

# DIGI-ZONE

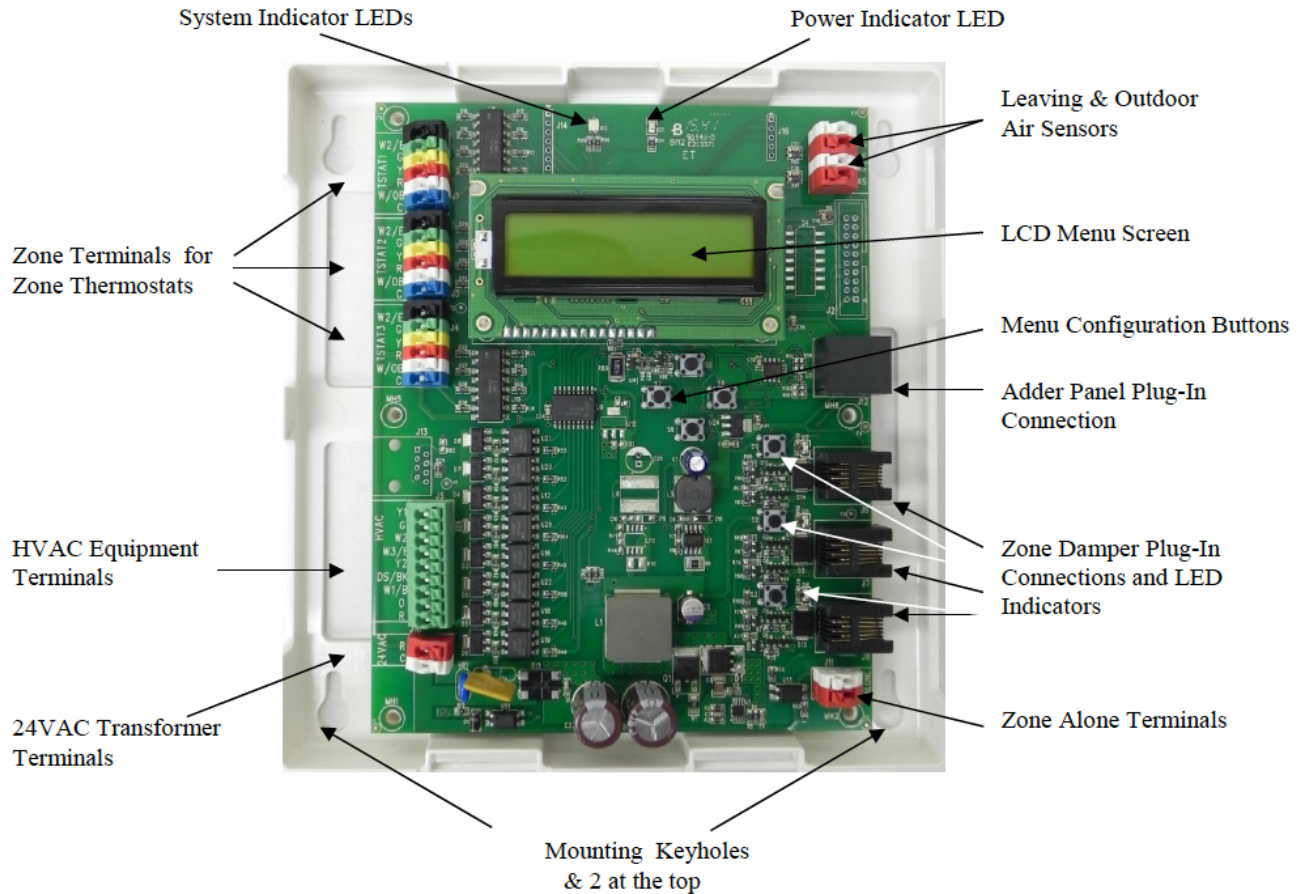
MDP3

HYDRO MAXX



INSTALLATION MANUAL

# MDP3 PANEL FEATURES



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### **INSTALLATION**

The MDP3 Control is a two (2) and three (3) zone, expandable (103 zones) control panel that can be used with conventional single stage and two stage heating and cooling, heat pumps with or without dual fuel and two speed heat pumps for up to three stages of heating. The MDP3 panel is the central control panel that all zone dampers, zone thermostats, HVAC Controls, power transformer, Outdoor Air (OAS) and Leaving Air Sensor (ZPS) are wired.

When installing the MDP3 panel it is important to pick a central location where it is most convenient to bring all the wires. Most often this is at the furnace or air handler. It is often the most convenient location and closest to power, the HVAC unit controls and the zone dampers when typically located at or near the plenum.

The MDP3 panel case is made of sturdy ABS plastic and can be mounted to any flat surface. It is recommended that the panel be mounted to a wall or return plenum and NOT on the furnace or plenum where it will be in contact with the excessive hot temperatures.. The panel can be located in an attic space or in an enclosed cabinet of a rooftop unit. Insure the panel is not in direct exposure to the elements.

The cover easily removes from the case by pulling firmly and separating the cover from the case exposing the circuit board. There are 4 key-hole mounting points in each corner of the case. The case has openings in the rear of the case as well as the side for all wiring. Wiring can come from the back as well as the side in order to make a neat installation.

## OPERATION

The MDP3 can be controlled by conventional single stage or heat pump thermostats. Each thermostat can then call for heating, cooling or the fan. This panel can control single stage gas-oil-electric heating and cooling, two stage heating and cooling and most heat pumps. This panel can control two stage/speed and dual/fossil fuel heat pumps.

When a call for either heating or cooling is made the panel keep open the damper(s) to the zone(s) calling, close the damper(s) to those zones not calling, activate the appropriate controls for heating or cooling, whichever is being called and not accept any calls for the opposite mode.

Any calls for the opposite mode will be locked out until the initial mode is either satisfied or a period of time (adjustable 10 to 30 minutes) has elapsed that is sufficient for the first mode to satisfy. A unique sequence determines the time the unit has been running or needs to continue to run in order to adequately provide conditioning for each mode. If a particular mode has already been calling for the set period of time or longer and an opposite call comes in the MDP3 will immediately drop the mode, enter the purge mode in order to dissipate the conditioned air into the zones calling before switching over to provide the new conditioning call to its zones.

When using the MDP3 to control multi-stage stage heating or cooling, the stages are controlled based upon time after the first stage call from the thermostat. When any zone calls the panel's built-in timer begins and after the set period of time elapses the MDP3 will energize the second then the third stage heat (W2 & W3) or cool (Y2) output. The Stage Timer is adjustable between 5 to 60 minutes after the first stage calls. Once the second stage is on, it will continue to run until the call is satisfied and/or then cycle into the third stage of heat, if applicable, until call is satisfied.

Once all zone thermostats are satisfied for heating and cooling, the MDP3 can now accept Fan calls allowing Continuous Air Circulation (CAC) in those zones where the thermostat's Fan Switch is set to ON. These zone dampers will be Open while the dampers to the zones where the Fan Switch is set to AUTO will be CLOSED.

When all zone thermostats are satisfied for both Heating and Cooling, and all Fan switches are set to AUTO position, the HVAC unit will be off and all zone dampers will return to a normally open position. Once a zone calls for heating, cooling or fan, the dampers to the calling zones remain open and the dampers to the zones not calling will close.

### Menu Set-Up for Various HVAC Equipment (See Digital Menu Flow Guide, sheet 7)

Most all of the MDP3 equipment set up options are available through its menu driven 2x16 character LCD. The MDP3 is factory set for conventional heating and cooling operation. The panel only needs to be configured when using with an electric furnace or heat pumps.

Other functions come by wiring for specific applications. The following shows the most typical settings. Review each function for you application.

**SYSTEM – G/E or HP** This setting sets the HVAC Output operation. In G/E the Y1 makes as a Cool call and W1 as a Heat call. In HP position Y1 makes as the compressor call for both heating and cooling.

**HP Type – CONV or FF** This setting is used to determine the equipment output when the System is set to HP, this setting determines if the output will be for a conventional heat pump with electric back-up heat or fossil (dual) fuel mode.

### OAS (Outdoor Air Sensor) Enabled (Adjustable) or Disabled

The Outdoor Air Sensor is used only when using a heat pump with dual/fossil fuel back-up furnace. The OAS senses the outdoor air temperature and switches the heating control between the heat pump and the fossil fuel furnace. The temperature set point for the OAS is adjustable via the Menu setting OBP. It is adjustable from 5°F to 53°F

#### Enabled

If the OAS senses the outdoor temperature is higher than the Outdoor Balance Point (OBP) setting the compressor will continue to run. If the outdoor temperature is lower than the OBP setting, the compressor will drop and the fossil fuel furnace will energize. When the OAS is enabled, the OAS temperature will be displayed on the MENU LCD. **When the OAS is Enabled the sensor must be wired into the OAS terminal blocks or the panel will not acknowledge any call from the thermostats.**

In the fossil fuel mode use of the OAS is optional. When the OAS is enable the Stag Optimization feature is no longer available.

#### Disabled

The heat pump will continue to run until heat call is satisfied or the emergency heat is activated via the thermostat or Menu setting EM Heat Enabled.

**Thermostat (TSTAT) – HC or HP** This setting determines if conventional Heat/Cool thermostats or Heat Pump thermostats are being used. Do not mix HC & HP stats, all stats used must be HC or HP. A conventional HC stat would have separate W and Y output for heating and cooling calls. A HP stat uses Y for both a heat and cool call and the O or B is used to determine whether the call is for Cooling (O) or Heating (B).

**STAT RV – O or B** When using HP type stats this setting determines if the O or B terminal (on stat) is wired to the W/OB terminal on the MDP3 to determine if the call if for Heat (B) or Cool (O).

**NUMBER OF ZONES** This setting establishes the total (2-103) number of zones being used in the system.

**FAN IN HEAT – Enabled or Disabled** This setting will activates the Fan on a call for Heat in the Enabled position. In Disabled, the heating unit must activate the fan when the heat is called.

**FAN IN PURGE – Enabled or Disabled** This setting determines if the Fan is kept on (Enabled) or off (Disabled) during the Purge Mode, after the end of each heat or cool call.

## **PURGE TIMER**

The MDP3 has a built-in Purge Time after each call is satisfied and provides a minimum off time before another call is initiated.

The Purge Time is set at 2 minutes after all calls for a particular mode are satisfied or when the Changeover Timer requires a changeover due to opposing calls.

After all calls are satisfied or the changeover timer activates, the Purge Timer begins and the heating or cooling, whichever was on, is deactivated. Typically the fan may be running during this time and the damper(s) to the last zone(s) calling will remain open to purge the conditioned air only into those zones that were calling for the conditioning. The FAN IN PURGE setting may be Enabled to keep the fan running during the Purge mode in order to prevent the fan cycling off and back on between modes. In the instance where the fan staying on may create a draft, and the frequency of opposite calls is minimal, you may select the Disabled setting.

**EM HEAT – Enabled or Disabled** This setting establishes any heat call to call for the Emergency Heat. With this setting enabled EH RUNNING will scroll across the LCD and the Heat Status LED will flash (3x per second). This is used when there is no Emergency Heat selector on the thermostats.

## **MINIMUM ON TIMER – Enabled or Disabled**

The MDP3 has a minimum on time whenever the compressor operates in order to prevent frequent short cycling. Once there is a call for cooling or the compressor on a heat pump, the MDP3 will hold that call for a period of 5 minutes if this feature is Enabled. If Disabled is selected the minimum on timer feature is not operational.

## **STAGING OPTIONS**

### **STAGE TIMER (Adjustable 5 to 60 Minutes)**

The MDP3 has a built-in stage timer that eliminates the need and added cost of using two stage thermostats. On a call for either heating or cooling the timer begins. Setting the Stage Timer via the MENU provides an adjustable time delay of 5 to 60 minutes between the first and second stage calls and the same between a second stage and third stage call of heating, if applicable.

### **STAGE OPTIMIZE (SO) – Enabled (Adjustable) or Disabled**

The Stage Optimization setting uses the LAS adjustable temperature setting to control the function of bringing on additional stages of heating or cooling based on the supply air temperature.

SO HEAT LIMIT is adjustable from 80°F to 140°F

SO COOL LIMIT is adjustable from 55°F to 70°F

When SO is Enabled, if the LAS senses a temperature above the SO HEAT LIMIT additional stages of heating are locked out from energizing. If the LAS senses a temperature below the SO HEAT LIMIT additional stages of heating are energized based on the SO HEAT Limit setting. If the LAS senses a temperature below the SO COOL LIMIT additional stages of cooling are locked out from energizing. If the LAS senses a temperature above the SO COOL LIMIT additional stages of cooling are energized based on the SO COOL Limit setting.

When SO is Disabled the sensor has no impact on staging of the MDP3.

### **ZONE STAGING (# OF ZONES CALLING) Mode – Enabled**

**or Disabled** – When Enabled the MDP3 will stage from first to second stage when >50% of the total zones are calling (based upon the number of zones menu option). Once 50% or more of the zones are calling the stage timer will start in heating for the purpose of going into 3<sup>rd</sup> stage (except in FF HP mode). Once 50% or less of the zones are calling the board will go back to 1<sup>st</sup> stage (minimum on timers will apply when applicable. When Disabled staging will be based upon stage timers or alternate menu setting.

### **FOSSIL FUEL (FF) CHANGEOVER (Adjustable 70°F to 100°F)**

In this mode the LAS is used to determine if the Duct temperature is lower than the FF changeover temperature. set point, if it is the MDP3 will shut the compressor outputs off and run the EM heat. The set point is adjustable from 70°F to 100°F.

When Enabled and the LAS measured temperature is less than the FF Changeover Temperature, the compressor is shut down and the EM heat is activated for the remainder of the heat calls (until the MDP3 enters the purge mode).

When Disabled the FF Changeover function is inactive, assume normal heating operation.

### **CHANGEOVER TIMER (Adjustable 10 to 30 Minutes)**

Whenever a call is made for either heating or cooling, the changeover timer is activated in order to track the amount of time heating or cooling is on. When an opposite call is made after a first call is existing the changeover timer calculates the amount of time the unit has already been supplying the first mode in order to determine how long it will hold off the opposite call. If an opposite call is made shortly after the first call, the opposite call may be held off for as much as 30 minutes. If the first call or subsequent calls for the first call mode has had that mode operating for up to 30 minutes already and an opposite call comes in after 30 minutes, the changeover timer will immediately recognize the opposite call, shutting off the current mode, enter the purge mode and automatically switch to the opposite mode.

The longer a call has been running up to 30 minutes, the shorter the wait time will be for an opposite call. If a call is over 30 minutes and an opposite call is made the changeover will be immediate following the purge time. This intelligent changeover timing makes the MDP3 unique to any other zoning system.

### **LAS (Leaving Air Sensor) – Enabled (Adjustable) or Disabled**

The Leaving Air Sensor, Model ZPS, is a remote sensor that is located in the supply air duct to sense the Leaving Air temperature of the HVAC Unit. The ZPS is a high limit protection for the heating and a low limit protection for the cooling. When zoning, the airflow through the HVAC Unit is critical. The ZPS protects the equipment in low air flow situations as well as when by-pass air is being directed back into the return air duct.

The heating limit is adjustable from 110°F to 170°F. The cooling limit is adjustable from 40°F to 50°F. When the LAS setting is Enabled the ZPS senses heating above its set point, or cooling below its set point, the MDP3 will drop all stages of heating or cooling. The ZPS must sense a 10°F fall for heating or rise for cooling before re-activating the first stages of heating or cooling. If multi stage heating or cooling is being used the stage timer will start again once the first stage is re-activated.

When The LAS is Enabled the LAS temperature (example: LAS = 72°) will be displayed on the MENU LCD. **When LAS is Enabled the sensor must be wired into the LAS terminal blocks or the panel will not acknowledge any call from the thermostat.**

When LAS setting is Disabled the sensor has no impact on the operation of the MDP3.

#### **CENTRA - ZONE – Enabled or Disabled**

The Zone 1 (Z1) thermostat is the master changeover point for all system calls. (Zone 1 becomes master thermostat)

When Enabled the system is switched from heating, cooling and fan calls based on what the Z1 thermostat last called for. Once the Z1 stat calls for heating, all other zone stats can only call for heating and cooling calls are locked out. The Z1 stat must then call for cooling in order to switch the system to cooling, now the other zones are able to call for cooling only and heat calls are locked out. Likewise, the Z1 stat must call for fan before the other zones may call for fan, heat and cool calls are locked out.

When Enabled, CENTRA - ZONE will scroll across the MENU LCD.

When Disabled the MDP3 returns to normal zoning operation

#### **DS/BK (Adjustable 10 to 75%)**

The DS/BK terminal may be used with HVAC equipment that utilize a variable-speed blower fan. This setting signals the HVAC unit to reduce the blower speed. Connect the DS, BK, ODD or DHUM terminal on the HVAC equipment to this terminal.

This output will provide 24vac when the percentage of zones calling is less than the user defined DS/BK operation setting. The DS/BK operation setting is adjustable from 10-75% in 5% increments.

When the DS/BK terminal is energized, DS/BK will scroll across the MENU LCD.

#### **TEST – Enabled or Disabled**

When this setting is Enabled all of the time delays on the MDP3 are accelerated to provide a quick test period. When Enabled the Power LED will flash and TEST will scroll across the MENU LCD.

When Disabled the MDP3 resumes normal operation.

#### **ZONE-A-LONE (Eliminates Zoning)**

The zone one thermostat becomes the controlling thermostat for the entire system. During long unoccupied periods, one thermostat (Z1) can be set back versus adjusting each zone thermostat on the system. All dampers are opened and all calls for heat, cool or fan are made from the zone one thermostat, all other zone thermostats are locked out.

Normally Closed contacts: Zone-A-Lone is enabled

Normally Open contacts: Resume normal zoning operations

When Zone-A-Lone is enabled, ZONE-A-LONE will scroll the MENU LCD.

#### **CHECKOUT**

System checkout is accomplished through the use of the MENU LCD and the LED readouts that constantly indicate the system operation.

The **MENU LCD** displays all controlled settings, adjustable or fixed. Displays **LIMIT** when heating or cooling temperature limits are reached, **EM Heat** when the system calls for it or the EM Heat setting is enabled, **TEST** when enabled, **CENTRA-ZONE** when enabled, **ZONE ALONE** when the zone alone terminals are closed, **DS/BK** when the appropriate parameters allow the blower to slow down and **OAS < OBP** when the Outdoor Air Sensor detects temperatures below the defined Outdoor Balance Point setting. Also displays **OAS & LAS °F** (OAS & LAS temperatures).

**POWER LED** is constantly illuminated **GREEN** when 24VAC is applied to the MDP3. The power LED will flash green when the test mode is enabled.

**HEAT LED** is constantly illuminated **RED** when MDP3 is calling for the first stage of heating, will flash two times (2X) when second stage heat energizes and will flash three times (3X) when the third stage of heat or emergency heat is energized.

**COOL LED** is constantly illuminated **GREEN** when the MPD3 is calling for the first stage of cooling and will flash two times (2X) when the second stage of cooling is energized.

**FAN LED** is constantly illuminated **YELLOW** when calling for the fan or when the compressor is running.

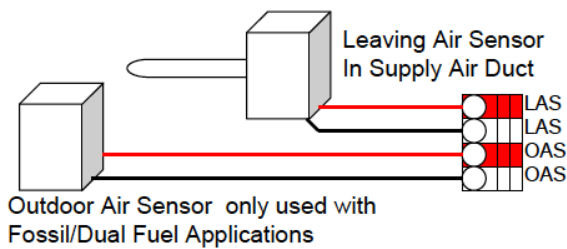
**ZONE DAMPER LEDs** will constantly be illuminated **GREEN** when no zone is calling. When a zone calls for heating, cooling or fan that zone LED will remain illuminated and those zones not calling the LED will go out.

**WIRING**

The MDP3 is very simple to wire and requires only a minimum number of connections. The MDP3 terminal blocks are color coded and screw-less for all wires to be easily pushed into their respective terminal by de-pressing the button for each point and releasing once the wire is seated. (Solid wire can often just be pushed into the terminal without de-pressing the button.) To remove the wire, just press its button again and remove the wire.

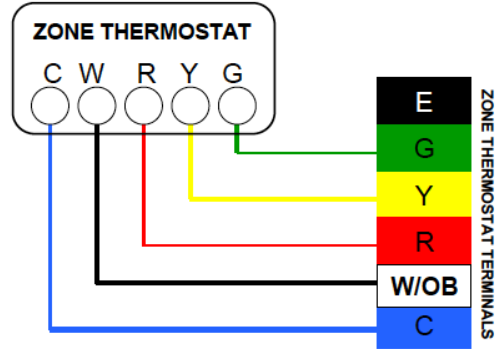
**SENSORS: ZPS and OAS**

The ZPS and OAS (if used) each require two (2) wires to their respective LAS and OAS terminals on the H32P panel.



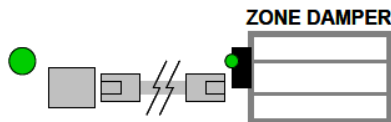
**Zone Thermostats** – The thermostats wiring will be for Conventional single stage (Y-G-R-W-C) or Heat Pump (Y-G-R-E-C and O or B). See Wiring Diagram 1 and 2 each type of thermostat.

**WIRING DIAGRAM 1 – Conventional Thermostats**

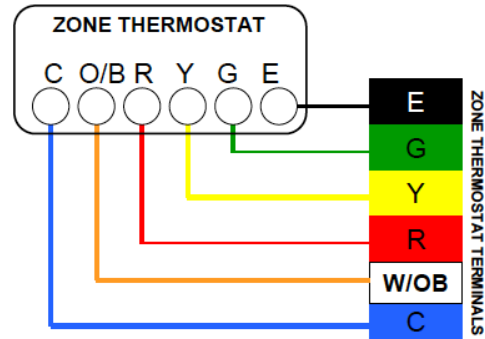


**Zone Dampers** – The MDP3 provides DC power to ZONEFIRSTs' exclusive Plug-In Zone Dampers. These dampers use and are supplied with a modular cord that is complete with RJ11 jacks on each end of a 25' cable for each zone damper. Up to 10 dampers can be wired to each zone.

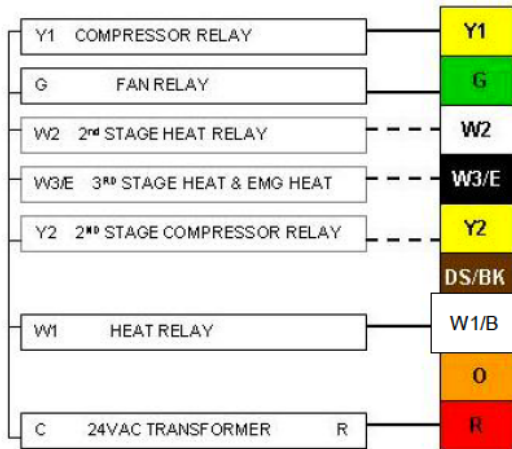
The panel has a GREEN LED to indicate when the damper should be open. Each damper motor has a two color LED that a positive indication of the damper being open or closed. When the LED is GREEN the damper is Open. When the LED is RED the damper is closed.



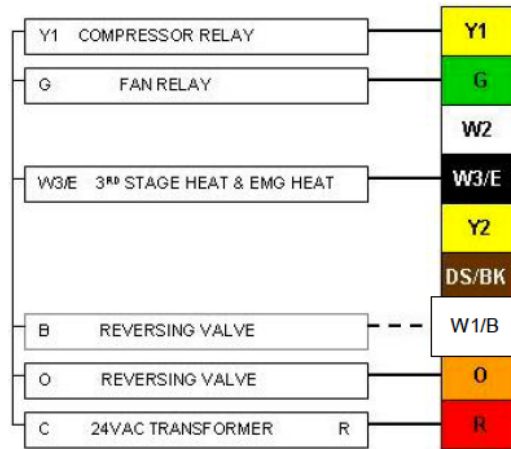
**WIRING DIAGRAM 2 – Heat Pump Thermostat**



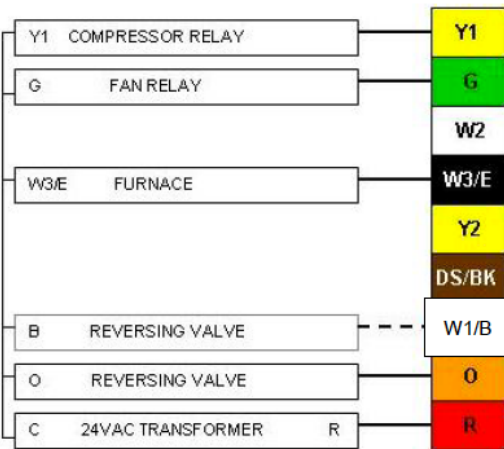
**WIRING DIAGRAM 3 - HVAC Equipment – Up to Three Stage Heating and Two Stage Cooling**



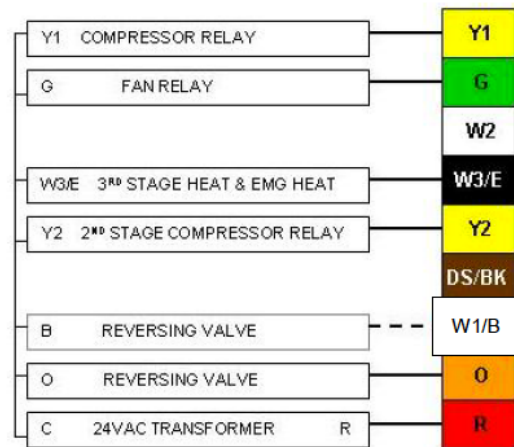
**WIRING DIAGRAM 5 – Single Speed Compressor Heat Pump**



**WIRING DIAGRAM 4 - HVAC Equipment – Dual Fuel Heat Pump with Fossil Fuel Back-Up**



**WIRING DIAGRAM 6 – Two Speed Compressor Heat Pump**



## TROUBLESHOOTING

The MDP3 is a very simple control to troubleshoot, especially with the LED indicators. The only other device needed is a simple Volt/Ohm meter. Almost all problems can be traced to an external component or wiring to the MDP3. The following procedures can help isolate the problem.

### Zone(s) Not Calling

Each zone has a Green LED next to the zone relay when it is calling and that calling is being recognized by the MDP3. If a zone is supposed to be calling and the Zone LED is not on, check for 24VAC across the thermostat terminal C and the Y, if a Cool call, W if a Heat Call, or G if a Fan call. If there is no voltage here at the panel the panel is not getting the signal from the thermostat. The problem is wiring issue, a broken wire or a problem in the thermostat. To check the zone on the panel, place jumper from R to Y, R to W or R to G to see that the panel is operating properly.

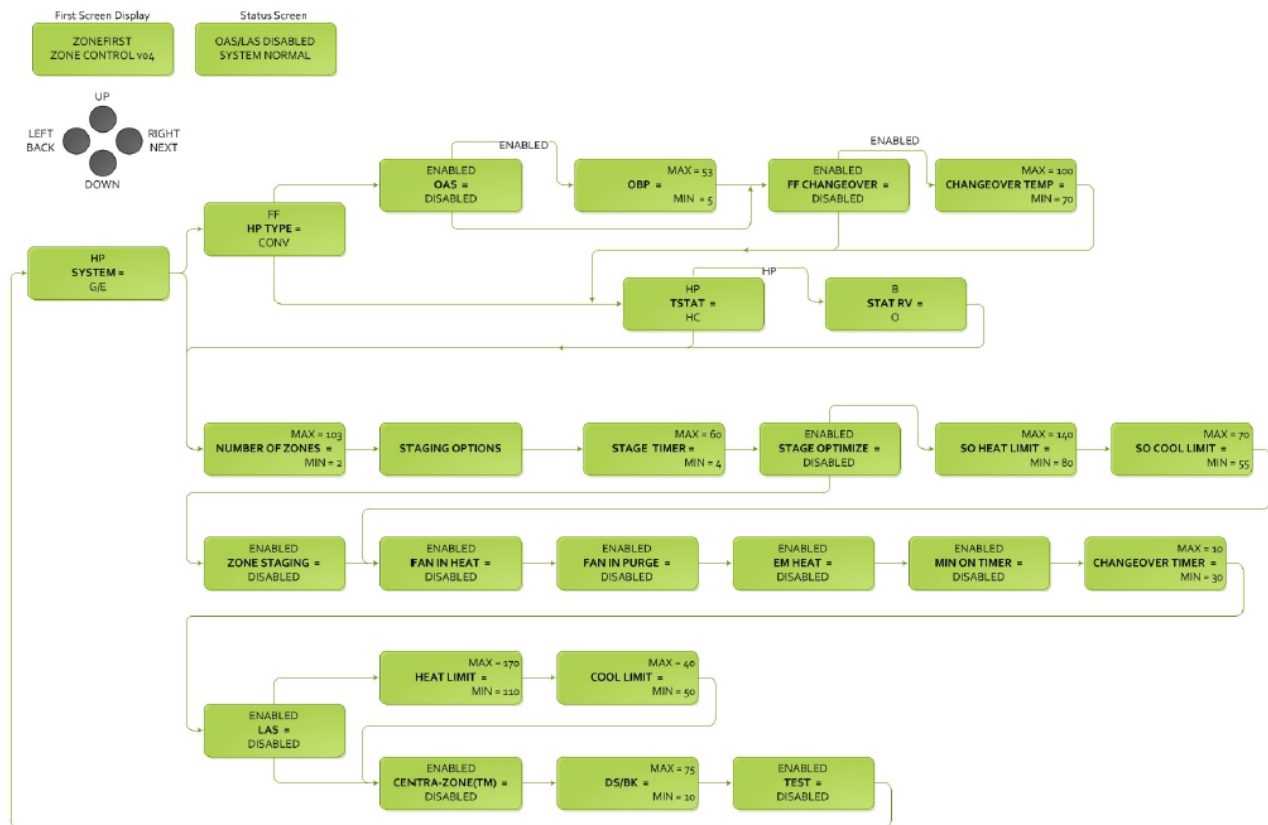
### Zone(s) Will Not Shut Off

If a zone will not stop calling, the Zone LED should still be on. Depending on the call disconnect the Y, W or G wire from the terminal strip. The zone will drop out. Check the thermostat wiring for a wiring error or short that keeps the zone calling.

### Damper Motor Checkout

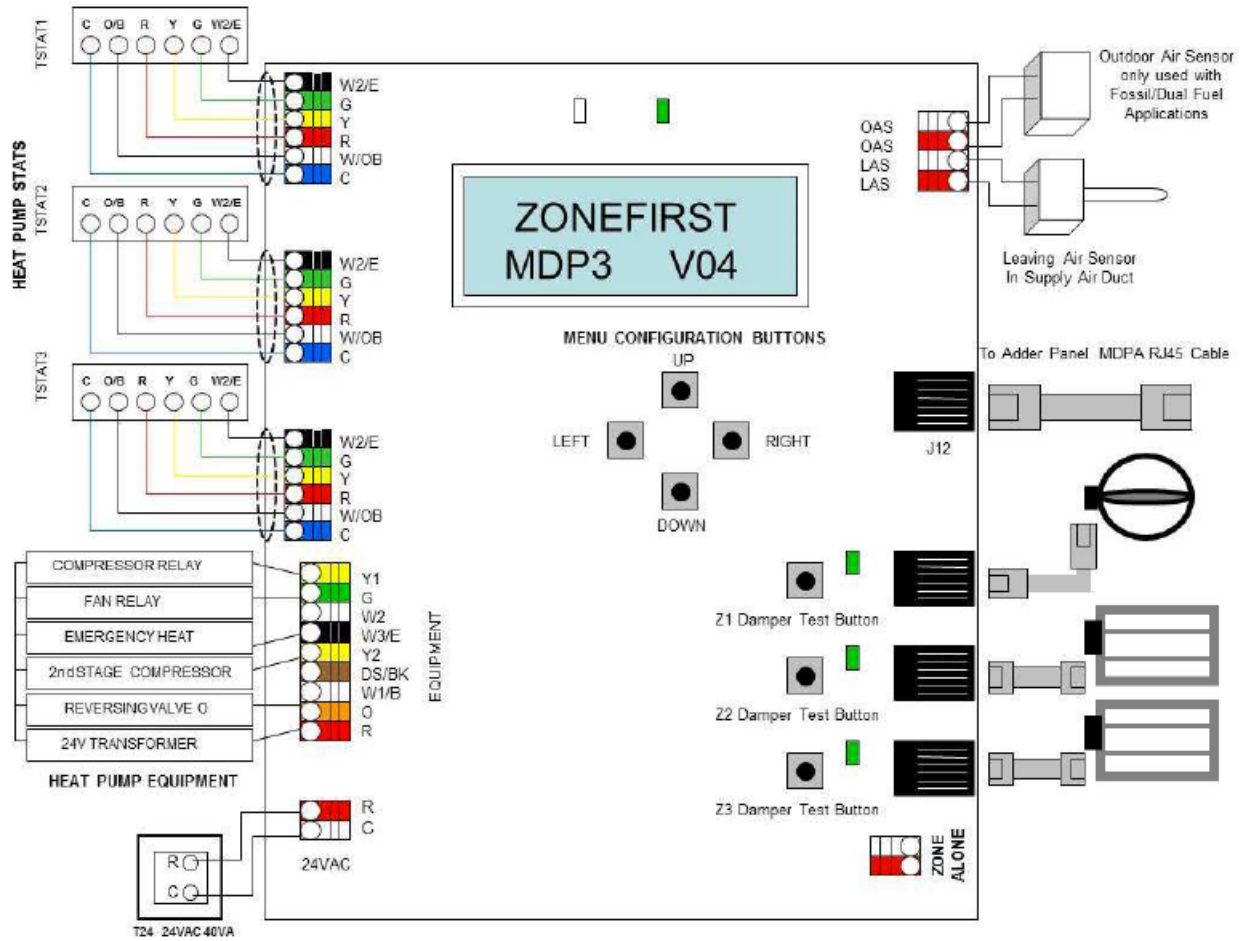
To checkout the dampers, the panel has a GREEN LED for each zone. This illuminates when the dampers are to be OPEN, either on a call or when all zones are satisfied. The damper position is confirmed by the bi-color LED on the motor. When the panel is Green, the motor LED must be Green also indicating the damper being open. When the panel LED is not lit the motor should be closed and this is confirmed by the damper LED being Red.

## ZONEFIRST<sup>®</sup> MDP3 FLOW CHART





# MDP3 WIRING DIAGRAM



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