

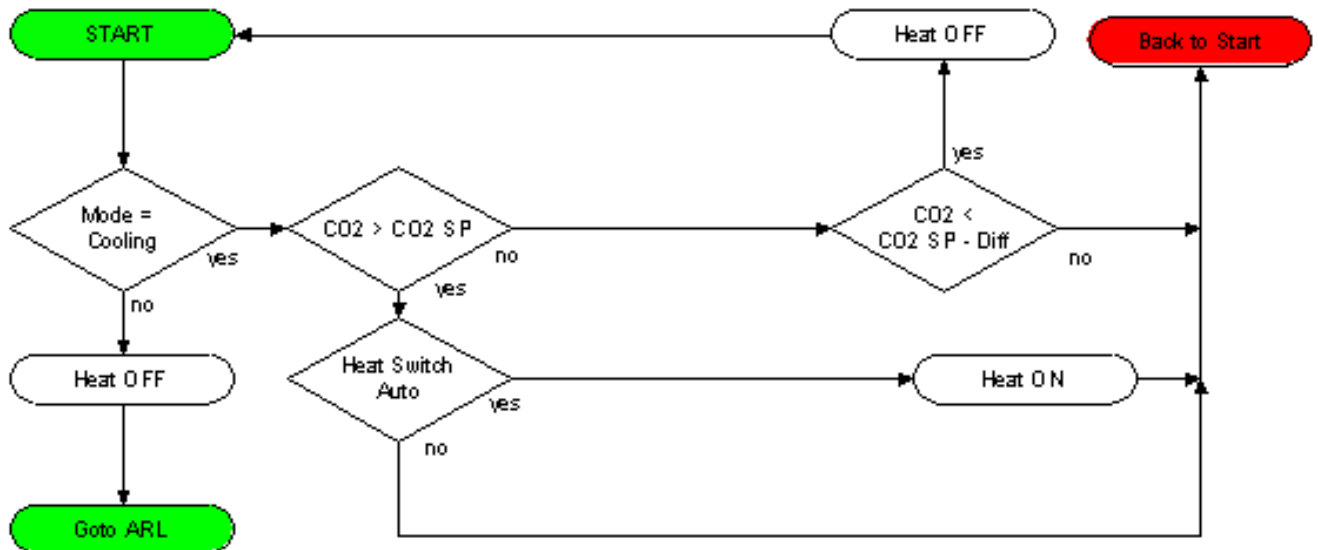
**Ambient Reverse Loading & CO2 Control Application Note
APP- 010**

THEORY

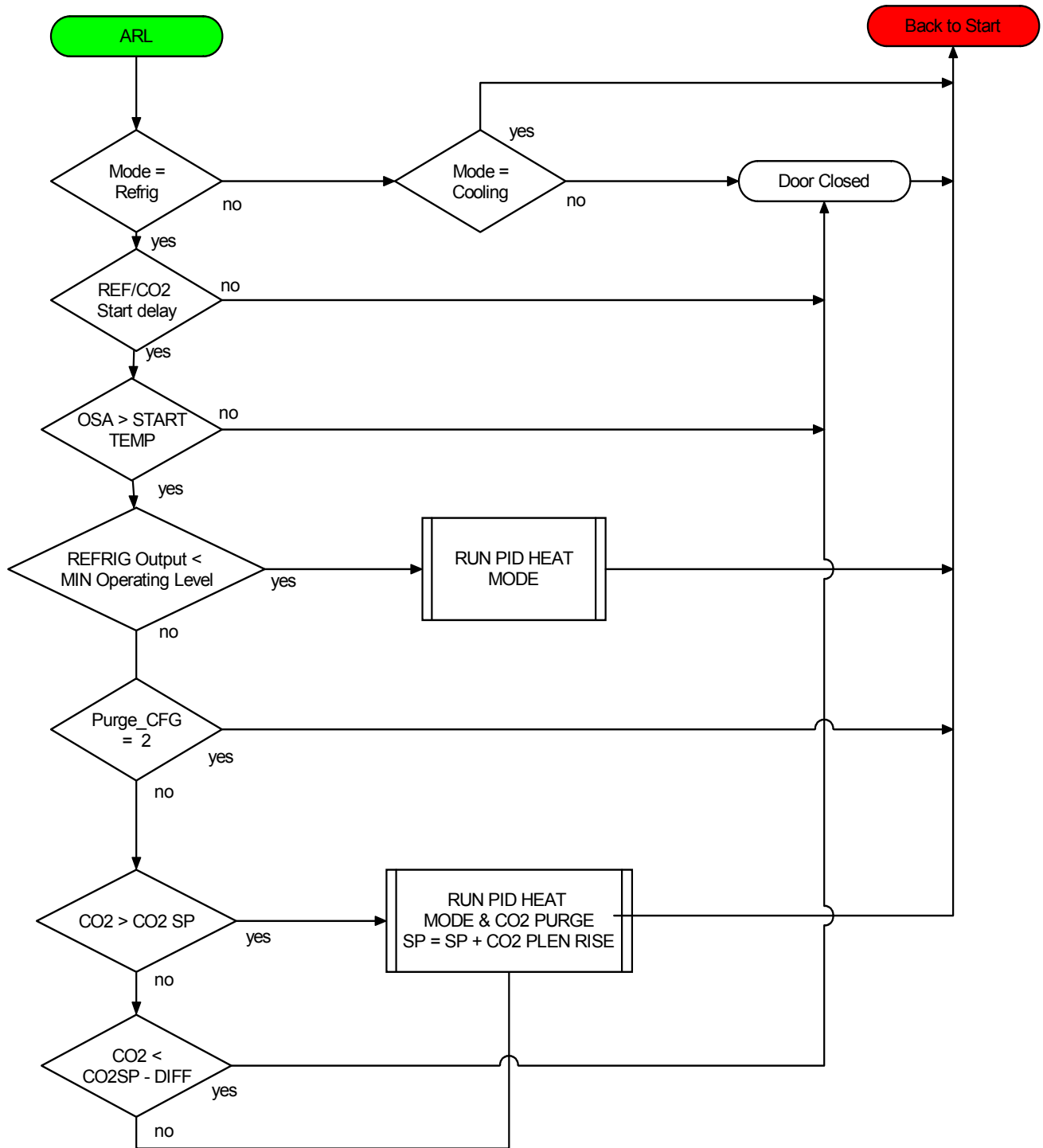
ARL (Ambient Reverse Loading) is a new way to bring fresh air into a storage during long runs of Refrigeration. The bottom line, is that Potato’s need fresh air!! There are many different gases that build up in a storage and can affect the health of a storage. CO2 is the easiest to measure of these gases, and is always present when the buildup of gases occurs. Thus CO2 is the best and easiest gas to measure and use for control.

ARL is a way to use the fresh air doors to false load the refrigeration system in times of low load conditions. In the past, hot gas injection has been used to false load the system, but did nothing to control the build up of CO2. When the OSA conditions are right, opening the fresh air doors will introduce fresh air and heat to the plenum. The heat will cause the refrigeration to increase and keep it from shutting off. There are a number of cautions to be aware of and guard against in this type of operation. Simply opening the doors to some predefined setting, can cause plenum temperature fluctuations to occur. **Note - the XT panel is the only panel in the industry that can operate the 0-20ma refrigeration circuit and pulse the fresh air doors at the same time.** The design of the ARL logic incorporates a second PID loop, so that the Door PID and Refrigeration PID can run at the same time.

The following flow chart, shows the logic for the Cooling Mode.
CO2 SP = CO2 Setpoint , set on main screen of the HMI.
Diff = CO2 Diff, set on E2 parameters page. Default setting is 200 ppm



When operating in the Refrigeration mode, the operation will be based on the following flow chart. There is an initial Refrigeration Start delay before the control can start. The OSA must be greater than the Start temp before the system can also run the ARL logic.



PARAMETER EXPLANATION

PURGE_CYCLE, this is a E2 and would need to be set to 3 for the ARL and CO2 purge to function.

REF / CO2 Start Delay, this is the amount of time in minutes that you want to wait on initial start up of the refrigeration system before the ARL logic is implemented. This is an E2 parameter called ROL_START_DLY, the default setting is 5 minutes. This may want to be increased, depending on the amount of time your system takes to start up and get past the first stage of Refrigeration.

MIN Operating Level, this would typically be the point that you have the first stage of Refrigeration set to turn on. This is a E2 parameter called REF_LEVEL. If the Refrigeration output falls below this setting, the ARL will be activated. This will cause the fresh air doors to go into a PID Heat Mode. The max amount the door will open is an E2 parameter call MAX_DOOR. This is a critical setting and typically would be 20%.

Note - the flow chart shows a Purge_CFG = 2. This is used for another application, and when viewing the flow chart, you should take the no branch.

CO2SP, this is the CO2 Setpoint and is set on the Main HMI screen.

DIFF, this is the CO2 differential setting and is a E2 parameter call CO2_DIFF. The default setting is 200 ppm.

When the Refrigeration is running above the minimum operating level and the CO2 builds above the CO2 Setpoint, the PID Heat modes operates differently. Instead of running off of the temperature Setpoint, it adds to the Setpoint a parameter called CO2_RAS. This parameter is in 1/10th of a degree, and a typical setting would be 5 or .5 degrees. Example: if you had a temperature setpoint of 45.0 degrees, the refrigeration was running above the minimum setting and the CO2 was above the CO2 Setpoint. The PID heat mode would be activated, to control at a Setpoint of 45.0 + .5 or 45.5 degrees. This would cause the fresh air doors to open, and the refrigeration output would ramp up. The doors would only open to the MAX_DOOR setting, and as soon as the CO2 drop below the CO2SP - Diff, it would close the doors. In this operation, you are guaranteed that the Plen would not rise more than a 1/2 degree.