

## SYSTEM DESIGN

The concept of the DIGITRACT system is to provide an inexpensive and easy to install two zone system which can be used to upgrade air conditioning and heating systems for two story and ranch style homes.

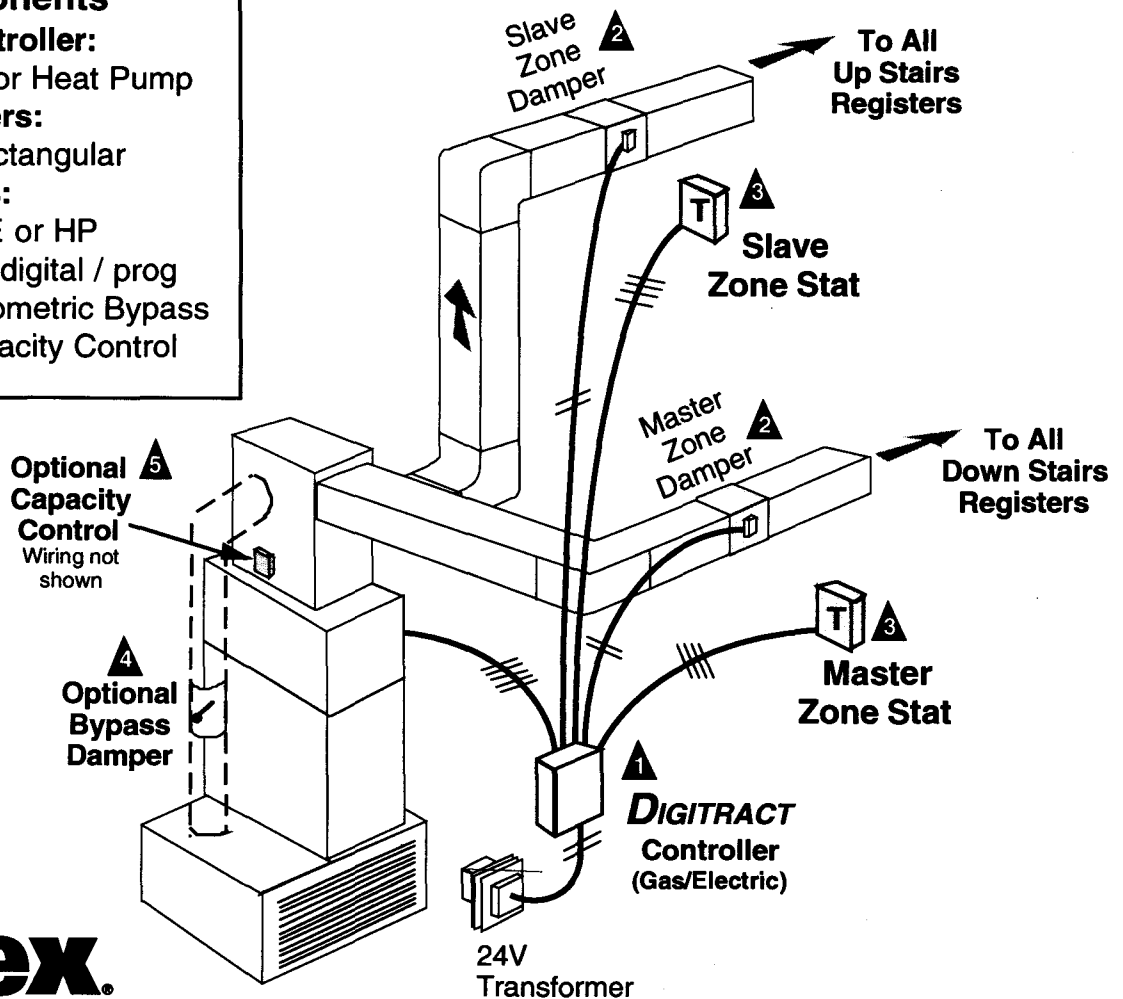
The fact that warm air rises results in overheating the second floor of most two story homes during the winter months. The second floor of these homes may also stay uncomfortably warm during the summer months when the thermostat located on the first floor is satisfied. The typical solution to these uncomfortable situations is to install two separate air conditioning units, one for the first floor and another for the second floor.

This solution creates an inefficient system which is expensive to operate. The first cost of the home is also raised substantially. Additionally, if a second unit is installed it can cause mechanical noise problems, the condensate pan or humidifier can overflow damaging ceilings and valuable furnishings and cost to maintain and service both units becomes a nuisance for the home owner.

However, installing one unit and DIGITRACT Zoning provides low cost comfort and increased control for your customers.

### System Components

1. **System Controller:**  
Gas Electric or Heat Pump
2. **Zone Dampers:**  
Round or Rectangular
3. **Thermostats:**  
Standard G/E or HP  
mechanical / digital / prog
4. **Optional Barometric Bypass**
5. **Optional Capacity Control**



# There are two ways to apply the DIGITRACT System;

## METHOD 1

To maximize the operation of your DIGITRACT System we recommend properly sized duct work, a bypass damper and a capacity control device. In this way excessive static pressure cannot build up in the duct system. The capacity control cycles the compressor and gas valve to eliminate coil freeze up and premature heat exchanger failure.

## METHOD 2

If the duct system and each run is large enough to handle 70% of the total CFM you may eliminate the bypass and capacity control to reduce the initial system cost. However, to eliminate noise the return and supply registers should also be oversized. This system design should be used where air delivery to each area of the house is roughly equal.

## SYSTEM CONTROLLER SELECTION

There are two types of DIGITRACT System Controllers available, Gas/Electric and Heat Pump. The Gas/Electric Controller is Auto Changeover. The Heat Pump is Manual Changeover. Select the controller that corresponds with your type of heating and cooling system. (Some Heat Pumps use Gas/Electric style thermostats. For this type of Heat Pump, use the Gas/Electric Controller.)

## THERMOSTAT SELECTION

The DIGITRACT System requires two thermostats to provide information to the System Controller a Master and a Slave.

### Thermostats for Gas/Electric Units

The Master thermostat must be provided with a cool-off-heat-auto switch for auto changeover operation and a fan auto-on switch. A standard cool-off-heat stat can be used but will result in manual changeover operation for the Master zone. The Slave thermostat must also be provided with a cool-off-heat-auto switch for auto changeover operation. A standard cool-off-heat stat can be used but will result in manual changeover operation for the Slave zone. Only the Master zone fan auto-on switch can put the fan into continuous operation.

NOTE: The cooling compensator on some mechanical thermostats may cause a false cooling call. The solution for this problem is to clip the cooling compensator.

### Thermostats for Heat Pumps

Both the Master and Slave thermostats must be of heat pump design and have a cool-off-heat switch, in addition, the Master stat must also have a fan auto-on switch. The thermostats must contain W2 terminals if electric heat is used.

### Programmable Thermostats for Gas/Electric & Heat Pumps

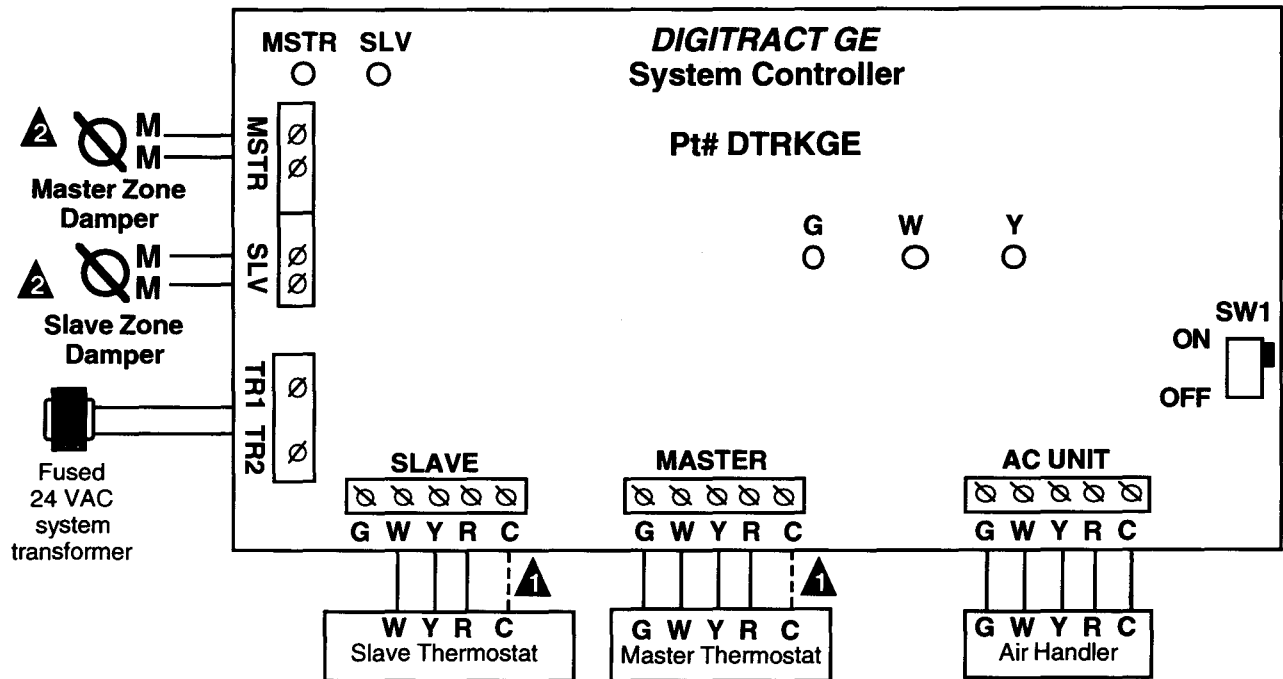
Programmable thermostats may be used for both Master and Slave thermostats. The thermostats may be battery operated or steal power from the system transformer. If a stat requiring 24 volt power is used the "C"\* or common wire must be connected to the "C" terminal on the Controller. Please follow the thermostat manufacturer's instructions regarding optimal location and wiring.

## TRANSFORMER

The DIGITRACT two damper system requires only one 40VA 24 Volt transformer. However, if additional dampers are used as slaves, the transformer must provide 12VA for each extra damper. The load side of the transformer must be fused in accordance with the electrical load. A one amp fuse is appropriate for a two damper system.

\*"C" terminal can be used to: Power the common wire on a programmable thermostat or an electronic thermostat.

**The DIGITRACT Gas/Electric Controller (Pt# DTRKGE)  
Diagram for Single Stage Gas/Electric Unit**



- 1 Run dotted line wires if using thermostats that require a 24 volt common wire.
- 2 Each thermostat can operate up to 3 zone dampers. (See Slaving Zone Dampers wiring.)

This wiring diagram is to be used on systems where duct work can be sized properly so that no bypass damper or capacity controller are needed. If the duct work is not oversized add a bypass damper to control the static pressure and capacity controller to protect the unit.

**DIGITRACT GE OPERATION DESCRIPTION**

**NO ZONES CALLING/VENTILATION**

When neither thermostat is calling for heating or cooling, both dampers are open and the furnace or air conditioner is off. During this time unconditioned air can be circulated through both zones by turning the fan switch of the Master thermostat to ON.

**ONE ZONE CALLING**

When only one zone is calling, the unit turns on for the mode called (heat or cool) and the damper for the zone not calling is powered closed. The "MSTR" or "SLV" light on the Controller corresponding to the zone that is NOT calling will be illuminated. Note: the L.E.D. for the "non" calling zone will be lit signifying that damper is being powered closed.

**TWO ZONES CALLING FOR THE SAME MODE**

When both zones are calling for the same mode of operation (heat or cool) the unit turns on for the mode called (heat or cool) and both dampers stay open.

**AUTO CHANGEOVER**

If the thermostats are calling for different modes, the unit (furnace or air conditioner) will run in the mode of the first thermostat calling and close the damper of the zone calling for the other mode. After the first thermostat is satisfied, the unit will shut off for 5 minutes. After the time delay, the dampers will change position (the open damper will close and vice versa) and the furnace or air conditioner will turn on for the still calling thermostat. In this way heating and cooling calls can be addressed simultaneously throughout the day without the homeowner manually requesting a heat or cool call.

## STATUS LIGHTS:

There are two damper operation and three mode lights on the System Controller. The damper operation lights are MSTR and SLV. When on, they indicate that the corresponding damper is closed or closing. The mode lights are G, W and Y. When on, G indicates the blower fan is on, W indicates the furnace is on and Y indicates the air conditioner is on. Please note that in heat mode the blower fan will turn on even though the G light is not on. This is because the furnace is controlling the fan not the DIGITRACT controller. Also, if a capacity controller is being used the furnace or air conditioner may not be running even though the W or Y lights are on. This is because the capacity controller can temporarily shut down the furnace or air conditioner to prevent overheating or coil freeze ups.

### STATUS LIGHTS DESCRIPTION TABLE

LIGHT	COLOR	FUNCTION
G	Green	Blower fan on
W	Red	Furnace on
Y	Yellow	Air conditioner on
MSTR	Red	Master zone damper close
SLV	Red	Slave zone damper close

### INDOOR BLOWER FAN CONTROL

The DIGITRACT turns on the indoor blower fan when the AC is on or when the MASTER thermostat fan switch is at the ON position. In heat mode, the fan is controlled by the furnace fan controller or bonnet control.

### LOCK OUT / PURGE

Calls will be locked out for 5 minutes after all calls are satisfied. During this period the damper of the last calling zone is open and the other zone is closed. If the Master thermostat fan switch is in the ON position, during this lockout period residual conditioned air will be purged into the zone of the last calling thermostat.

### LIGHT SEQUENCE DESCRIPTION TABLE GAS/ELECTRIC

MSTR	SLV	G	W	Y	OPERATION
0	1	X	1	0	Heat call from master zone
1	0	X	1	0	Heat call from slave zone
0	0	X	1	0	Heat call from both zones
0	1	1	0	1	Cool call from master zone
1	0	1	0	1	Cool call from slave zone
0	0	1	0	1	Cool call from both zones
0	1	X	0	0	Time Delay/Purge master zone.
1	0	X	0	0	Time Delay/Purge slave zone.
0	0	1	0	0	Blower fan on, Master thermostat fan switch at ON position

0 = light off

1 = light on

X = G light on when Master thermostat fan switch is at ON position.

# SEQUENCE OF OPERATION

## GAS/ELECTRIC

If you are using Cool-Off-Heat-Auto thermostats you can operate your system in the AUTO CHANGEOVER mode. Set both Thermostats in the AUTO position. If a call for cooling is received from any thermostat cooling will be initiated. If the other zone calls for heating it will be ignored until the first call is satisfied. When the first call is satisfied the system will go through a five minute purge cycle delay at which time the furnace will start to satisfy the heating call ,if necessary.

## For Manual Changeover operation

Operate the Cool-Off-Heat-Auto switch on the Master thermostat to start operation. For cooling, set the Master thermostat switch to the cool position. Lower the cooling set point to initiate a cooling call, this will put the system into the cooling mode, now both thermostats will operate in the cooling mode. Any calls for cooling will open the appropriate damper and start the air conditioner.

Turning the Master thermostat system switch to off will turn off the Master thermostat. The system will remain in the cooling mode. Cooling can still be initiated from the Slave thermostat. To turn the system completely off, in auto or manual changeover modes both thermostats must be switched to off.

When the Master thermostat switch is set to heat and, after a heating call is initiated by the Master thermostat, the system will be put in the heating mode. Now, calls for heating from either thermostat will operate that thermostat's damper and turn on the heating system.

Turning the Master thermostat system switch to off when the system is in the heating mode will turn off only the Master thermostat. Heating can still be initiated from the Slave thermostat. The Slave thermostat switch must also be turned to off to completely prevent the heat from turning on. In other words, to turn the system completely off, both thermostats must be switched to off.

## FAN SWITCH

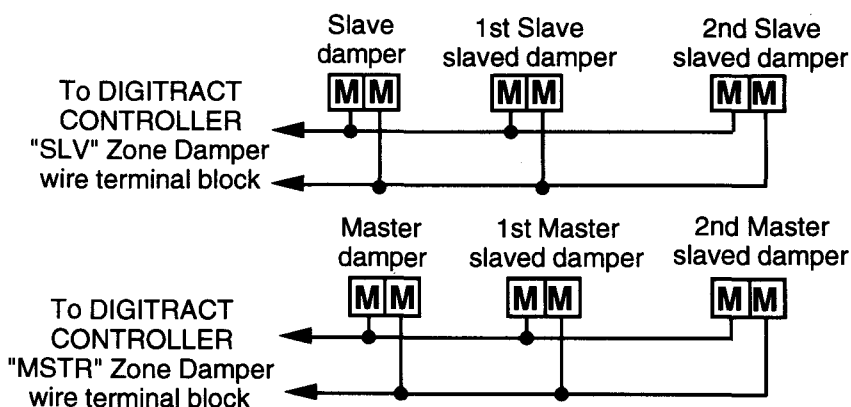
The fan will operate in the cooling mode on a call from either thermostat. Only the Master thermostat's fan auto-on switch can put the fan into continuous operation.

## DAMPER OPERATION

The Master damper will open or close on calls from the Master thermostat. The Slave damper is controlled by the Slave thermostat and will operate in the mode selected by the Master thermostat. When both thermostats are satisfied, both dampers will open fully after a 5 minute purge delay for ventilation purposes.

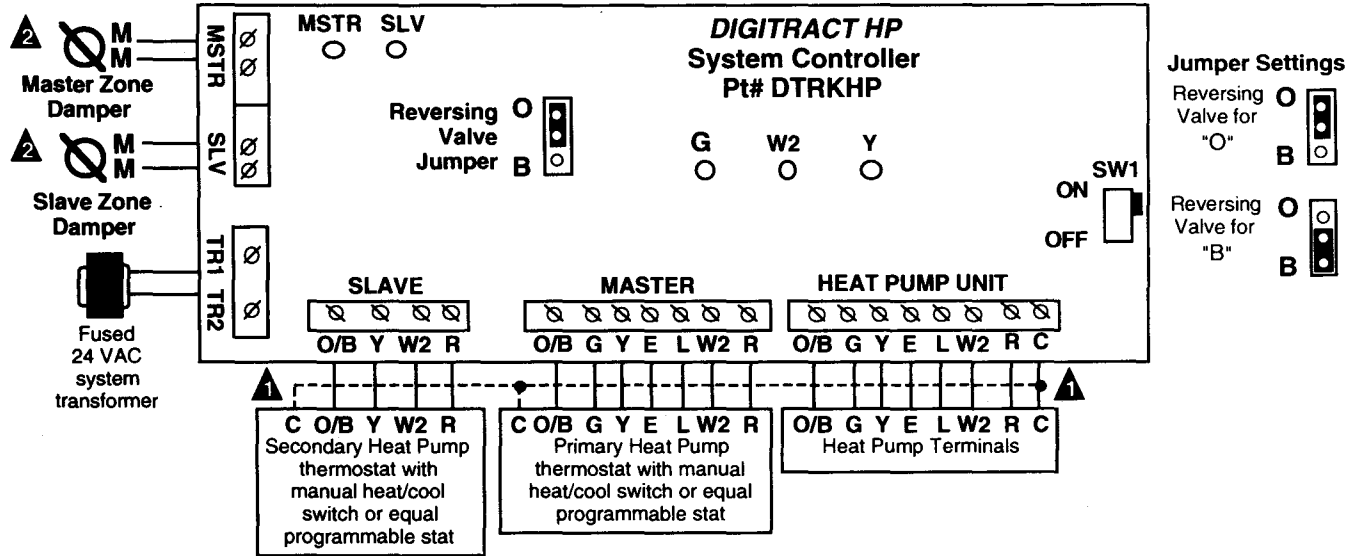
## SLAVING ZONE DAMPERS

Up to three dampers can be controlled by one thermostat. To wire multiple dampers to one thermostat, use the diagram shown below. Remember that each low pressure slave damper requires 12VA. Size the Controller's transformer accordingly. i.e. Six total dampers in a system require at least a 72VA transformer.



The DIGITRACT Heat Pump Controller (Pt# DTRKHP) is designed to work with most types of Heat Pumps. There is a jumper to select either "O" or "B" reversing valve operation. Some Heat Pumps use Gas/Electric stats. For this type of Heat Pump, use the DTRKGE Controller.

### DIAGRAM FOR ANY SINGLE STAGE HEAT PUMP



- ▲ Run dotted line wires if using thermostats that require a 24 volt common wire.
- ▲ Each thermostat can operate up to 3 zone dampers. (See Slaving Zone Dampers wiring.)

This wiring diagram is to be used on systems where duct work can be sized properly so that no bypass damper or capacity controller are needed. If the duct work is not oversized add a bypass damper to control the static pressure and capacity controller to protect the unit.

### DIGITRACT HP OPERATION DESCRIPTION

#### NO ZONES CALLING/VENTILATION

When neither thermostat is calling for heating or cooling, both dampers are open and the heat pump is off. During this time unconditioned air can be circulated through both zones by turning the fan switch of the Master thermostat to ON.

#### MODE (HEAT/COOL)

The DIGITRACT HP mode of operation is determined by the Master thermostat. To operate heating, set the Master thermostat to Heat. To operate cooling, set the Master thermostat to Cool. Only calls for the mode determined by the Master thermostat will be recognized. Example: If the Master thermostat is set for Cool then only cool calls from the Master and Slave thermostats will be recognized. Heat calls from either thermostat will be ignored. To recognize heat calls the Master thermostat mode must be changed to Heat.

#### ONE ZONE CALLING

When only one zone is calling, the unit turns on for the mode called (heat or cool) and the damper for the zone not calling is closed.

#### TWO ZONES CALLING FOR THE SAME MODE

When both zones are calling for the same mode of operation (heat or cool) the unit turns on for the mode called (heat or cool) and both dampers stay open.

#### AUXILIARY HEAT

Auxiliary heat is energized when the Master thermostat is set for Heat and either thermostat is calling for auxiliary or supplemental heat. An outdoor thermostat can be used to minimize electric heat operating costs.



## STATUS LIGHTS

There are two damper operation and three mode lights on the Heat Pump Controller. The damper operation lights are MSTR and SLV. When on, they indicate that the corresponding damper is closed or closing. The mode lights are G, W and Y. When on, G indicates the blower fan is on, W indicates the auxiliary heat is on and Y indicates the heat pump compressor is on. If a capacity controller is being used the heat pump or auxiliary heat may not be running even though the Y and/or W light(s) are on. This is because the capacity controller can temporarily shut down the compressor or auxiliary heat to prevent overheating or coil freeze ups.

## HEAT PUMP STATUS LIGHTS DESCRIPTION

LIGHT	COLOR	FUNCTION
G	Green	Blower fan on
W	Red	Auxiliary heat on
Y	Yellow	Compressor on
MSTR	Red	Master zone damper close
SLV	Red	Slave zone damper close

## INDOOR BLOWER FAN CONTROL

The DIGITRACT turns on the indoor blower fan when the heat pump is on or when the MASTER thermostat fan switch is at the ON position.

### LIGHT SEQUENCE DESCRIPTION TABLE HEAT PUMP

MSTR	SLV	G	W	Y	OPERATION
0	1	1	0	1	Call from master zone
1	0	1	0	1	Call from slave zone
0	0	1	0	1	Call from both zones
0	1	1	1	1	Two stage heat call from master zone
1	0	1	1	1	Two stage heat call from slave zone
0	0	1	1	1	Two stage heat call from both zones
0	0	1	0	0	Blower fan on, Master thermostat fan switch at ON position

0 = light off

1 = light on

## SEQUENCE OF OPERATION

### HEAT PUMP SYSTEMS WHICH OPERATE THE REVERSING VALVE WITH THE "O" TERMINAL

Move the jumper labeled "BO" on the controller board to operate the reversing valve from the "O" terminal. (See the controller wiring diagram for jumper location and settings).

The Master thermostat controls the mode of operation, either heating or cooling. If the Slave thermostat is moved into the opposite mode from the Master thermostat, its damper will remain closed and no call will be recognized by the System Controller. To turn the system off completely, move the Master and Slave thermostat system switches to off.

### HEAT PUMP SYSTEMS WHICH OPERATE THE REVERSING VALVE WITH THE "B" TERMINAL

Move jumper labeled "BO" on the controller board to the "B" position to operate the reversing valve in the heat mode (See the controller wiring diagram for jumper location and settings). Set the Slave thermostat to the off position.

Move the Master thermostat heating lever to a set point well below room temperature. Then move the cool-off-heat switch to the heat position. Adjust the heat set point to initiate a heating call and operate the compressor. Initiating the heat call will close the Slave damper and leave the Master damper in the open position to receive warm air.

Move the system switch on the Slave thermostat to heat. Then, generate a heating call from the Slave thermostat by raising the set point to above room temperature. Setting the Slave thermostat for heating will open its damper.

The Master thermostat controls the mode of operation, either heating or cooling. If the Slave thermostat is moved into the opposite mode from the Master thermostat, its damper will remain closed and no call will be recognized by the System Controller. To turn the system off completely, move the Master and Slave thermostat system switches to off.

## FAN SWITCH

The fan will operate in the cooling or heating mode on a call from either thermostat when the master thermostat fan switch is in the Auto position. Only the Master thermostat's fan auto-on switch can put the fan into continuous operation.

## DAMPER OPERATION

The Master damper will open or close on calls from the Master thermostat. The Slave damper is controlled by the Slave thermostat and will operate in the mode selected by the Master thermostat. When both thermostats are satisfied, both dampers will open fully for ventilation purposes.

## NON RECYCLE TIMERS

Non recycle timers are recommended for heat pump systems with more than one thermostat. A Non Recycle Timer will prevent compressor short cycling.

# TRLAT

## LEAVING AIR TEMPERATURE CONTROL

The TRLAT is a simple single stage capacity controller for both gas/electric and heat pump units. It monitors the leaving air temperature of the unit. During a low-load cooling operation, the TRLAT cycles the compressor, preventing coil freeze-up. In the heating operation, the TRLAT cycles the gas valves to protect the heat exchanger from overheating in gas/electric units, and cycles the compressor in Heat Pump units

### SYSTEM COMPATIBILITY:

The TRLAT can be used with any of the following California Economizer zoning systems.

**Gas/Electric:** System 1000, model SYGE. System 2000, model 101AACB. DIGITRACT, model DTRKGE. VVHC, single stage applications only, models 37P37 and 89371. VVHC ENHANCED, single stage applications only, model 62P48.

**Heat Pump:** DIGITRACT, model DTRKHP.

### TRLAT CAPACITY CONTROL OPERATION:

The TRLAT sensor measures the leaving air temperature of the unit.

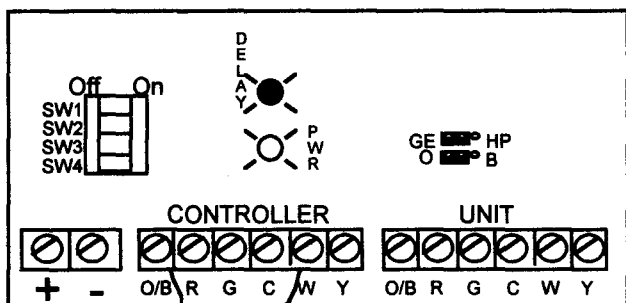
**Cool mode (gas/electric and heat pump):** If the leaving air temperature drops below the TRLAT cooling set point (field settable to 41, 44, 47 or 50 degrees Fahrenheit), the Y (Controller) breaks from Y (Unit) and makes to G. This turns off the compressor and keeps the indoor blower fan running to warm up the evaporator. Four minutes after the leaving air temperature rises above the cooling set point, Y (Controller) makes to Y (Unit) and breaks to G. This restarts the compressor and returns indoor blower fan control to the Switching Center/Controller.

**Heat mode (gas/electric):** If the leaving air temperature rises above the TRLAT heating set point (field settable to 125, 140, 150 or 160 degrees Fahrenheit), the W (Controller) breaks from W (Unit) and makes to G. This turns off the heater and keeps the indoor blower fan running to cool down the heater. Four minutes after the leaving air temperature drops below the heating set point, W (Controller) makes to W (Unit) and breaks to G. This restarts the heater and returns indoor blower fan control to the heater or Switching Center/Controller.

**Heat mode (heat pump):** For heat pumps, the heat set point is 118 degrees and unchangeable. If the leaving air temperature rises above 118 degrees Fahrenheit, the Y (Controller) breaks from Y (Unit) and makes to G. This turns off the compressor and keeps the indoor blower fan running to cool down the indoor coil. Four minutes after the leaving air temperature drops below the heating set point, Y (Controller) makes to Y (Unit) and breaks to G. This restarts the compressor and returns indoor blower fan control to the Switching Center/Controller.

**Cutout disable:** The cool cutout is disabled in heat mode. The heat cutout is disabled in cool mode. This permits the heat to turn on in a cold building and the air conditioner to turn on in a hot building. For heat pumps, this also prevents the compressor from cycling off when the heat pump is in defrost mode. The O/B (Controller) input tells the TRLAT what mode of operation (heat or cool) is active.

**For GE systems, a jumper wire (factory installed) must be connected between O/B (Controller) and W (Controller). For heat pumps, remove this jumper wire.**



### JUMPERS

**GE/HP:** For gas/electric systems, place jumper on GE and center pin. For heat pumps, place jumper on HP and center pin.

**O/B:** For heat pumps, if reversing valve is energized in cool mode, place jumper on O and center pin. If reversing valve is energized in heat mode, place jumper on B and center pin.

**Jumper wire** (factory installed) must be connected between O/B (Controller) and W (Controller) for GE systems and removed for heat pumps.

### STATUS LIGHTS

**DELAY (red):** On when compressor or furnace is disabled.

**PWR (yellow):** On when TRLAT is powered.

		Cool
SW1	SW2	Cutout
On	On	50 Deg F
On	Off	47 Deg F
Off	On	44 Deg F
Off	Off	41 Deg F
		Heat
SW3	SW4	Cutout
On	On	125 Deg F
On	Off	140 Deg F
Off	On	150 Deg F
Off	Off	160 Deg F

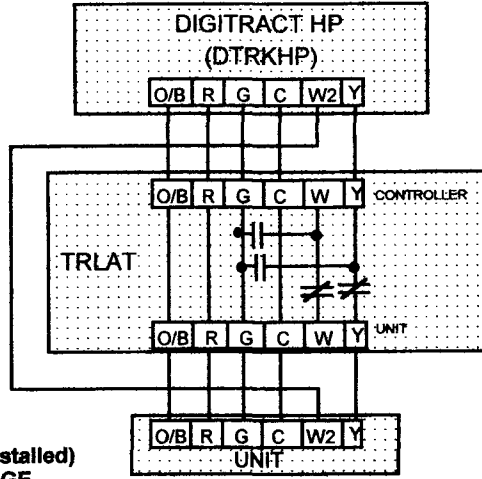
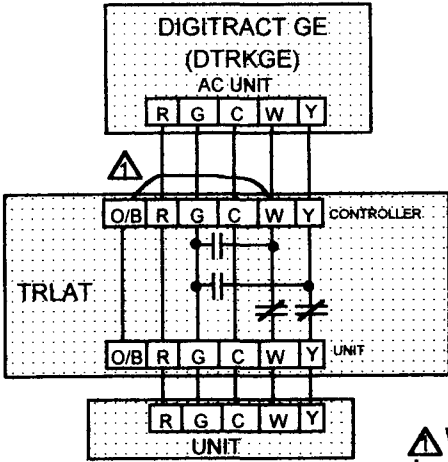
### SET POINT SETUP

A four pole dip switch is used to designate the desired heat and cool cutoff set points. Using the table above, set the switch positions to correspond to the cutoff temperatures desired. For heat pumps, the heat cut off set point is 118 degrees and unchangeable.



# TRLAT LEAVING AIR TEMPERATURE CONTROL

## TYPICAL WIRING

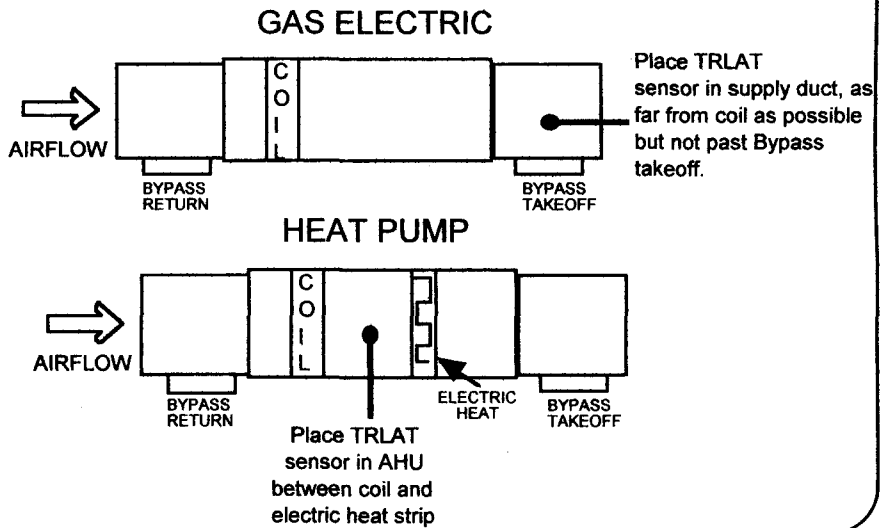
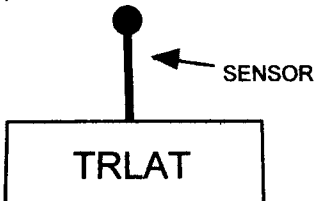


Heat pump notes:  
 1) Remove factory installed jumper wire between O/B (Controller) and W (Controller).  
 2) Electric heat is controlled by the thermostat second stage only, not by the TRLAT.

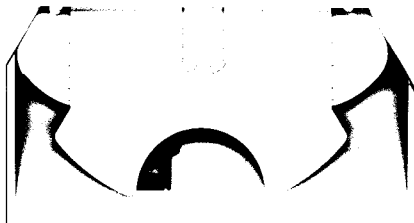
**⚠ WARNING!**  
 Jumper wire (factory installed) must be connected for GE applications between W (Controller) and O/B (Controller). If not, the TRLAT will not shut off the heater when the heat set point is exceeded.

## TRLAT SENSOR PLACEMENT

The TRLAT air temperature sensor should be mounted in the location detailed to the right. If preferred, the sensor can be removed from the casing and mounted remotely. If less than 200 feet, use 18 gauge, 2 conductor wire. If over 200 feet, use two conductor shielded wire and connect the shield to the C terminal at the TRLAT. The sensor is wired to the + - terminals (red to + and white to -).



**Include a bypass damper and capacity control device in your installation** on existing jobs or on new construction where the duct work cannot be oversized, and/or the zones have unequal loads. Also use these devices to eliminate noise and/or to provide capacity control.



## BYPASS DAMPER

A bypass damper is used to provide constant air delivery through the air conditioning unit. As the building load is satisfied, the zone dampers close. To solve the potential problem of air noise, the DIGITRACT Damper System utilizes the barometric bypass strategy.

The goal is to cause the bypass damper to modulate open allowing excess air to flow from

the supply to the return side of the air conditioning unit. In this way, excessive static pressure cannot build up in the duct system. This prevents noise at the diffusers and erratic control in the zones. We strongly recommend that barometric bypass dampers be installed in systems in which the ducts are not sized to handle 70% of the unit's capacity. This would apply to most retrofit situations.

The barometric bypass damper is designed for systems 5 tons and under. The damper is simple to install and requires no wiring or electrical power to operate. The barometric bypass damper is an efficient solution for small system static pressurization compensation.

The barometric damper can be installed in the horizontal or vertical position, providing maximum flexibility in the field. As detailed below, a simple counterweight is balanced to open as static pressure builds in the system. Recommended sizing for the barometric bypass damper is as follows:

### WE DO NOT RECOMMEND USE OF THE BAROMETRIC BYPASS IN ANY SYSTEM EXCEEDING 5 TONS.

For larger systems use the CALIFORNIA ECONOMIZER Electronic Bypass.

## INSTALLATION AND OPERATION

The barometric bypass damper can be installed in any position. Note the arrow showing air flow direction in the examples below. Do not run speed screws into the damper housing. Screws could restrict damper travel. Make sure the counterweight is not obstructed in any way.

The bypass damper is installed between the supply and return plenums at the unit. For example, in an up discharge unit, a pipe is run from the supply to the return duct to accommodate the barometric damper-as shown below in the vertical application example.

During initial calibration of the bypass damper, all zone dampers must be in the open position--turning the DIGITRACT Controller power switch to off opens all the zone dampers.

Set all thermostats for no calls. Then turn the fan switch on. Now adjust the counterweight to balance the damper so that it is just ready to open. The damper should still be in the closed position. Now turn the DIGITRACT Controller back on and set one of the zone thermostats to call for cooling. The bypass damper should open--if not, move the counterweight as required.

Now set both of your thermostats to call for cooling, the bypass should close if not, adjust the counterweight.

The same procedure is used if you select the heating mode and set the stats to call for heating instead of cooling.

There is no wiring or other power source required for the barometric bypass damper operation.

## BYPASS SELECTION CHART

SYSTEM SIZE	DAMPER SIZE	PART #	L	W	NOMINAL CFM
UP TO 2.5 TONS	9 INCH	101ABBD09	11"	12"	1000
3 TONS	10 INCH	101ABBD10	12"	13"	1200
4 TONS	12 INCH	101ABBD12	14"	15"	1600
5 TONS	14 INCH	101ABBD14	16"	17"	2000

