Description:
Single tank, 2 pumps with alternation, fill application using level sensor. Initial conditions to be set as follows:
- lead pump is pump 1
- lag pump is pump 2
- lead pump setpoint, lag pump setpoint, and pumps off setpoint are all configured accordingly.

Basic operation is to keep tank filled to some nominal level.

Automatic Operation:
Level 1 – Level at this point could be rising, falling, or steady depending on where in the current cycle it is.
Level 2 – Tank level has dropped to the point that the lead pump is activated. The expectation is the tank now starts filling.
Level 3 – Tank level has dropped to the point that the lag pump is also activated. Lead pump cannot handle filling by itself.
Level 4 – Tank is now full and all pumps should be turned off. Once the pump(s) off condition is reached and there are no active alarms, the lead pump now becomes the lag pump, and the lag pump becomes the lead pump in preparation for the next fill cycle (i.e. level 2/level 3 is reached).
Level 5 – High alarm float has been activated due to pumps not being turned off or a sensor failure. This will cause both pumps to be shut off and an alarm condition to be generated. Instead of a float, a high alarm limit could be set to accomplish the same thing.
Level 6 – Reaching this level may indicate a sensor failure or a pump did not start. The low alarm float has activated, both pumps are turned on, and an alarm is generated. Instead of a float, a low alarm limit could be set to accomplish the same thing.

Manual Operation:
Due to the limited number of digital inputs, the HOA (hand/off/auto) functionality is accomplished via the integral display and keypad. This "virtual" HOA switch allows the user to manually control pump operations, turn off pump control, or turn on automatic pump control. There is a "virtual" HOA switch for each pump.
- the hand selection will override current operations and turn on the selected pump.
- the off selection means that pump is turned off and not allowed to run.
- the auto selection allows the selected pump to run as described above.

If Alternation is set to "Fixed", a pump cycle will always start with the configured lead pump and the lag pump will always be the other pump. No alternation is done and the lead pump is always the same pump.

Minimum IO Requirements:
4 digital inputs
- high alarm float (optional)
- low alarm float (optional)
- pump 1 running
- pump 2 running

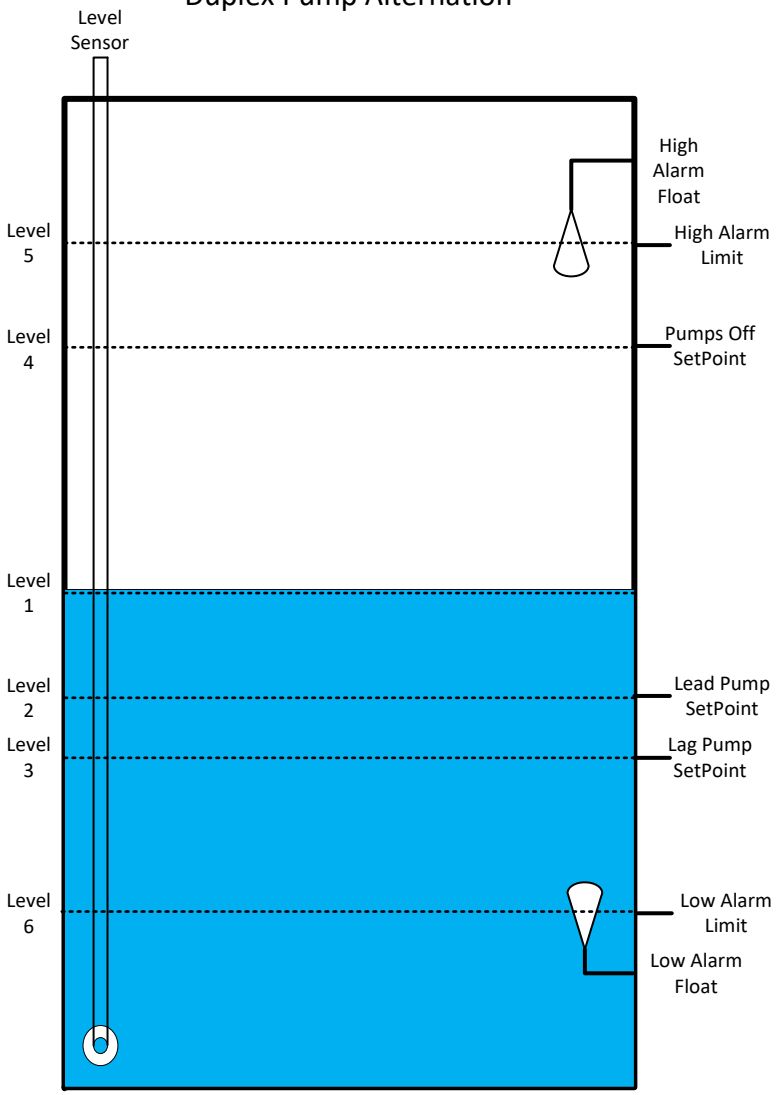
3 digital outputs
- pump 1 on/off
- pump 2 on/off
- alarm

1 analog input
- tank level

Additional IO:
Additional inputs may be used to provide other functionality.
- motor over temp
- phase fault (this may be accomplished by the AC V/I inputs)
- seal fault
- general fault

In most instances these inputs will generate an alarm condition and both pumps will be shut off and an alarm generated

Tank Fill Application
Level Sensor and Floats
Duplex Pump Alternation



Description:
Single tank, 1 pump, fill application using level sensor. Initial conditions to be set as follows:
- pump on setpoint and pump off setpoint are all configured accordingly.

Basic operation is to keep tank filled to some nominal level.

Automatic Operation:
Level 1 – Level at this point could be rising, falling, or steady depending on where in the current cycle it is.
Level 2 – Tank level has dropped to the point that the pump is activated. The expectation is the tank now starts filling.
Level 3 – Tank is now full and pump should be turned off.
Level 4 – High alarm float has been activated due to pump not being turned off or a sensor failure. This will cause the pump to be shut off and an alarm condition to be generated. Instead of a float, a high alarm limit could be set to accomplish the same thing.
Level 5 – Reaching this level may indicate a sensor failure or the pump did not start. The low alarm float has activated, the pump is turned on, and an alarm is generated. Instead of a float, a low alarm limit could be set to accomplish the same thing.

Manual Operation:
Due to the limited number of digital inputs, the HOA (hand/off/auto) functionality is accomplished via the integral display and keypad. This "virtual" HOA switch allows the user to manually control pump operation, turn off pump control, or turn on automatic pump control.
- the hand selection will override current operation and turn the pump on
- the off selection means the pump is turned off and not allowed to run
- the auto selection allows the pump to run as described above

Minimum IO Requirements:
4 digital inputs
- high alarm float (optional)
- low alarm float (optional)
- pump running

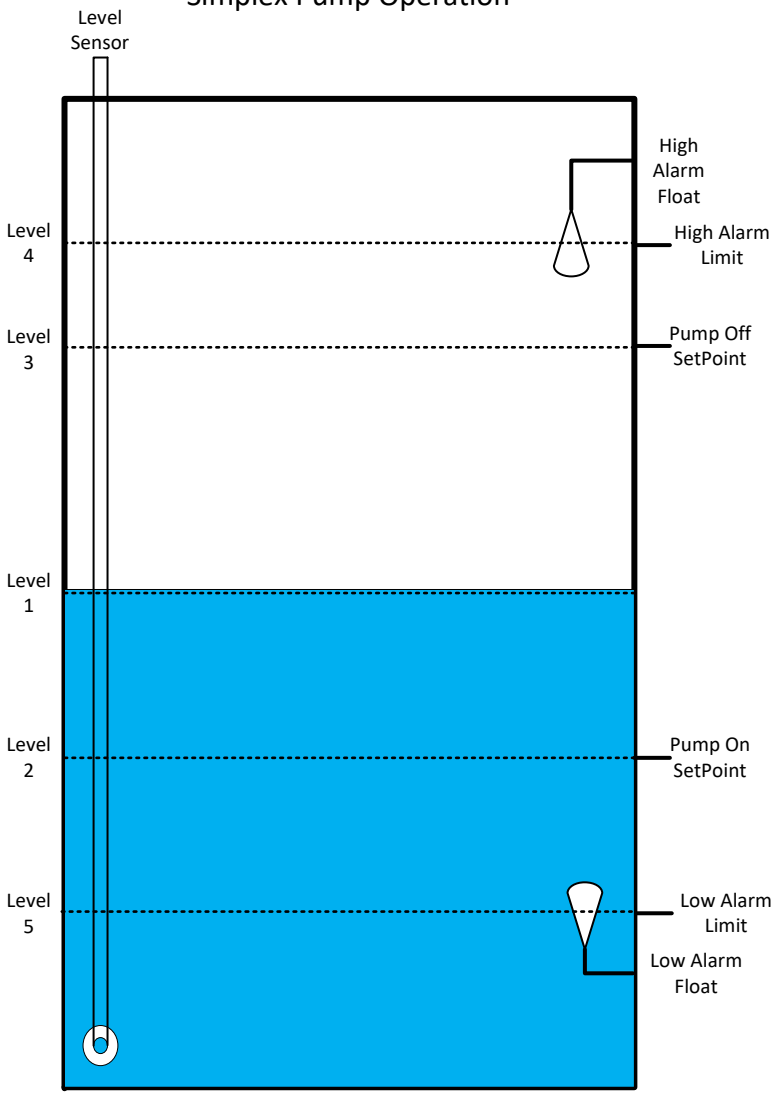
3 digital outputs
- pump on/off
- audible alarm
- visual alarm

1 analog input
- tank level

Additional IO:
Additional inputs may be used to provide other functionality.
- motor over temp
- phase fault (this may be accomplished by the AC V/I inputs)
- seal fault
- general fault

In most instances these inputs will generate an alarm condition and the pump will be shut off and an alarm generated.

Tank Fill Application
Level Sensor and Floats
Simplex Pump Operation



Description:
Single tank, 2 pumps with alternation, fill application using floats. Initial conditions to be set as follows:
- lead pump is pump 1
- lag pump is pump 2

Basic operation is to keep tank filled to some nominal level.

Automatic Operation:
Level 1 – Level at this point could be rising, falling, or steady depending on where in the current cycle it is.
Level 2 – Tank level has fallen to the point that the lead pump is activated. The expectation is the tank now starts filling.
Level 3 – Tank level has fallen to the point that the lag pump is also activated. Lead pump cannot handle filling the tank by itself.
Level 4 – Tank is now full and all pumps should be turned off. Once the pump(s) off condition is reached and there are no active alarms, the lead pump now becomes the lag pump, and the lag pump becomes the lead pump in preparation for the next fill cycle (i.e. level 2/level 3 is reached).
Level 5 – High alarm float has been activated due to pumps not being turned off or a float failure. This will cause both pumps to be turned off and an alarm condition to be generated.
Level 6 – Reaching this level may indicate a float failure or the pumps did not start. The low alarm float has activated, both pumps are turned on, and an alarm is generated.

Manual Operation:
Due to the limited number of digital inputs, the HOA (hand/off/auto) functionality is accomplished via the integral display and keypad. This "virtual" HOA switch allows the user to manually control pump operations, turn off pump control, or turn on automatic pump control. There is a "virtual" HOA switch for each pump.
- the hand selection will override current operations and turn on the selected pump.
- the off selection means that pump is turned off and not allowed to run.
- the auto selection allows the selected pump to run as described above.

If Alternation is set to "Fixed", a pump cycle will always start with the configured lead pump and the lag pump will always be the other pump. No alternation is done and the lead pump is always the same pump.

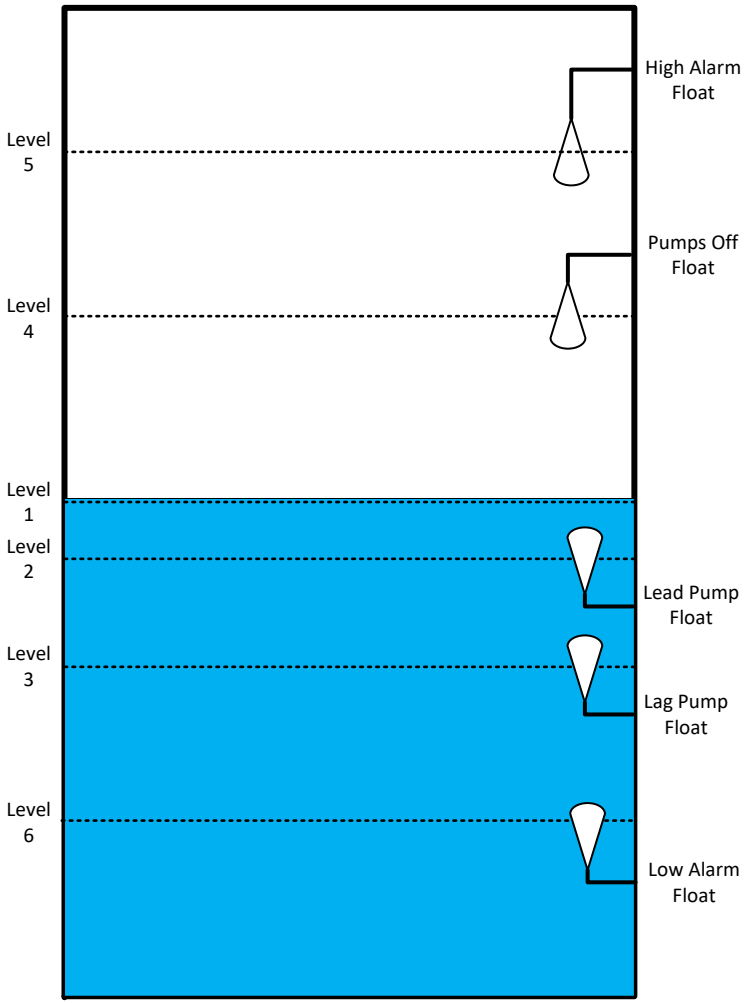
Minimum IO Requirements:
7 digital inputs
- high alarm float (optional)
- low alarm float (optional)
- lead pump float
- lag pump float
- all pumps off
- pump 1 running
- pump 2 running

3 digital outputs
- pump 1 on/off
- pump 2 on/off
- alarm

Additional IO:
Additional inputs may be used to provide other functionality.
- motor over temp
- phase fault (this may be accomplished by the AC V/I inputs)
- seal fault
- general fault
- pressure sensor (tank level)

In most instances, these inputs will generate an alarm condition and both pumps will be shut off and an alarm generated.

Tank Fill Application
Floats Only
Duplex Pump Alternation



Description:
Single tank, 1 pump, fill application using floats.
Basic operation is to keep tank filled to some nominal level.

Automatic Operation:
Level 1 – Level at this point could be rising, falling, or steady depending on where in the current cycle it is.
Level 2 – Tank level has fallen to the point that the pump is activated. The expectation is the tank now starts filling.
Level 3 – Tank is now full and the pump should be turned off.
Level 4 – High alarm float has been activated due to pump not being turned off or a float failure. This will cause the pump to be turned off and an alarm condition to be generated.
Level 5 – Reaching this level may indicate a float failure or the pump did not start. The low alarm float has activated, the pump is turned on, and an alarm is generated.

Manual Operation:
Due to the limited number of digital inputs, the HOA (hand/off/auto) functionality is accomplished via the integral display and keypad. This "virtual" HOA switch allows the user to manually control pump operation, turn off pump control, or turn on automatic pump control.
- the hand selection will override current operations and turn the pump on.
- the off selection means the pump is turned off and not allowed to run.
- the auto selection allows the pump to run as described above.

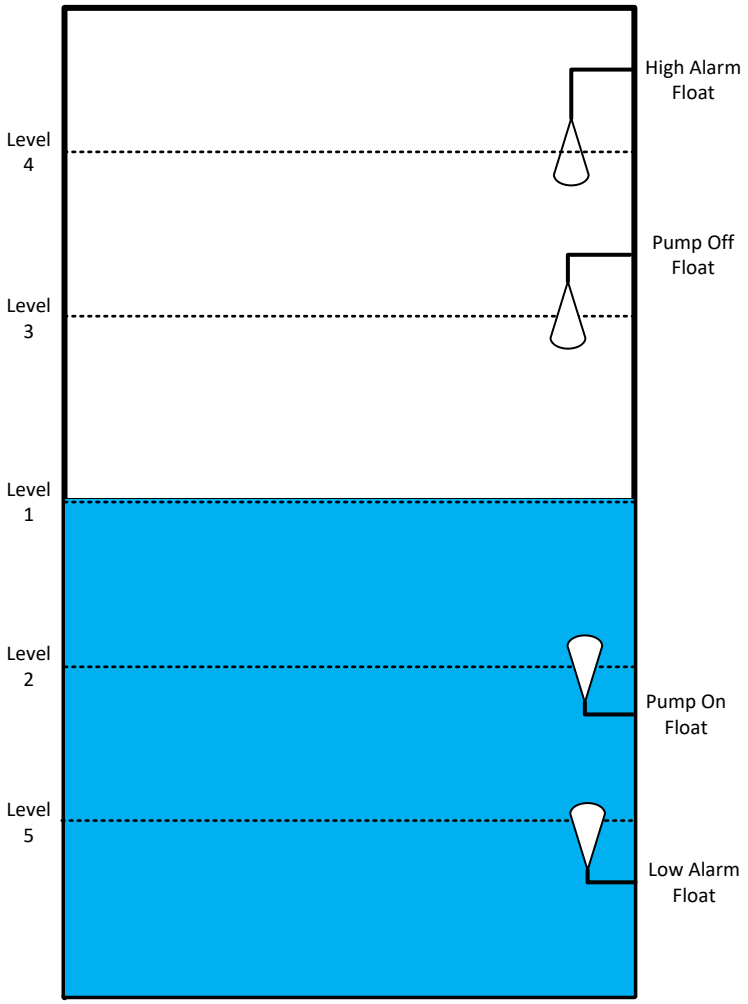
Minimum IO Requirements:
7 digital inputs
- high alarm float (optional)
- low alarm float (optional)
- lead pump float
- lag pump float
- all pumps off
- pump running

3 digital outputs
- pump on/off
- audible alarm
- visual alarm

Additional IO:
Additional inputs may be used to provide other functionality.
- motor over temp
- phase fault (this may be accomplished by the AC V/I inputs)
- seal fault
- general fault
- pressure sensor (tank level)

In most instances, these inputs will generate an alarm condition, the pump will be shut off, and an alarm generated.

Tank Fill Application
Floats Only
Simplex Pump Operation



Description:
Single tank, 2 pumps with alternation, drain application using level sensor. Initial conditions to be set as follows:
- lead pump is pump 1
- lag pump is pump 2
- lead pump setpoint, lag pump setpoint, and pumps off setpoint are all configured accordingly.

Basic operation is to keep tank emptied to some nominal level.

Automatic Operation:

Level 1 – Level at this point could be rising, falling, or steady depending on where in the current cycle it is.

Level 2 – Tank level has risen to the point that the lead pump is activated. The expectation is the tank now starts draining.

Level 3 – Tank level has risen to the point that the lag pump is also activated. Lead pump cannot handle pumping the tank down by itself.

Level 4 – Tank has now been emptied and all pumps should be turned off. Once the pump(s) off condition is reached and there are no active alarms, the lead pump now becomes the lag pump, and the lag pump becomes the lead pump in preparation for the next drain cycle (i.e. level 2/level 3 is reached).

Level 5 – Low alarm float has been activated due to pumps not being turned off or a sensor failure. This will cause both pumps to be turned off and an alarm condition to be generated. Instead of a float, a low alarm limit could be set to accomplish the same thing.

Level 6 – Reaching this level may indicate a sensor failure or the pumps did not start. The high alarm float has activated, both pumps are turned on, and an alarm is generated. Instead of a float, a high alarm limit could be set to accomplish the same thing.

Manual Operation:

Due to the limited number of digital inputs, the HOA (hand/off/auto) functionality is accomplished via the integral display and keypad. This "virtual" HOA switch allows the user to manually control pump operations, turn off pump control, or turn on automatic pump control. There is a "virtual" HOA switch for each pump.
- the hand selection will override current operations and turn on the selected pump.
- the off selection means that pump is turned off and not allowed to run.
- the auto selection allows the selected pump to run as described above.

If Alternation is set to "Fixed", a pump cycle will always start with the configured lead pump and the lag pump will always be the other pump. No alternation is done and the lead pump is always the same pump.

Minimum IO Requirements:

4 digital inputs
- high alarm float
- low alarm float
- pump 1 running
- pump 2 running

3 digital outputs
- pump 1 on/off
- pump 2 on/off
- alarm

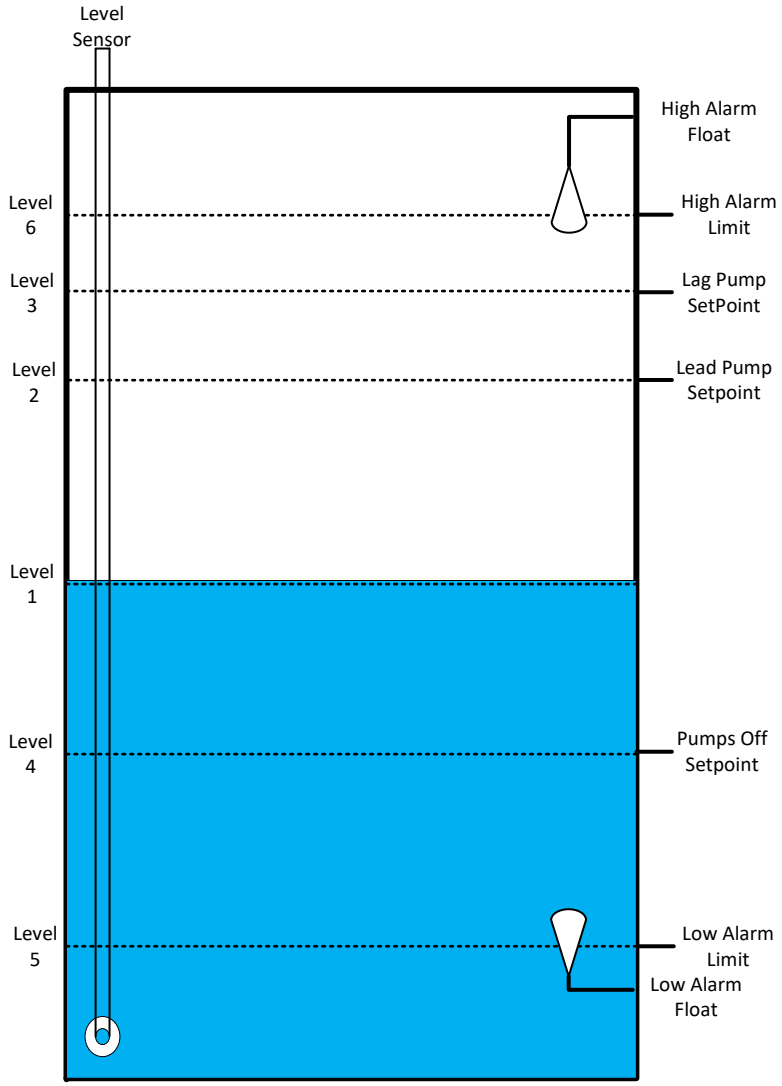
1 analog input
- tank level

Additional IO:

Additional inputs may be used to provide other functionality.
- motor over temp
- phase fault (this may be accomplished by the AC V/I inputs)
- seal fault
- general fault

In most instances these inputs will generate an alarm condition and both pumps will be shut off and an alarm generated.

Tank Drain Application
Level Sensor and Floats
Duplex Pump Alternation



Description:
Single tank, 1 pump, drain application using level sensor. Initial conditions to be set as follows:
- pump on setpoint and pump off setpoint are configured accordingly.

Basic operation is to keep tank emptied to some nominal level.

Automatic Operation:
Level 1 – Level at this point could be rising, falling, or steady depending on where in the current cycle it is.
Level 2 – Tank level has risen to the point that the pump is activated. The expectation is the tank now starts draining.
Level 3 – Tank has now been emptied and the pump should be turned off.
Level 4 – Low alarm float has been activated due to the pump not being turned off or a sensor failure. This will cause the pump to be turned off and an alarm condition to be generated. Instead of a float, a low alarm limit could be set to accomplish the same thing.
Level 5 – Reaching this level may indicate a sensor failure or the pump did not start. The high alarm float has activated, the pump is turned on, and an alarm is generated. Instead of a float, a high alarm limit could be set to accomplish the same thing.

Manual Operation:
Due to the limited number of digital inputs, the HOA (hand/off/auto) functionality is accomplished via the integral display and keypad. This "virtual" HOA switch allows the user to manually control the pump operation, turn off pump control, or turn on automatic pump control. There is a "virtual" HOA switch for each pump.
- the hand selection will override current operations and turn the pump on.
- the off selection means the pump is turned off and not allowed to run.
- the auto selection allows the pump to run as described above.

Minimum IO Requirements:
4 digital inputs
- high alarm float
- low alarm float
- pump running

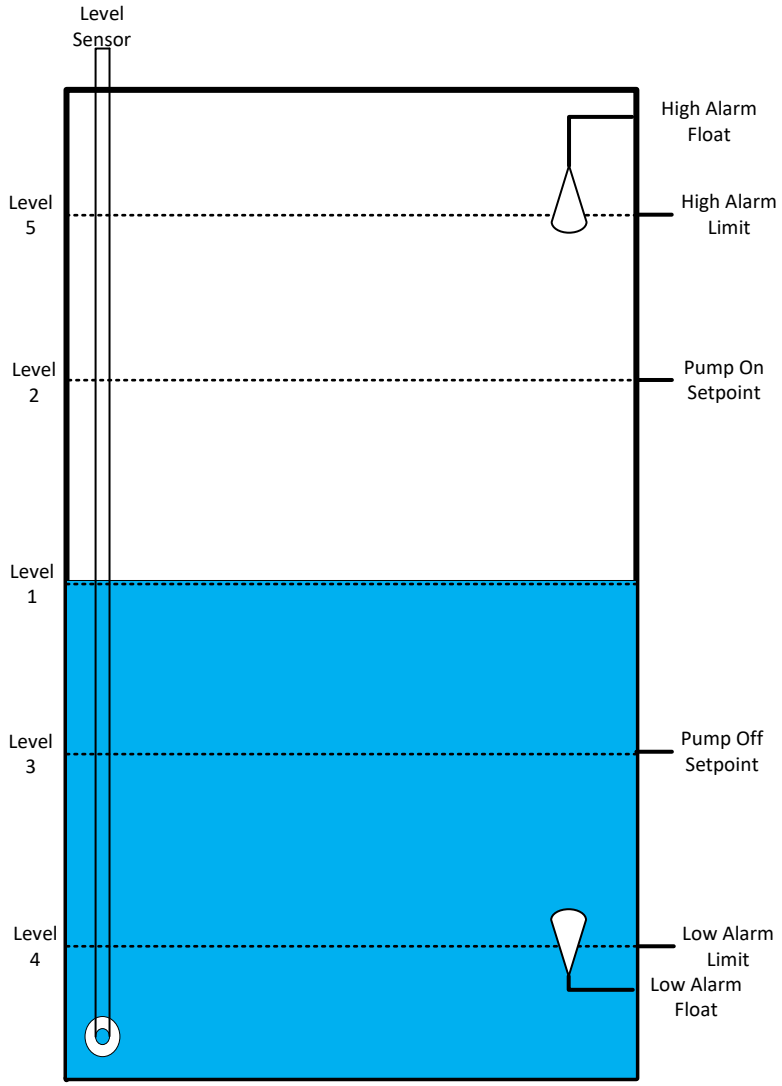
3 digital outputs
- pump on/off
- audible alarm
- visual alarm

1 analog input
- tank level

Additional IO:
Additional inputs may be used to provide other functionality.
- motor over temp
- phase fault (this may be accomplished by the AC V/I inputs)
- seal fault
- general fault

In most instances these inputs will generate an alarm condition and the pump will be shut off and an alarm generated.

Tank Drain Application
Level Sensor and Floats
Simplex Pump Operation



Description:
Single tank, 2 pumps with alternation, drain application using floats. Initial conditions to be set as follows:
- lead pump is pump 1
- lag pump is pump 2

Basic operation is to keep tank emptied to some nominal level.

Automatic Operation:
Level 1 – Level at this point could be rising, falling, or steady depending on where in the current cycle it is.
Level 2 – Tank level has risen to the point that the lead pump is activated. The expectation is the tank now starts draining.
Level 3 – Tank level has risen to the point that the lag pump is also activated. Lead pump cannot handle pumping the tank down by itself.
Level 4 – Tank has now been emptied and all pumps should be turned off. Once the pump(s) off condition is reached and there are no active alarms, the lead pump now becomes the lag pump, and the lag pump becomes the lead pump in preparation for the next drain cycle (i.e. level 2/level 3 is reached).
Level 5 – Low alarm float has been activated due to pumps not being turned off or a float failure. This will cause both pumps to be turned off and an alarm condition to be generated.
Level 6 – Reaching this level may indicate a float failure or the pumps did not start. The high alarm float has activated, both pumps are turned on, and an alarm is generated.

Manual Operation:
Due to the limited number of digital inputs, the HOA (hand/off/auto) functionality is accomplished via the integral display and keypad. This "virtual" HOA switch allows the user to manually control pump operations, turn off pump control, or turn on automatic pump control. There is a "virtual" HOA switch for each pump.
- the hand selection will override current operations and turn on the selected pump.
- the off selection means that pump is turned off and not allowed to run.
- the auto selection allows the selected pump to run as described above.

If Alternation is set to "Fixed", a pump cycle will always start with the configured lead pump and the lag pump will always be the other pump. No alternation is done and the lead pump is always the same pump.

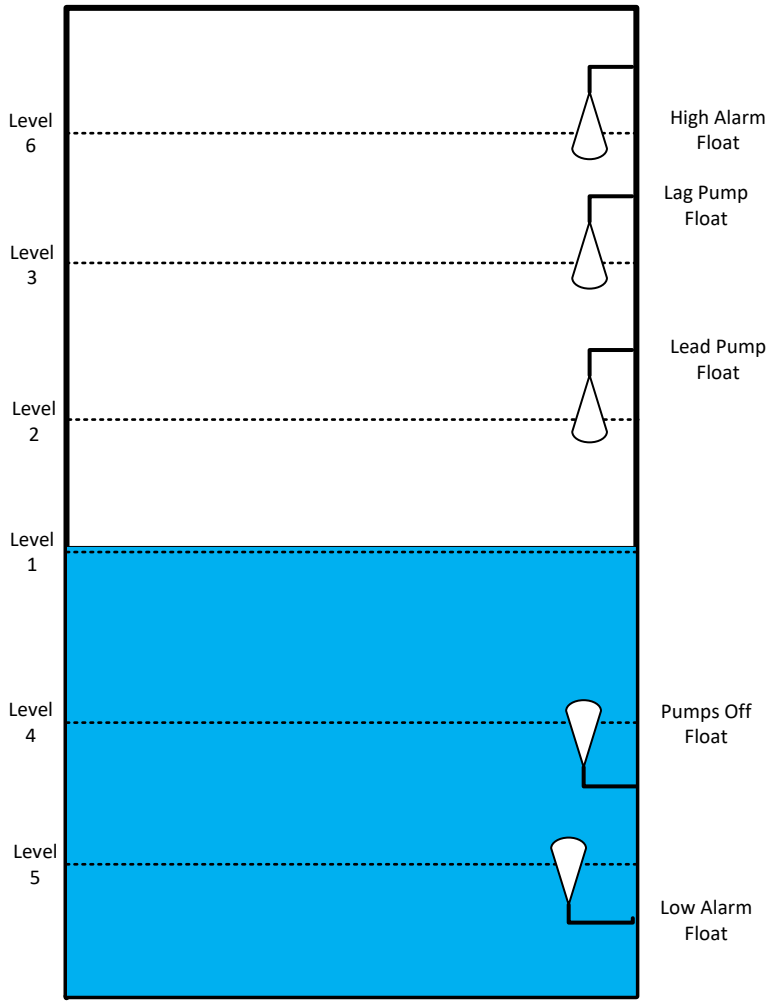
Minimum IO Requirements:
7 digital inputs
- high alarm float (optional)
- low alarm float (optional)
- lead pump float
- lag pump float
- all pumps off float
- pump 1 running
- pump 2 running

3 digital outputs
- pump 1 on/off
- pump 2 on/off
- alarm

Additional IO:
Additional inputs may be used to provide other functionality.
- motor over temp
- phase fault (this may be accomplished by the AC V/I inputs)
- seal fault
- general fault
- pressure input (tank Level)

In most instances these inputs will generate an alarm condition and both pumps will be shut off and an alarm is generated.

Tank Drain Application
Floats Only
Duplex Pump Alternation



Description:
Single tank, 1 pump, drain application using floats.
Basic operation is to keep tank emptied to some nominal level.

Automatic Operation:
Level 1 – Level at this point could be rising, falling, or steady depending on where in the current cycle it is.
Level 2 – Tank level has risen to the point that the lead pump is activated. The expectation is the tank now starts draining.
Level 3 – Tank level has risen to the point that the lag pump is also activated. Lead pump cannot handle pumping the tank down by itself.
Level 4 – Tank has now been emptied and all pumps should be turned off. Once the pump(s) off condition is reached and there are no active alarms, the lead pump now becomes the lag pump, and the lag pump becomes the lead pump in preparation for the next drain cycle (i.e. level 2/level 3 is reached).
Level 5 – Low alarm float has been activated due to pumps not being turned off or a float failure. This will cause both pumps to be turned off and an alarm condition to be generated.
Level 6 – Reaching this level may indicate a float failure or the pumps did not start. The high alarm float has activated, both pumps are turned on, and an alarm is generated.

Manual Operation:
Due to the limited number of digital inputs, the HOA (hand/off/auto) functionality is accomplished via the integral display and keypad. This "virtual" HOA switch allows the user to manually control pump operations, turn off pump control, or turn on automatic pump control. There is a "virtual" HOA switch for each pump.
- the hand selection will override current operations and turn on the selected pump.
- the off selection means that pump is turned off and not allowed to run.
- the auto selection allows the selected pump to run as described above.

If Alternation is set to "Fixed", a pump cycle will always start with the configured lead pump and the lag pump will always be the other pump. No alternation is done and the lead pump is always the same pump.

Minimum IO Requirements:
7 digital inputs
- high alarm float (optional)
- low alarm float (optional)
- lead pump float
- lag pump float
- all pumps off float
- pump 1 running
- pump 2 running

3 digital outputs
- pump 1 on/off
- pump 2 on/off
- alarm

Additional IO:
Additional inputs may be used to provide other functionality.
- motor over temp
- phase fault (this may be accomplished by the AC V/I inputs)
- seal fault
- general fault
- pressure input (tank Level)

In most instances these inputs will generate an alarm condition and both pumps will be shut off and an alarm is generated.

Tank Drain Application
Floats Only
Simplex Pump Operation