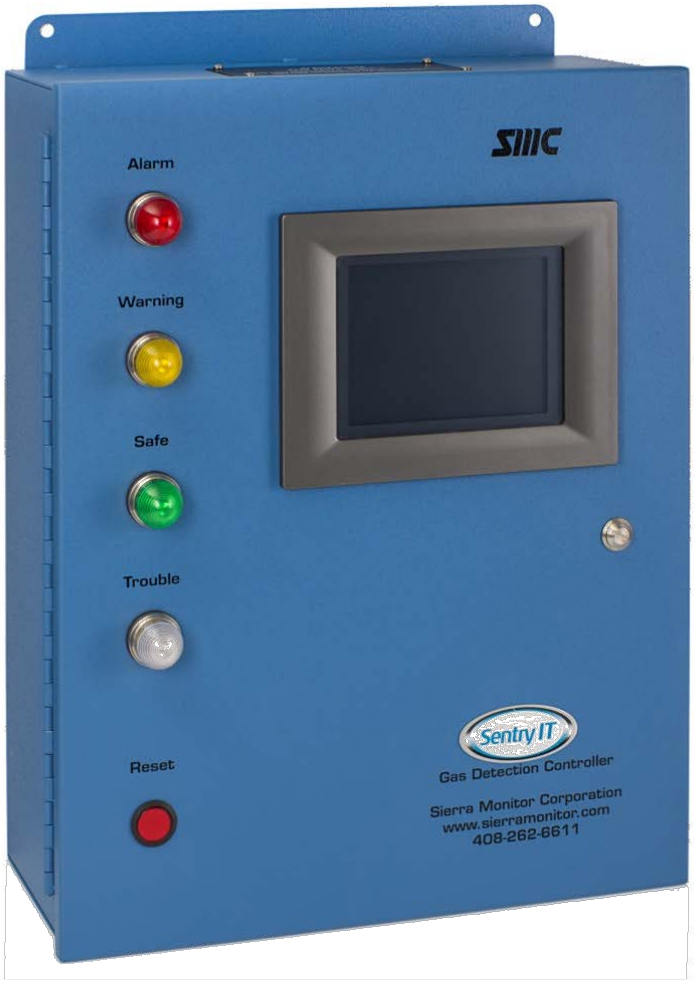
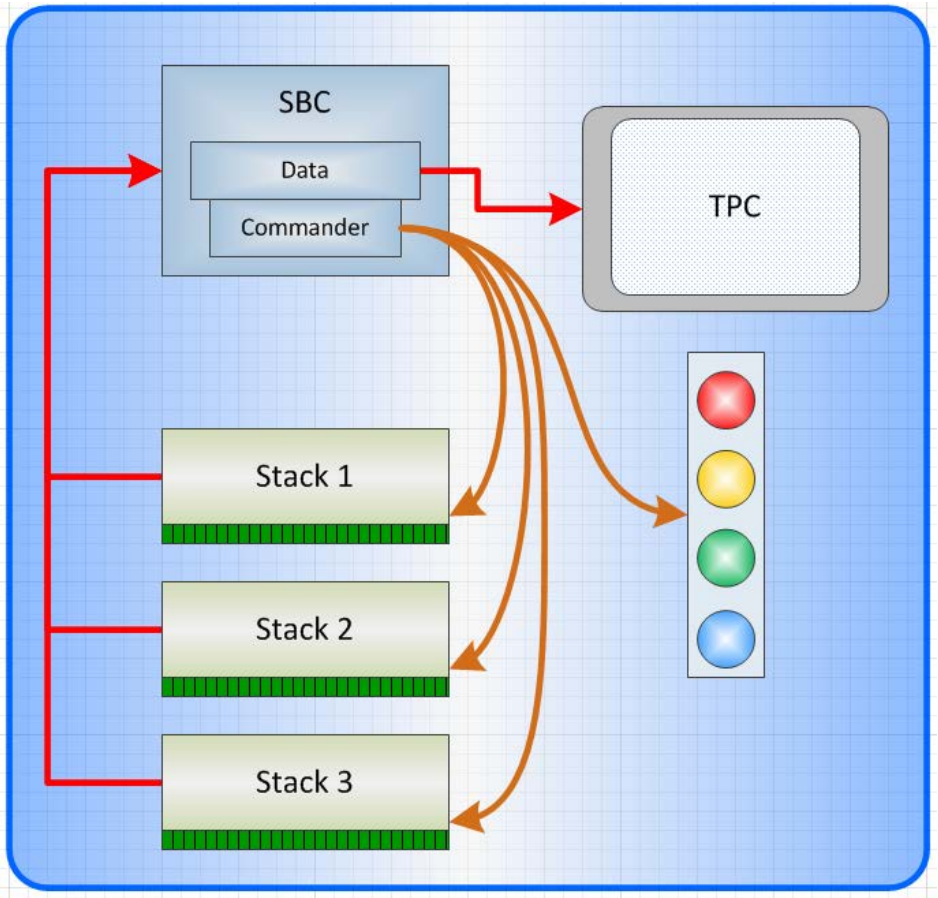


Introduction

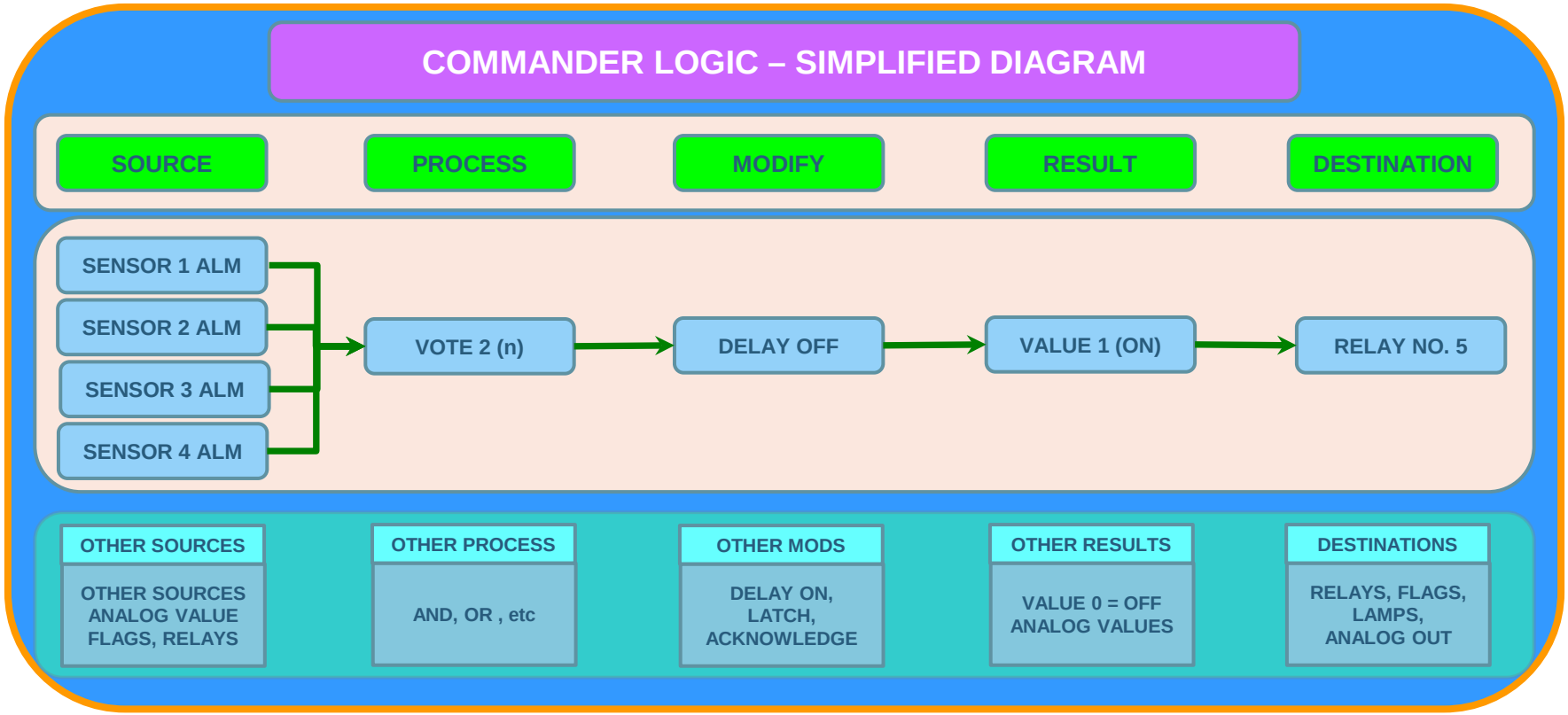
- Commander Logic:
  - Resides in the Sentry Controller central processor
  - Is configured using an easy to create CSV instruction set
  - Can be modified off-line and transferred to the controller via USB memory stick
- Commander Capabilities:
  - Enables integration of multiple points of data for logic based processing
    - Points of data can be
      - Sensor or Dry Contact inputs to the Sentry IT controller
      - Calculated values based on the inputs
  - Manages all controller relay functions
  - Manages all front panel LED indicator functions (factory set)
    - Note: Default logic controls front panel indicators unless it is overwritten by specific Commander logic instructions – consult factory
  - Compiles a customized History log
- Commander Power
  - Combines multiple inputs to determine logical conditions
  - Uses logical conditions to drive physical outputs
  - Allows unique and individual controls of more than forty relays

Sentry IT Controller

- Controller Architecture
  - Stacks
    - Field inputs - sensor and actuators
    - Field outputs - relays and analog outputs
  - Single Board Computer (SBC)
    - Manages data
    - Processes Commander instructions
  - Touch Panel Computer (TPC)
    - Operator interface displays system status
    - Displays Commander driven History Report
    - Displays Commander Project Title
    - Displays SMC Factory Order
    - Used for upload and download of Commander logic
  - Commander Logic
    - Drives field outputs
    - Controls panel lamps
    - Creates History Log



Commander Logic Overview



Creating a Commander Logic file

Upload existing userlogic.csv or open a saved userlogic.csv template

Saved .csv or .xls file

Excel Worksheet

Edit

Use project planning configuration sheets

Save .csv file

Create new userlogic.csv and download

At root directory of USB stick create folder: Commander.
Copy userlogic.csv file to be loaded to the Commander folder
Connect the USB to the USB port on the back of the TPC.
On the TPC display
- Press M key 5 times to show: Press E for System Management
- Press E
- Select Configuration
- Select Commander Logic
- Select Install User Logic from USB.

Follow the steps on the TPC display to install the Commander logic

Terminology

Term	Usage
Userlogic.csv	Commander logic file name for every Sentry-IT Controller
Process Block	A line in the Userlogic.csv file describing a single logical process step
Lamp (block)	A process block that drives a status LED lamp on the controller front panel
Flag (block)	A process block that creates a logical result to be used by other process blocks
Relay (block)	A process block that drives the status of a relay (digital output)
Analog Output	A process block that drives the value of a 4-20mA output

Sections of the Userlogic file

- Column Titles
- Fixed Default Blocks
  - Lamp logic
  - Trouble logic
  - Stack trouble history log
- Project Title
  - Project Title
  - Factory order number
- Customer Logic

Block Output	Tag Name	Function	On Setpoi	Change	Off Setpoi	Invert Out	On Delay	Off Delay	Min Runti	Latch Hi	Rising	Display M	Source 1
// Add Sensor to loop A sensor 9 for Room 9 Relay 9 stack 2 for Warning and Relay 1 stack 3 for Alarm per Alfredo 11-9-15													
// 11-10-15_LL Channel 9 and channel 10 of AI stack did not work. Lan modified the file to add sensor 11 for room 9													
//3-3-16_LL: Updated the commader file to Rev A per Config Rev A													
// LAMP Logic													
FL-94	No Valid Sensors	OR	-	-	-	YES	-	-	-	NO	-	-	C-001-V
FL-95	SYSTEM TROUBLE	OR	-	-	-	-	-	-	-	NO	-	YES	FL-94
FL-96	COMMON ALARM	OR	-	-	-	-	-	-	-	YES	-	YES	C-001-H
FL-97	COMMON WARNING	OR	-	-	-	-	-	-	-	NO	-	YES	C-001-L
FL-98	Not S High Alarm	NOR	-	-	-	-	-	-	-	NO	-	-	FL-96
LAMP-1	High Alarm LED	AND	-	-	-	-	-	-	-	NO	-	-	FL-96
LAMP-2	Low Alarm LED	AND	-	-	-	-	-	-	-	NO	-	-	FL-97
LAMP-3	Normal LED	NOR	-	-	-	-	-	-	-	NO	-	-	FL-95
LAMP-4	Trouble LED	AND	-	-	-	-	-	-	-	NO	-	-	FL-95
// Default Trouble Logic - Note that a trouble on a stack will energize all trouble relays through the reset line.													
RL-001-T	Stack 1 Trouble	OR	-	-	-	-	-	-	-	NO	-	-	FL-95
RL-002-T	Stack 2 Trouble	OR	-	-	-	-	-	-	-	NO	-	-	FL-95
RL-003-T	Stack 3 Trouble	OR	-	-	-	-	-	-	-	NO	-	-	FL-95
RL-004-T	Stack 4 Trouble	OR	-	-	-	-	-	-	-	NO	-	-	FL-95
RL-005-T	Stack 5 Trouble	OR	-	-	-	-	-	-	-	NO	-	-	FL-95
RL-006-T	Stack 6 Trouble	OR	-	-	-	-	-	-	-	NO	-	-	FL-95
// Default History Report Logic - Only the Stack in Trouble will be reported													
FL-10	STACK 1 TROUBLE	OR	-	-	-	-	-	-	-	NO	-	YES	C-001-T
FL-11	STACK 2 TROUBLE	OR	-	-	-	-	-	-	-	NO	-	YES	C-002-T
FL-12	STACK 3 TROUBLE	OR	-	-	-	-	-	-	-	NO	-	YES	C-003-T
FL-13	STACK 4 TROUBLE	OR	-	-	-	-	-	-	-	NO	-	YES	C-004-T
FL-14	STACK 5 TROUBLE	OR	-	-	-	-	-	-	-	NO	-	YES	C-005-T
FL-15	STACK 6 TROUBLE	OR	-	-	-	-	-	-	-	NO	-	YES	C-006-T
Title	Maintenance 1	OR	-	-	-	-	-	-	-	NO	-	-	
Order	154439	OR	-	-	-	-	-	-	-	NO	-	-	
FL-21	ANY SENSOR WARNING	OR	-	-	-	-	-	-	-	NO	-	YES	C-001-L
FL-22	ANY SENSOR ALARM	OR	-	-	-	-	-	-	-	YES	-	YES	C-001-H
FL-23	Digital Inputs stack 4	OR	-	-	-	-	-	-	-	YES	-	YES	S-004-1
FL-24	Digital Inputs stack 5	OR	-	-	-	-	-	-	-	YES	-	YES	S-005-1

Process Block Structure

Col	Title	Description
A	Block Output	Defines the use of the process block result – e.g. Relay state or Flag State
B	Tag Name	16 character block name – user determines case and significance
C	Function	Determine how the source values are mathematically processed – OR, AND etc.
D	On Setpoint	Used for analog value processing only – turns the block input condition true
E	Change	Future use for historian (ignore)
F	Off Setpoint	Used for analog value processing only – turns the block input condition false.
G	Invert Output	Inverts a block result from true to false or false to true
H	On Delay	Delays the block change result for the number of hours:minutes:seconds
I	Off Delay	Delays the block return to normal for the number of hours:minutes:seconds
J	Min Runtime	Continues the changed output for a minimum time regardless of the input stimulus state
K	Latch Hi	Holds the output in the switched state until a manual reset is activated
L	Rising	Defines if the input will rise above a set point or fall below a set point
M	Display Mode	Determines when a change of state will be written to the History log.
N	Source (1….48)	Up to 48 source values can be identified for processing by each block

Process Block Detail (1/_)

- Block Output (Type) **COLUMN A**
  - The process block results in a value, the Block Output. The value will be used accroding to the type of Block:
    - Flags are used to compute intermediate values or to generate History Log records
    - Relay blocks are used to cause the respective relay address to be On or Off
    - LAMP blocks drive the respective display lights on the door of the controller
  - Block names must be unique and they must follow the conventions
    - FL-01 through FL-510
    - RL-001-1 through RL-003-16 (typical) according to the stack and relay address
    - RL-001-T through RL-003-T Common Trouble relays for input stacks
    - LAMP-1 through LAMP-4 matching four indicators on the front panel
      - Note: Certain Flags and all LAMPS are reserved for system use and not exposed to the user.
- Tag Name **COLUMN B**
  - The tag name is 16 characters free form by user discretion.
  - Recommended convention is to capitalize all names that will be written in the History Log and use lower case for non-reporting Tags.

Process Block Detail (2/_)

- Function COLUMN C
  - Allowable Boolean Logic functions are:
    - OR, AND, NOR, NAND, AVE, VOTE-01 : VOTE-48 K-EVENT
      - Vote requires a further qualifier to identify how many of the source values must meet the criteria for the function result to be true
- On Setpoint COLUMN D
  - Allowable values are integers from 0001.0
  - Used to compare an analog input value against a set-point to establish a true condition
  - The true condition is subject to other qualifiers such as delay on/off
- Change COLUMN E
  - Future for historian
- Off Setpoint COLUMN F
  - Allowable values are integers from 0001.0
  - Used to compare a rising analog value against a set-point to establish a true condition
  - The true condition is subject to other qualifiers such as delay on/off

Process Block Detail (3/_)

- Invert Output COLUMN G
  - Allowable responses NO, YES
  - Invert Output defaults to NO.
    - If the value is set to "YES" the process block value will be inverted . (1 inverts to 0, 0 inverts to 1)
- On Delay COLUMN H
  - Allowable values are from 00:00:00 and higher (HH:MM:SS syntax important)
  - The period is set as above for the time that the On setpoint is exceeded until the block output is activated. If during this wait period the input level is less than the Off setpoint the output will not activate and the delay timer will reset.
- Off Delay COLUMN I
  - Allowable values are from 00:00:00 and higher (HH:MM:SS syntax important)
  - The period is set as above for the time that the Off setpoint is exceeded until the block output is activated. If during this wait period the input level is less than the On setpoint the output will not activate and the delay timer will reset.
- Minimum Run Time COLUMN J
  - Allowable values are from 00:00:00 and higher (HH:MM:SS syntax important
  - Used to compare a rising analog value against a set-point to establish a true condition
  - The true condition is subject to other qualifiers such as delay on/off

Source Syntax – Modbus Stack

Logic: Columns A -> M	Sources: Columns N –> BI (48)

- Analog Values: A-00A-1 thru 16 : A-00B-1 thru 16 Analog Value – Loop A/B –Sensor Number
- Warning Alarm States: L-00A-12: Warning Condition – Loop A – Sensor Number 12
- Alarm States : H-00A-12: Alarm Condition – Loop A – Sensor Number 12
- Relay Warning: RL-00A-1L thru RL-00A-16L : RL-00B-1L thru RL-00B-16L
- Relay Alarm: RL-00A-1H thru RL-00A-16H : RL-00B-1H thru RL-00B-16H
- Common Warning C-00A-L Loop A sensors 1 through 16, C-00B-L Loop B sensors 17 through 32
- Common Alarm C-00A-H Loop A sensors 1 through 16, C-00B-H Loop B sensors 17 through 32
- Valid Sensor V-00A-1 through V-00A-16 and V-00B-1 through V-00B-16
- Trouble Alarm C-00A-T C-00B-T Trouble Loop A or Trouble Loop B
- Zone Group A-00A-1 thru 16 : A-00B-1 thru 16 Analog Value – Loop A/B –Sensor Number

Discussion:

1. Up to 48 sources can be assigned to a single process block
2. Maximum number of Modbus stacks is 1
3. Modbus stack is always in stack position 1
4. The Modbus Stack has two serial channels: Loop A and Loop B
5. Modules on Loop A (selector switch 1 -> 16) are 1 through 16
6. Modules on Loop B (selector switch 1 -> 16) are 17 through 32
7. Zone Group identifies a group of sensor inputs that will be combined into a display group – all parameters active.

Source Syntax – Analog Stack

Logic: Columns A -> M	Sources: Columns N –> BI (48)

- Analog Values: A-001-16 : Analog Value – Stack Number 1 – Sensor Number 16
- Warning Alarm States: L-001-12: Warning Condition – Stack Number 1 – Sensor Number 12
- Alarm States H-001-12: Alarm Condition – Stack Number 1 – Sensor Number 12
- Common Warning C-001-L
- Common Alarm C-001-H
- Valid Sensor V-001-1 through V-001-16
- Trouble Alarm C-001-T.
- Zone Group: A-001-16 : Analog Value – Stack Number 1 – Sensor Number 16

Discussion:

1. Up to 48 sources can be assigned to a single process block
2. Each Analog Stack has 16 channels
3. Multiple Analog Stacks allowed but only 32 channels can be active
4. Zone Group identifies a group of sensor inputs that will be combined into a display group – all parameters active.

Source Syntax – PSG Stack

Logic: Columns A -> M	Sources: Columns N –> BI (48)

- Analog Values: A-001-16 : Analog Value – Stack Number 1 – Sensor Number 16
- Warning Alarm States: L-001-12: Warning Condition – Stack Number 1 – Sensor Number 12
- Alarm States H-001-12: Alarm Condition – Stack Number 1 – Sensor Number 12
- Common Warning C-001-L
- Common Alarm C-001-H
- Valid Sensor V-001-1 through V-001-16
- Trouble Alarm C-001-T.

Discussion:

1. Up to 48 sources can be assigned to a single process block
2. Each PSG Stack has 2 loops A & B
3. Each loop supports up to 8 modules: switch positions 1 - 8
4. Loop A modules are Commander modules1 through 8
5. Loop B modules are Commander modules 9 through 16
6. Two PSG stacks required for 32 modules
7. Zone Group identifies a group of sensor inputs that will be combined into a display group – all parameters active

Source Syntax – Others

Logic: Columns A -> M	Sources: Columns N –> BI (48)

- Digital Input Stack
  - Input Status: S-002-1 : Digital Input Status – Stack Number 2 – Sensor Number 1
- Computed Logic Values
  - Flag: F-001 through F-450
  - Relay State: RL-001-1 Relay 1, Stack 1
- Special Values
  - Flash FLASHER

Discussion:

1. Each Digital Input Stack has 8 supervised dry contact inputs
2. Digital Stacks can be used at stack addresses 1 through 6
3. Computer Logic Values are the result from other process blocks
   a. Flags are often used as sources for further logic processes
   b. Relay states are not preferred as sources.
4. Adding “FLASHER” as source for any Relay will cause the Relay to cycle on and off.
5. The cycle time is user configured via the delay-off function.

Commander Sample solutions

1. Creating Display Zones
2. Zone voting
3. Fan controls
4. Reset and Acknowledge
5. History Log
6. Analog Output

Solution 1 – Creating Display Zones

- Applications:
  - Grouping Sensors into manageable display groups
  - Use Zones for default display on the Touch Panel
  - The bar graph display groups sensors by Zones
- Creating a Zone
  - In Commander use the Block Address ZN-01 etc.
  - Provide a Tag Name that will be meaningful on the TPC
  - Use the OR function
  - Identify the members of the Zone using the Analog value source
  - The remaining parameters are not used in Zone setting.

//Zone

Block Address	Tag Name	Function	On Setpoint	Change	Off Setpoint	Invert Output	On Delay	Off Delay	Min Runtime	Latch Hi	Rising	Display Mode	Source 1	Source 2	Source 3	Source 4
ZN-01	ZN-01: ROOM 1	OR	~~20~~	~~0~~	~~19~~	~~NO~~	~~0:05~~	~~0:00~~	~~0:00~~	~~NO~~	~~YES~~	~~YES~~	A-00A-1	A-00A-2	A-00A-3	A-00A-4
ZN-02	ZN-02: ROOM 2	OR	~~20~~	~~0~~	~~19~~	~~NO~~	~~0:05~~	~~0:00~~	~~0:00~~	~~NO~~	~~YES~~	~~YES~~	A-00A-5	A-00A-6	A-00A-7	A-00A-8
ZN-03	ZN-03: ROOM 3	OR	~~20~~	~~0~~	~~19~~	~~NO~~	~~0:05~~	~~0:00~~	~~0:00~~	~~NO~~	~~YES~~	~~YES~~	A-00A-9	A-00A-10	A-00A-11	A-00A-12
ZN-04	ZN-04: ROOM 4	OR	~~20~~	~~0~~	~~19~~	~~NO~~	~~0:05~~	~~0:00~~	~~0:00~~	~~NO~~	~~YES~~	~~YES~~	A-00A-13	A-00A-14	A-00A-15	A-00A-16

Solution 2 – Zone Voting

- Applications:
  - Voting can be used to avoid critical actions until the alarm is confirmed by multiple sensors
- Creating a Voting Zone:
  - The Block Address of a Voting Zone is recommended to be a Flag
    - This allows unique non-display tag names for documentation
    - A Relay, with a reporting name, can read the Flag
    - It is OK to create the voting zone directly on the Relay
  - Use the Function VOTE n
    - Where n is the number of votes required to change the flag state
    - Syntax: there is a space between the word vote and the number
  - Sources
    - Sources may be L (warning), H (alarm) or other Flag states
    - Up to 48 sources can be named in one Voting Group
    - Any Source can be used in more than one Voting Zone

Block Address	Tag Name	Function	On Setpoint	Change	Off Setpoint	Invert Output	On Delay	Off Delay	Min Runtime	Latch Hi	Rising	Display Mode	Source 1	Source 2
FL-20	Module 1 and module 2	VOTE 2	-	-	-	-	-	-	-	~~NO~~	-	-	L-001-1	L-001-2
FL-21	Module 3 and module 4	VOTE 2	-	-	-	-	-	-	-	~~NO~~	-	-	L-001-3	L-001-4
FL-22	Module 5 and module 6	VOTE 2	-	-	-	-	-	-	-	~~NO~~	-	-	L-001-5	L-001-6
FL-23	Module 7 and module 8	VOTE 2	-	-	-	-	-	-	-	~~NO~~	-	-	L-001-7	L-001-8
FL-24	Module 9 and module 10	VOTE 2	-	-	-	-	-	-	-	~~NO~~	-	-	L-001-9	L-001-10
FL-25	Module 11 and module 12	VOTE 2	-	-	-	-	-	-	-	~~NO~~	-	-	L-001-11	L-001-12

Solution 3 – Fan Controls

- Application:
  - Avoid short cycle on mechanical equipment
  - Insure maximum ventilation after gas alarm
  - Caution:
    - Sentry-IT relays numbered up to 8 on any stack are not rated for inductive fan loads
    - Sentry IT relays numbered 9 – 16 are high amperage, socketed relays the can be used for direct switching of fans up to 8 Amps
- Creating Fan Controls:
  - In the example below:
    - On Delay of 5 seconds avoids a false start due to a data spike
    - Min Runtime of 20 minutes insures that, once activated, the fan will operate for at least 20 mins.
    - Off Delay of 10 minutes continues ventilation even after the alarm has been cleared

Block Address	Tag Name	Function	On Setpoint	Change	Off Setpoint	Invert Output	On Delay	Off Delay	Min Runtime	Latch Hi	Rising	Display Mode	Source 1	Source 2
// Relay Stack 2_Bottom Board														
RL-002-1	Fan Low Speed	OR	~~20~~		~~0~~	~~19~~ ~~NO~~	0:05	10:00	20:00	~~NO~~	~~YES~~	~~NO~~	C-00A-L	C-00B-L
RL-002-2	Fan High Speed	OR	~~20~~		~~0~~	~~19~~ ~~NO~~	0:05	10:00	20:00	~~NO~~	~~YES~~	~~NO~~	C-00A-H	C-00B-H

Solution 4 – Reset & Acknowledge

- Application:
  - Provide Remote Reset function in parallel to the controller Rest Key
  - Allows either Acknowledge or Reset based on the controller set-up
- Creating Remote Reset Instructions:
  - Assign a Flag as FL-ACK
  - Use the function code OR
  - Provide 1 or more Digital Input sources using syntax S-00#-#
    - Where 00#-# is the digital input stack number followed by the specific input/s used for reset
- Installation:
  - Requires field installation of a remote momentary reset switch

//DI input Stack 2

Block Address	Tag Name	Function	~~On Setpoint~~	~~Change~~	~~Off Setpoint~~	~~Invert Output~~	~~On Delay~~	~~Off Delay~~	~~Min Runtime~~	~~Latch Hi~~	~~Rising~~	~~Display Mode~~	Source 1	Source 2
FL-ACK	Alarm Reset	OR	~~20~~		~~0~~	~~19~~ ~~NO~~	0:00	0:00	~~0:00~~	~~NO~~	~~YES~~	~~NO~~	S-002-1	S-002-2

Solution 5 – History Log

- Application:
  - Create a customized History Log on the TPC – "History Management"
  - Combine custom entries with system default log data
- Create History Log
  - Use the Logic column M "Display Mode" to control History Log entries
    - YES – Reports every transition of the Flag or Relay state
    - IF-YES – Reports only when the Flag or Relay state is true
    - NO – The Flag or Relay state is not reported
  - Recommended convention
    - use upper case tags for logged blocks
    - use lower case for non-logged blocks
  - All Entries into History Log are generated by Commander Logic
  - In the example there are four identical relays but only one requires logging

Block Address	Tag Name	Function	On Setpoint	Change	Off Setpoint	Invert Output	On Delay	Off Delay	Min Runtime	Latch Hi	Rising	Display Mode	Source 1	Source 2
RL-002-5	COMMON ALARM	OR	20	0	19	NO	0:05	0:00	0:00	YES	YES	YES	C-00A-H	C-00B-H
RL-002-6	Common Alarm	OR	20	0	19	NO	0:05	0:00	0:00	YES	YES	NO	C-00A-H	C-00B-H
RL-002-7	Common Alarm	OR	20	0	19	NO	0:05	0:00	0:00	YES	YES	NO	C-00A-H	C-00B-H
RL-002-8	Common Alarm	OR	20	0	19	NO	0:05	0:00	0:00	YES	YES	NO	C-00A-H	C-00B-H

Solution 6 – Analog Outputs

- Application:
  - Retransmit a sensor value as a 4-20 mA signal
  - Requires use of Analog Output Stack
- Create Analog Output
  - Use Block Addresses matching the Stack Number and the Channel number on AO Stack
  - Use the Function OUTPUT
  - Set range as 0 – 100%: On Setpoint = 0 and Off Setpoint = 100
  - Use a single Source, the analog value of any sensor
- Result
  - The 4-20 mA value will be scaled to reflect the current sensor reading.

// Analog output card -

Block Address	Tag Name	Function	On Setpoint	Change	Off Setpoint	Invert Output	On Delay	Off Delay	Min Runtime	Latch Hi	Rising	Display Mode	Source 1
AO-002-1	Analog Output 1	OUTPUT	0	-	100	-	-	-	-	-	-	-	A-001-1
AO-002-2	Analog Output 2	OUTPUT	0	-	100	-	-	-	-	-	-	-	A-001-2
AO-002-3	Analog Output 3	OUTPUT	0	-	100	-	-	-	-	-	-	-	A-001-3
AO-002-4	Analog Output 4	OUTPUT	0	-	100	-	-	-	-	-	-	-	A-001-4
AO-002-5	Analog Output 5	OUTPUT	0	-	100	-	-	-	-	-	-	-	A-001-5
AO-002-6	Analog Output 6	OUTPUT	0	-	100	-	-	-	-	-	-	-	A-001-6
AO-002-7	Analog Output 7	OUTPUT	0	-	100	-	-	-	-	-	-	-	A-001-7
AO-002-8	Analog Output 8	OUTPUT	0	-	100	-	-	-	-	-	-	-	A-001-8

Commander Logic Review

- Commander Logic:
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  - Is configured using an easy to create CSV instruction set
  - Can be modified off-line and transferred to the controller via USB memory stick
- Commander Capabilities:
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