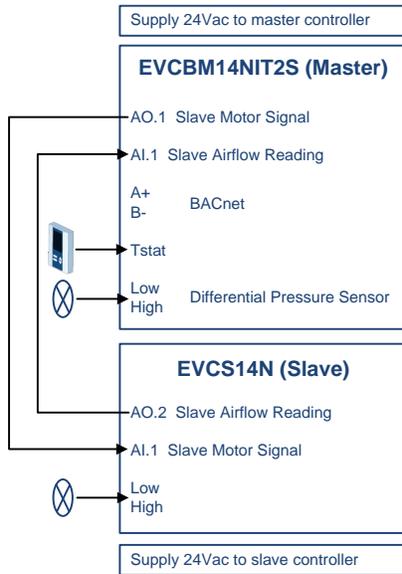# Dual Duct Terminal Units
Part Two

Last month, we covered the advantages of dual duct applications and where they can be used. This month, we will touch base with the Neptronic controllers used for these types of applications.

Dual duct applications have two duct-works (hot & cold), so it also requires two controllers; a master & a slave. Neptronic **EVCBM14NIT2S** represents the master controller and the **EVCB14N** represents the slave controller. The **TRL24** thermostat in this case is only connected to the master controller.

Master/Slave Wiring

As mentioned above, the **TRL24** is wired to the master controller. The master controller needs to send a signal to the slave controller to determine the airflow set-point required. The slave will also need to give feedback to the master on the airflow reading. There should only be one 24Vac power supply and it must be wired on both controllers. Note that the BACnet communication is optional.

Supply 24Vac to master controller

EVCBM14NIT2S (Master)

AO.1 Slave Motor Signal

AI.1 Slave Airflow Reading

A+
B-   BACnet

Tstat

Low
High   Differential Pressure Sensor

EVCS14N (Slave)

AO.2 Slave Airflow Reading

AI.1 Slave Motor Signal

Low
High

Supply 24Vac to slave controller

Airflow Monitoring

Both the master & the slave controllers are equipped with differential pressure transducers to monitor airflow. There are three possible airflow configurations;

Master (EVCBM14NIT2S)	Slave (EVCB14N)	Setting
Monitors Cold Deck	Monitors Hot Deck	Default
Monitors Cold Deck	Monitors Total Deck	*Cfg_Pressure 2 Option* is changed to Total
Monitors Hot Deck	Monitors Cold Deck	*MSV.35 Cfg_Motor 1 Ramp* is changed to Heating reverses monitoring configuration
Monitors Hot Deck	Monitors Total Deck	*Cfg_Pressure 2 Option* is changed to Total and *MSV.35 Cfg_Motor 1 Ramp* is changed to Heating reverses monitoring configuration

By default, the master controller monitors the cold deck and the slave controller monitors the hot deck. If **BV.49 Cfg_Pressure 2 Option** configuration is changed to Total, then the master controller will still monitor the cold deck but the slave controller will now monitor the total deck. **MSV.35 Cfg_Motor 1 Ramp** configuration can be used to reverse the monitoring configuration; when set to Heating (default Cooling), the master controller will now monitor the hot deck & the slave will monitor the cold deck. Usually, the engineer determines the preferred configuration.
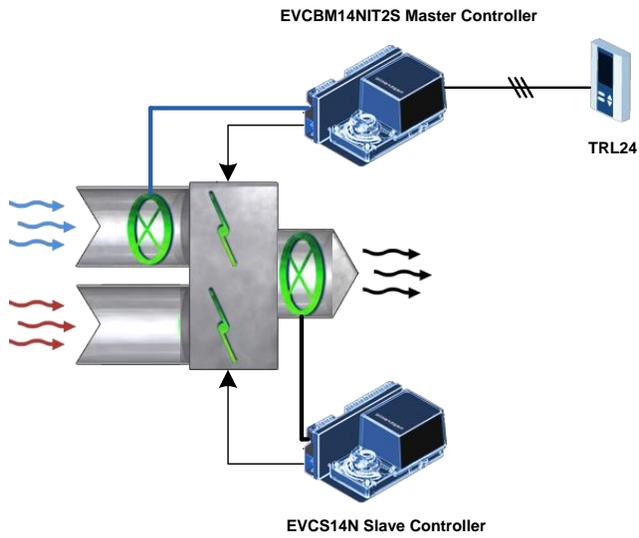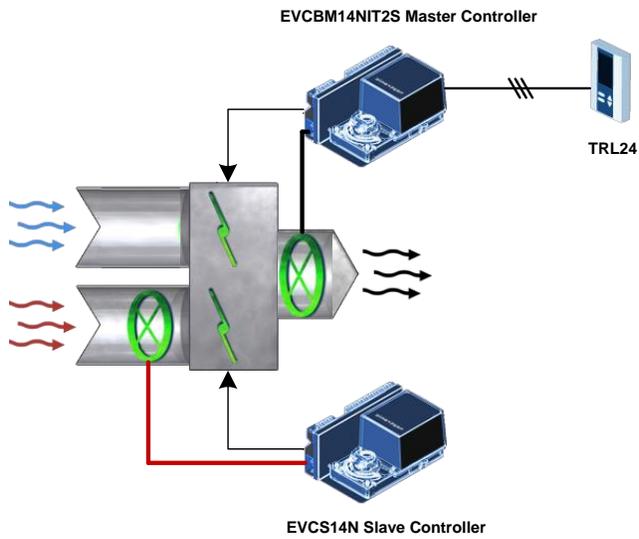
Cold & Hot Deck Monitoring
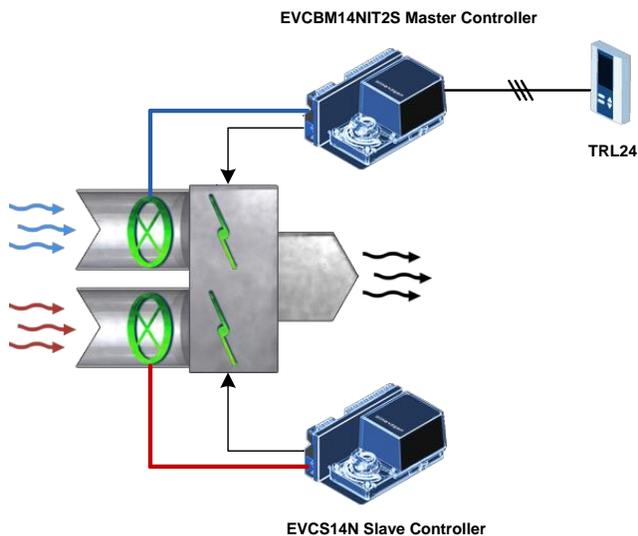
EVCBM14NIT2S Master Controller

TRL24

EVCS14N Slave Controller

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Cold & Total Deck Monitoring

EVCBM14NIT2S Master Controller

TRL24

EVCS14N Slave Controller

Hot & Total Deck Monitoring

**EVCBM14NIT2S Master Controller**

TRL24

EVCS14N Slave Controller

HVAC Controls   Electric Actuators   Actuated Valves   Humidifiers   Electric Heaters

Cold & Hot Deck Sequence & Options

It is possible to use the dual duct box so that the cold & hot deck air will never mix. This type of sequence is also called snap acting. **AV.128 Cfg_Mix Air Dead Band** configuration must be set to "0" to be able to achieve this.
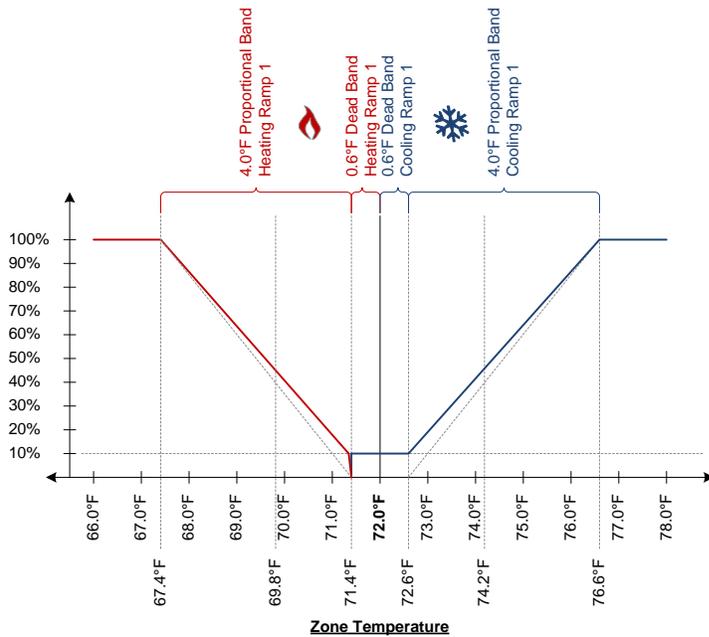
On Temperature Decrease

On temperature decrease (from cooling proportional band to dead band);
As space temperature decreases, the cold deck damper modulates from its maximum to minimum airflow position.
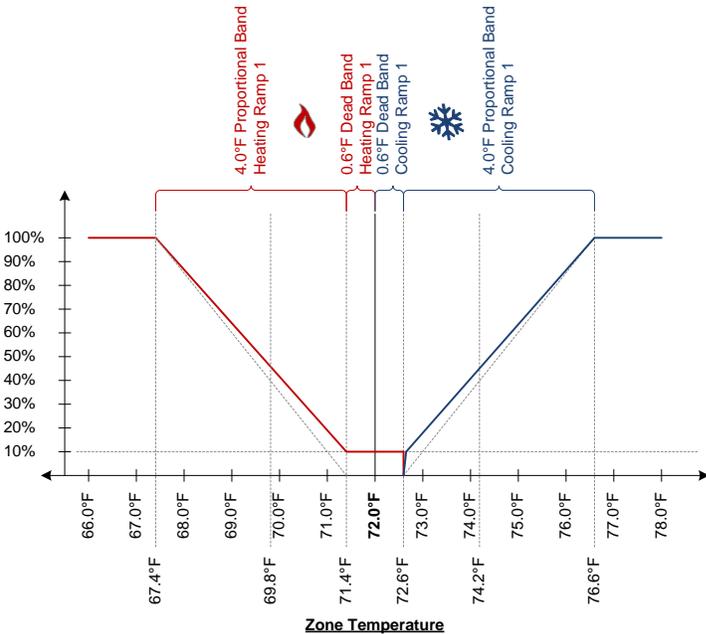
Dead band operation (from cooling operation);
While in the cooling and heating dead band, the cold deck damper remains at its minimum position until it reaches the limit of the heating dead band (71.4°F). At this point, the cold deck damper will close and the hot deck damper will open to its minimum airflow position.

On temperature decrease (from dead band to heating proportional band);
As space temperature reaches the heating dead band set-point (71.4°F), the cold deck damper closes and the hot deck damper opens to its minimum airflow position. If temperature keeps decreasing, the hot deck damper modulates from its minimum to the maximum airflow.

■ HVAC Controls   ■ Electric Actuators   ■ Actuated Valves   ■ Humidifiers   ■ Electric Heaters

On Temperature Rise

On temperature rise (from heating proportional band to dead band);
As space temperature increases, the hot deck damper modulates from its maximum to minimum airflow position.
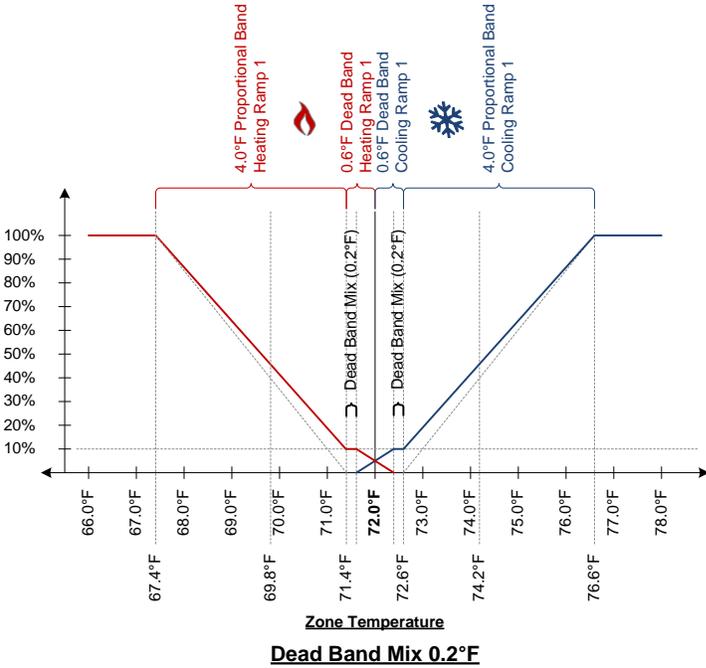
Dead band operation (from heating operation);
While in the heating and cooling dead band, the hot deck damper remains at its minimum position until it reaches the limit of the cooling dead band (72.6°F). At this point, the hot deck damper will close and the cold deck damper will open to its minimum airflow position.

On temperature rise (from dead band to cooling proportional band);
As space temperature reaches the cooling dead band set-point (72.6°F), the hot deck damper closes and the cold deck damper opens to its minimum airflow position. If temperature keeps rising, the cold deck damper modulates from its minimum to the maximum airflow.

It is also possible to mix the cold & hot deck when in the dead band. This allows a more precise control when neither heating nor cooling is required. In this case *AV.128 Cfg_Mix Air Dead Band* must be configured to 0.1°C (0.2°F) or 0.2°C (0.4°F). Note that the mixing band can be widened with the help of the *AV.22 Cfg_Heating 1 Dead Band* & *AV.42 Cfg_Cooling 1 Dead Band*.

■ HVAC Controls   ■ Electric Actuators   ■ Actuated Valves   ■ Humidifiers   ■ Electric Heaters

Chart 1

4.0°F Proportional Band
Heating Ramp 1

0.6°F Dead Band
Heating Ramp 1

0.6°F Dead Band
Cooling Ramp 1

4.0°F Proportional Band
Cooling Ramp 1

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%

Dead Band Mix (0.2°F)

Dead Band Mix (0.2°F)

66.0°F 67.0°F 68.0°F 69.0°F 70.0°F 71.0°F **72.0°F** 73.0°F 74.0°F 75.0°F 76.0°F 77.0°F 78.0°F

67.4°F 69.8°F 71.4°F 72.6°F 74.2°F 76.6°F

Zone Temperature
Dead Band Mix 0.2°F

Chart 2

4.0°F Proportional Band
Heating Ramp 1

0.6°F Dead Band
Heating Ramp 1

0.6°F Dead Band
Cooling Ramp 1

4.0°F Proportional Band
Cooling Ramp 1

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%

Dead Band Mix (0.4°F)

Dead Band Mix (0.4°F)

66.0°F 67.0°F 68.0°F 69.0°F 70.0°F 71.0°F **72.0°F** 73.0°F 74.0°F 75.0°F 76.0°F 77.0°F 78.0°F

67.4°F 69.8°F 71.4°F 72.6°F 74.2°F 76.6°F

Zone Temperature
Dead Band Mix 0.4°F

Cooling proportional band;
While in the cooling proportional band, the cold duct damper modulates from its minimum to maximum airflow position.

Dead band mix of the cooling dead band;
While in the dead band mix of the cooling dead band, the cold duct damper moves to its minimum airflow position. The hot duct damper is closed.

*Mixing Band (between cooling and heating dead band mix);*
While in between the two dead band mix, the cold & hot duct dampers modulate to keep a minimum airflow. The minimum heating and cooling airflow can be set at different values.

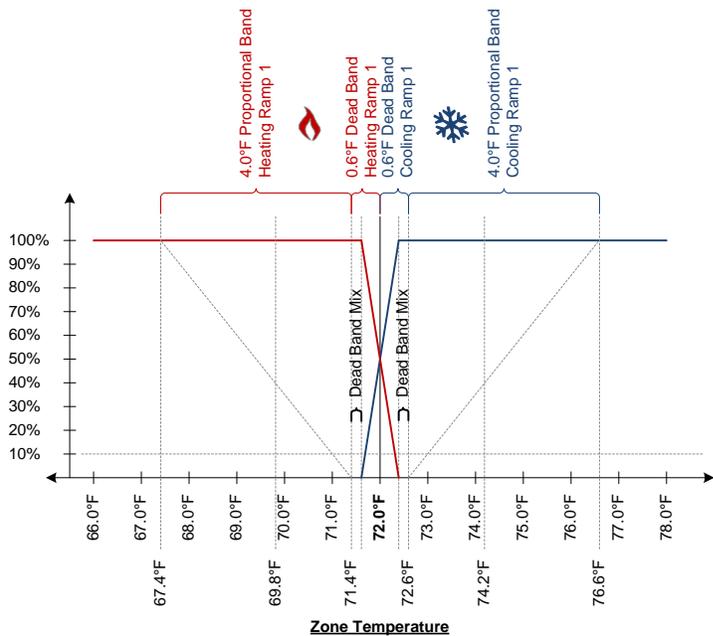*Dead band mix of the heating dead band;*
While in the dead band mix of the heating dead band, the hot duct damper moves to its minimum airflow position. The cold duct damper is closed.

Heating proportional band;
While in the heating proportional band, the hot duct damper modulates from its minimum to maximum airflow position.
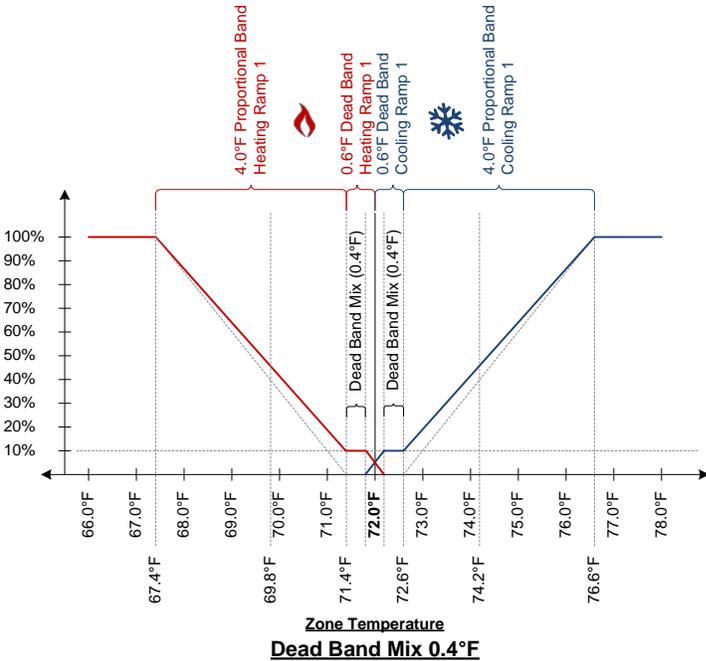
The last option is to make the controller act as a constant volume using *BV.48 Cfg_Constant Flow Option*. When disabled, the controller acts as a variable volume. Note that the controller still has the option to be the mixing type or the non-mixing type (snap acting). Usually, when constant volume is used, the dual duct VAV box will be the mixing type.

Mixing

4.0°F Proportional Band Heating Ramp 1
0.6°F Dead Band Heating Ramp 1
0.6°F Dead Band Cooling Ramp 1
4.0°F Proportional Band Cooling Ramp 1

Dead Band Mix
Dead Band Mix

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%

66.0°F 67.0°F 68.0°F 69.0°F 70.0°F 71.0°F **72.0°F** 73.0°F 74.0°F 75.0°F 76.0°F 77.0°F 78.0°F

67.4°F 69.8°F 71.4°F 72.6°F 74.2°F 76.6°F

Zone Temperature

Mixing

No Mixing

4.0°F Proportional Band Heating Ramp 1
0.6°F Dead Band Heating Ramp 1
0.6°F Dead Band Cooling Ramp 1
4.0°F Proportional Band Cooling Ramp 1

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%

66.0°F 67.0°F 68.0°F 69.0°F 70.0°F 71.0°F **72.0°F** 73.0°F 74.0°F 75.0°F 76.0°F 77.0°F 78.0°F

67.4°F 69.8°F 71.4°F 72.6°F 74.2°F 76.6°F

Zone Temperature

No Mixing

This covers most of the configurations for the dual duct applications. Note that there are additional features such as adding baseboard reheat available.

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