VAV Programming

Standard Engineering Practices

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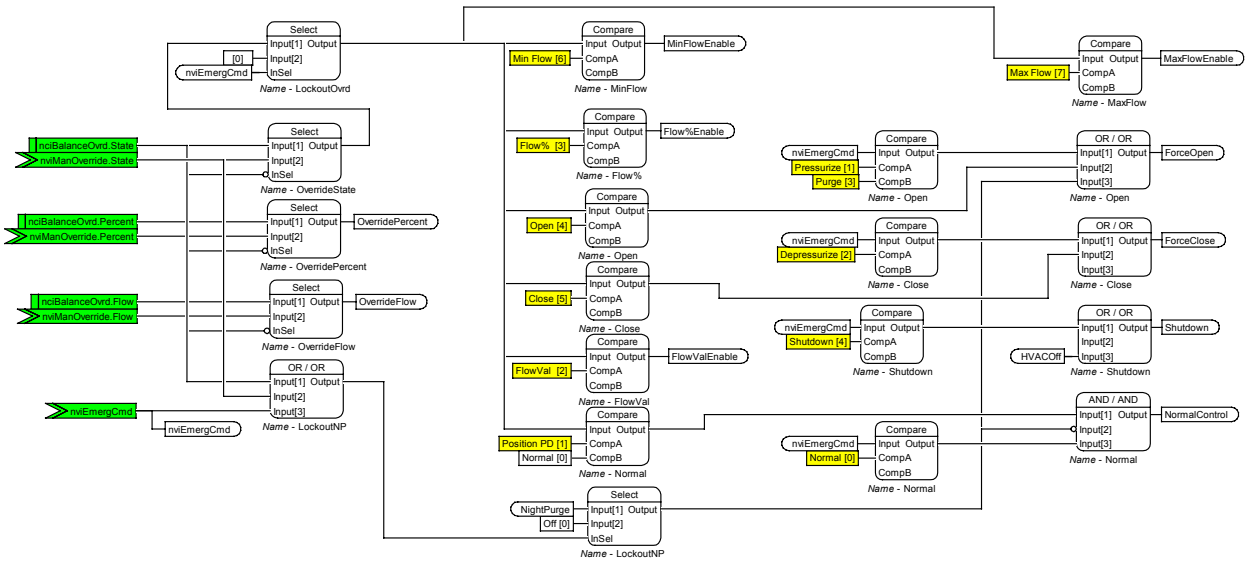
VAV Programming

VAV programming takes special consideration. To create a VAV application takes much forethought. You must consider the system, user interface, startup, balancing, and overall operation. The following list sets the minimums for VAV programming. By programming the VAV properly, field labor will be reduced significantly especially when it comes to balancing, temporary heat, or startup. Please note that job or the job specifications may require that modifications be made.

- Force Open – Allow the box to be commanded full open from the HMI of Network Controller.
- Force Close – Allow the box to be commanded full closed from the HMI of Network Controller.
- Force Max – Allow the box to be commanded maximum airflow from the HMI of Network Controller.
- Force Min – Allow the box to be commanded minimum airflow from the HMI of Network Controller.
- Force Heating On or Full open – Allow the heating to be commanded to full heat from the HMI or Network Controller.
- Force Heating Off or Full closed – Allow the heating to be commanded to no heat from the HMI or Network Controller.
- Provide "Global Commands" for the above parameters to command a range of VAV boxes to a set condition. Recommended that all boxes for a particular Air Handling Unit be grouped together. It may be required that on a large system you group by floor or zone. The latter may be required for smoke purge or evacuation.



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The above example shows how a typical VAV box is programmed to allow for Balancing and overrides to the primary air damper. While the above program is for the I/A series, the same strategies apply to MicroNet, DMS, or MicroFLo controllers.

The SNVT nciBalanceOvrd is the mechanism used by the I/A balancing program. It has priority over everything except nviEmergCmd, which has the highest priority. The SNVT nciBalanceOvrd is the only SNVT currently known, that will timeout unless periodically updated. For this reason, it may not be suitable for use on an HMI. The SNVT nviManOverride can be used for the above noted functions. Basically, nciBalanceOvrd and nviManOverride function the same way and the following explanation will apply to both nciBalanceOvrd and nviManOverride. Both SNVTs are Structured SNVTS and the State field is Enumerated. Please refer to the WorkPlace Tech Tool Engineering Guide for more information on Structured and Enumerated SNVTs. All rules applying to Enumerated and Structured type of SNVTs also apply to these two SNVTs.

- When the dot State field (nciBalanceOvrd.State or nviManOverride.State) is set to zero “0” (HVO_OFF), the VAV box functions normally.
- When the dot State field is set to one ”1” (HVO_POSITION), The damper is position is set to the value specified in the dot percent field. This is typically used for pressure dependant boxes and has no affect on a pressure independent box. It will be treated the same as a one “1” on pressure independent boxes.
- When the dot State field is set to two ”2” (HVO_FLOW_VALUE), the VAV box will control to the value set in the dot Flow field (0 to 65,534).
- When the dot State field is set to three ”3” (HVO_FLOW_PERCENT), the box flow is set to the value defined in the dot Percent field (0 to 100%). The flow position is determined based on the following formula. (((Mxflo-Mnflo) x Percent field) + Mnflo). This places the flow setpoint somewhere between the min flow setting and max flow setting depending upon the value entered.
- When the dot State field is set to four ”4” (HVO_OPEN), the box damper goes fully open.
- When the dot State field is set to five ”5” (HVO_CLOSE), the box damper goes fully closed.
- When the dot State field is set to six ”6” (HVO_MINIMUM), will set the VAV box to the minimum airflow setting.
- When the dot State field is set to seven ”7” (HVO_MAXIMUM), will set the VAV box to the maximum airflow setting.

The SNVT nviEmergCmd is used to command the VAV box into different emergency modes. This SNVT is an Enumerated SNVT.

- When the SNVT is set to zero ”0” (EMERG_NORMAL), the VAV functions normally
- When the SNVT is set to one ”1” (EMERG_PRESSURIZE), the pressurization control sequence is started. The box damper is driven fully open and both morning warm-up and heating are disabled.
- When the SNVT is set to two ”2” (EMERG_DEPRESSURIZE), the depressurization sequence is started. The box damper is driven fully closed, and both morning warm-up and heating are disabled.
- When the SNVT is set to three ”3” (EMERG_SHUTDOWN), the shutdown sequence is started. All outputs are turned off and the box control is disabled. This leaves the box damper in its current position.

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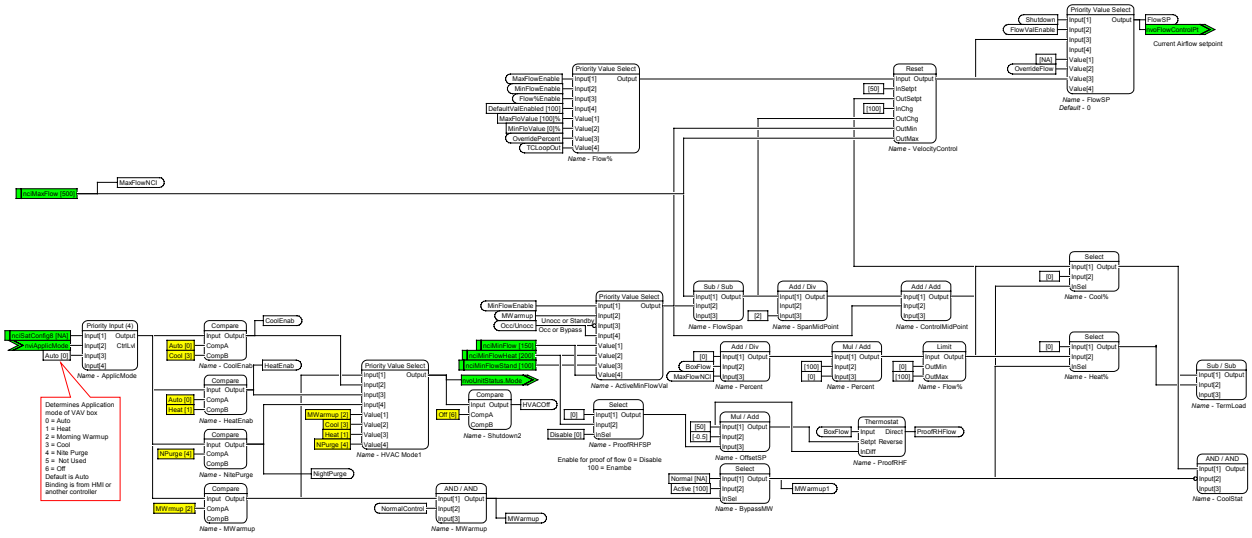
The above conditions are LONMark approved sequences and require additional programming to make the VAV box perform these functions. It is best to leave this section of the program alone and work within the parameters of the SNVTs discussed above.



The above shows a typical program using the balancing SNVTs and application mode SNVTs together to create a typical control sequence.

For programming consistency, a terminal box program should have a layout as shown below.

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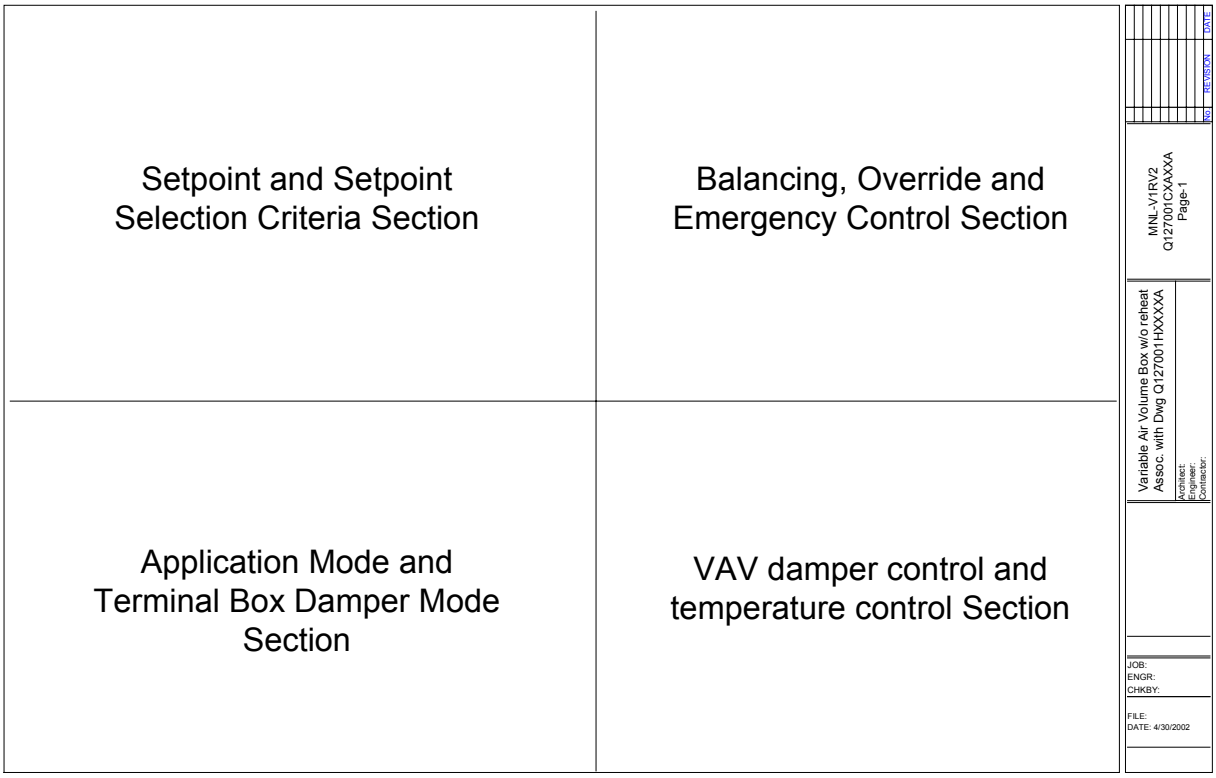

The applications on the Invensys TechZone do a tremendous job of meeting the above noted conditions. These applications are somewhat difficult to read and understand and may need to be "cleaned up" to make the programs more readable. Therefore, it is recommended that these applications be reused and minimally changed to fit the project's requirements. ***Exercise extreme caution whenever modifying these programs.Thoroughly test and checkout the program before final installation and commissioning.*** The size of the drawing can be enlarged per the previous section discussing page and printer layout, thus providing more space to make the software more readable.

Due to the complexity of a VAV program, some portions of the standards regarding location of SNVTs will be optional.

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