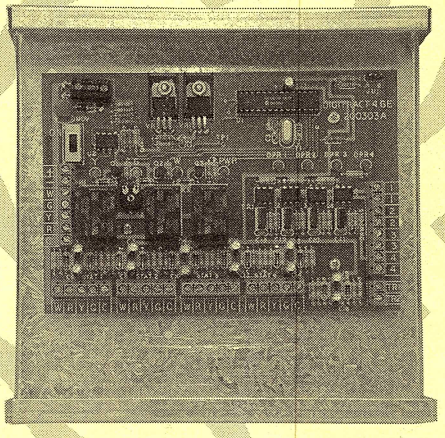
CALIFORNIA ECONOMIZER

The Zoning Systems Company

DigiTract 4

Comfort Control System



Zoning Systems

That's all we do.

Part #DT4MAN
Rev. November 2000

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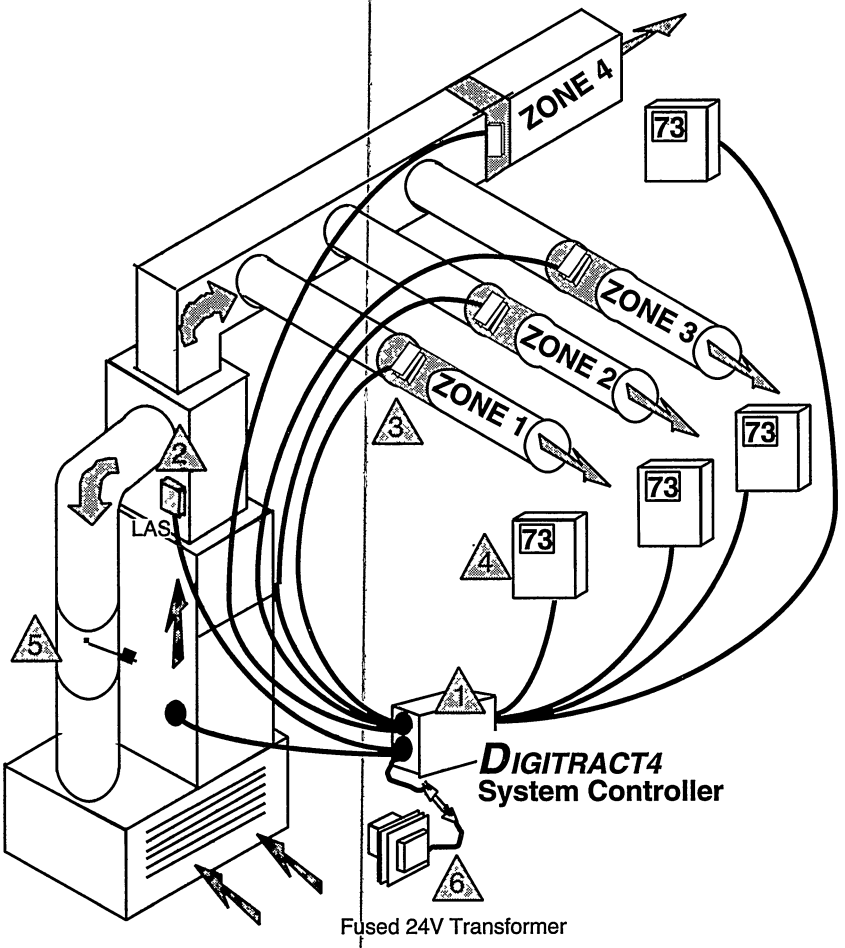
INTRODUCTION

The California Economizer DigiTract4 zoning system enables up to four room thermostats to control a single HVAC system. This permits superior building temperature control over a standard single thermostat.

1. System Controller
2. Leaving Air Sensor
3. Zone Damper
4. Zone Thermostat
5. Bypass Damper
6. Damper Transformer



SYSTEM DESCRIPTION

A complete DigiTract4 zoning system consists of a DigiTract4 System Controller with a Leaving Air Sensor (LAS), Zone Dampers, Zone Thermostats, Bypass Damper and Damper Transformer.

The **System Controller** is the heart of the DigiTract4 zoning system. It monitors the zone thermostats and LAS and controls the HVAC System and zone dampers. See pages 6 to 10 for further information.

The **Leaving Air Sensor (LAS)** is part of the Capacity Control feature of the System Controller. It is a sensor placed in the leaving air of the HVAC system. It senses the leaving air temperature of the HVAC system and sends this information to the System Controller. The System Controller uses this information to temporarily cycle the HVAC system off if the leaving air gets too hot in heat mode or too cold in cool mode. For heat pumps, this information is also used to control the auxiliary heat to maintain a minimum supply air temperature of 88 degrees. See Capacity Controller section, page 11, for further information.

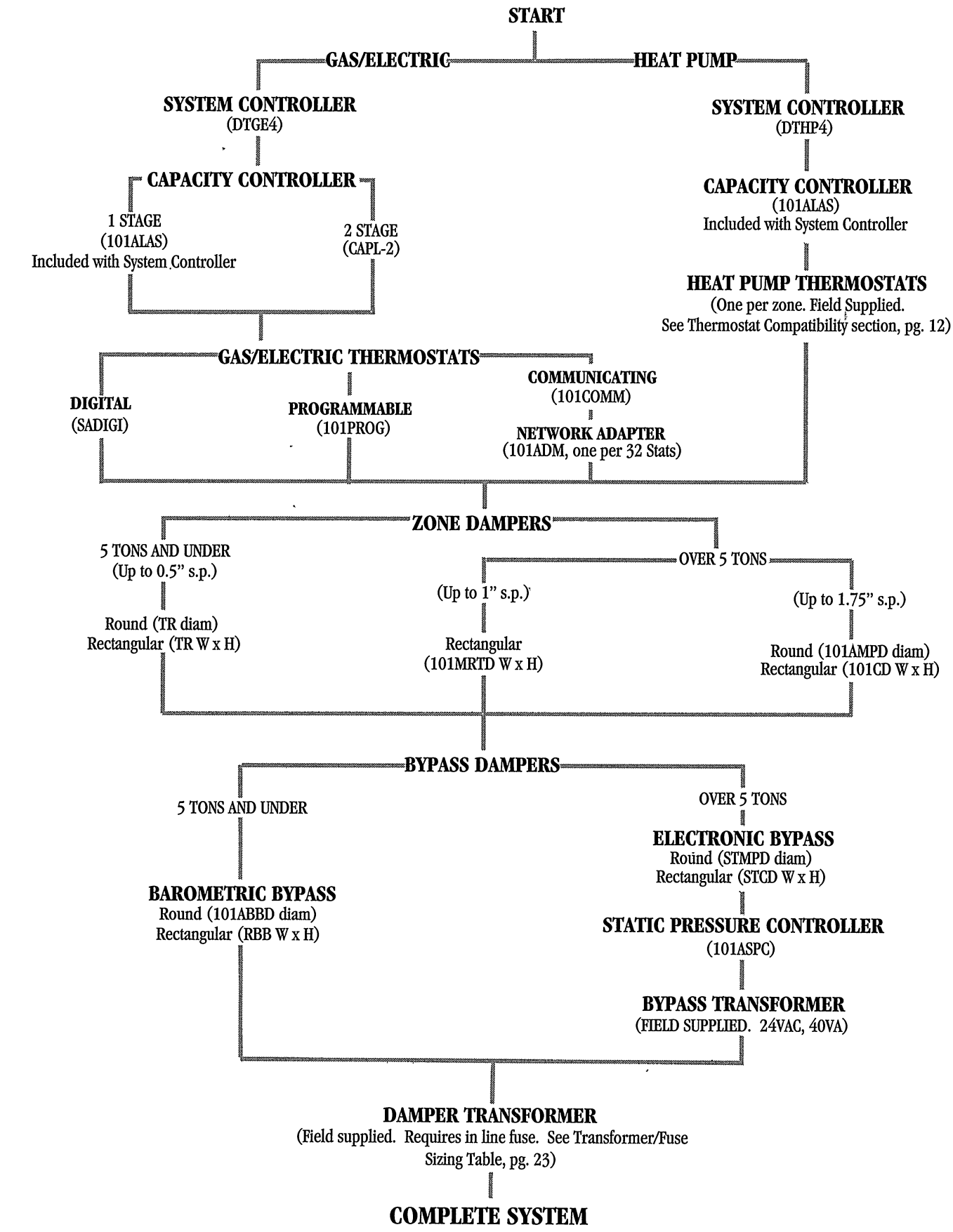
The **Zone Dampers** are air valves placed in the forced air duct work for each zone. They are controlled by the System Controller. While the HVAC system is running, the zone dampers for any zone thermostats not calling will close and zone dampers for the zones calling will remain open. Conditioned air is only directed to the zones needing it. See pages 14 to 18 for further information.

The **Zone Thermostats** monitor the room temperature of each zone and compare it to the heat and cool setpoints stored in them. If the room temperature drops below the heat setpoint, the zone thermostat makes a heat call telling the System Controller that zone needs heating. If the room temperature rises above the cool setpoint, that themostat makes a cool call telling the System Controller that zone needs cooling. See pages12 to 13 for further information.

The **Bypass Damper** is a pressure relief valve placed between the supply and return ducts of the forced air duct work. As zone dampers start closing, the bypass damper will open and divert some of the supply air to the return. This prevents a pressure buildup in the supply duct which can cause fan cavitation, excessive air velocities, and excessive zone damper blow-by. See pages 18 to 22 for further information.

Damper Transformer. Wired to TR1 and TR2 on the System Controller. Powers the zone dampers only. Requires in line fuse. See Damper Transformer section, page 23.

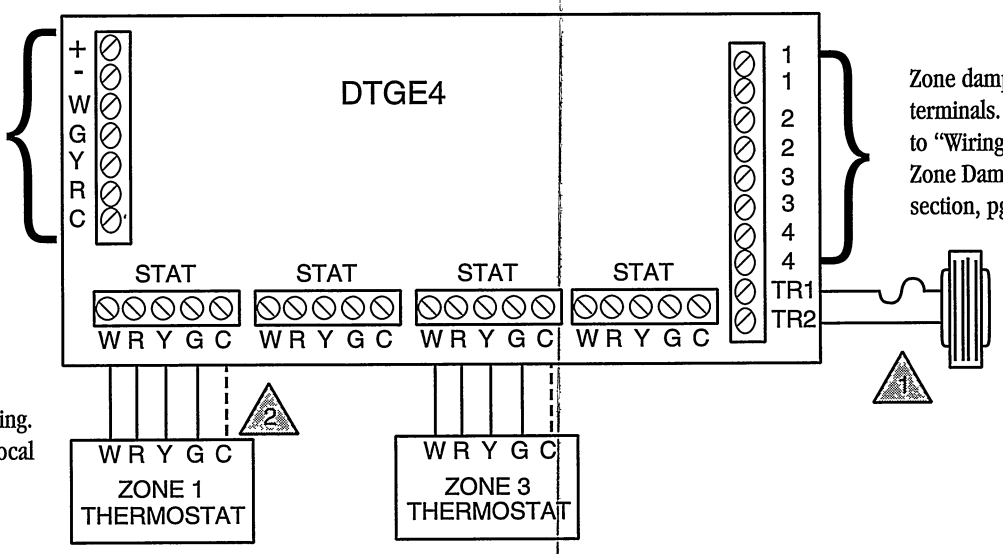
DIGITRACT4 COMPONENT SELECTION GUIDE



WIRING – GAS/ELECTRIC (DTGE4)

HVAC unit and LAS terminals. For single stage heat/cool systems, wire per "Single Stage" wiring insert. For two stage heat and/or cooling, add a CAPL-2 Capacity Controller and wire per "Two Stage" wiring insert.

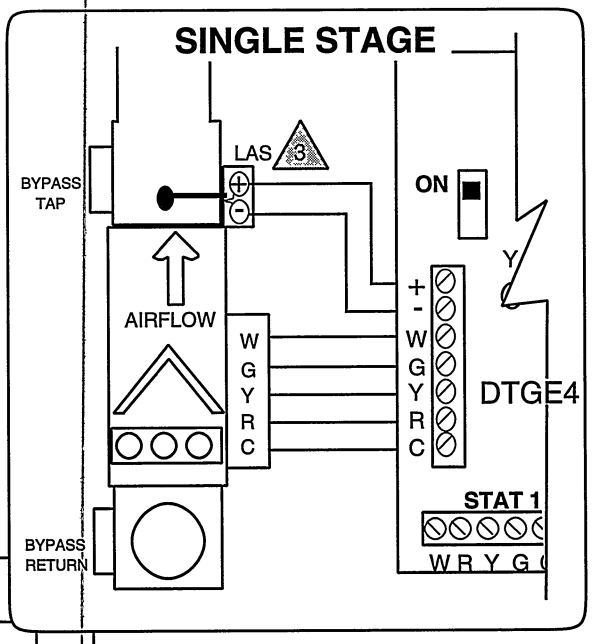
Use minimum 18 gauge for all wiring. All wiring must meet state and local codes.

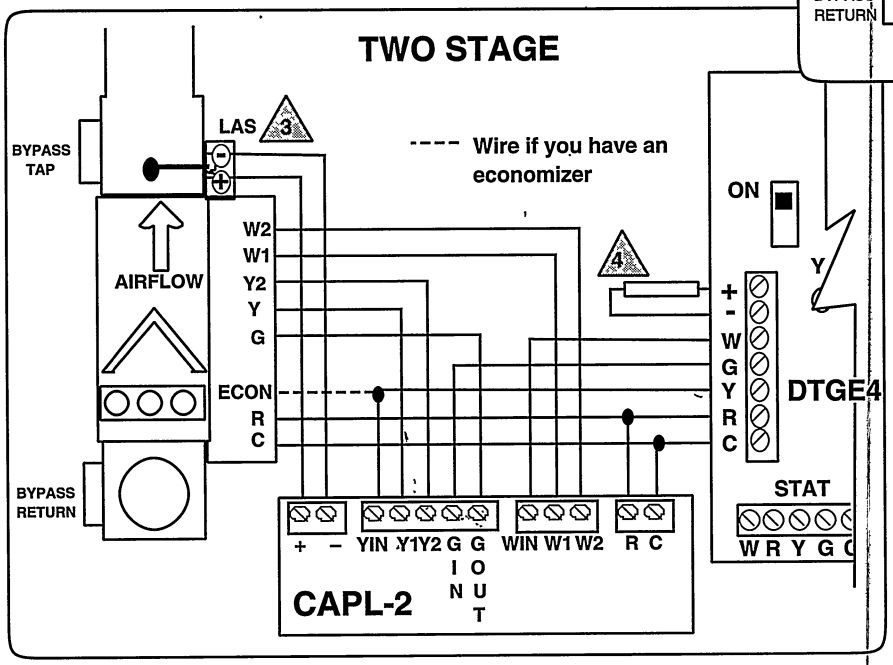


1. Fuse 24VAC transformer. Transformer and fuse must be sized for the total number of zone dampers. See Transformer/Fuse Sizing Table on page 23.

2. The C (24V return) is only used for electronic, hard wired thermostats. Refer to Zone Thermostats – Compatibility section, page 12, for further information.

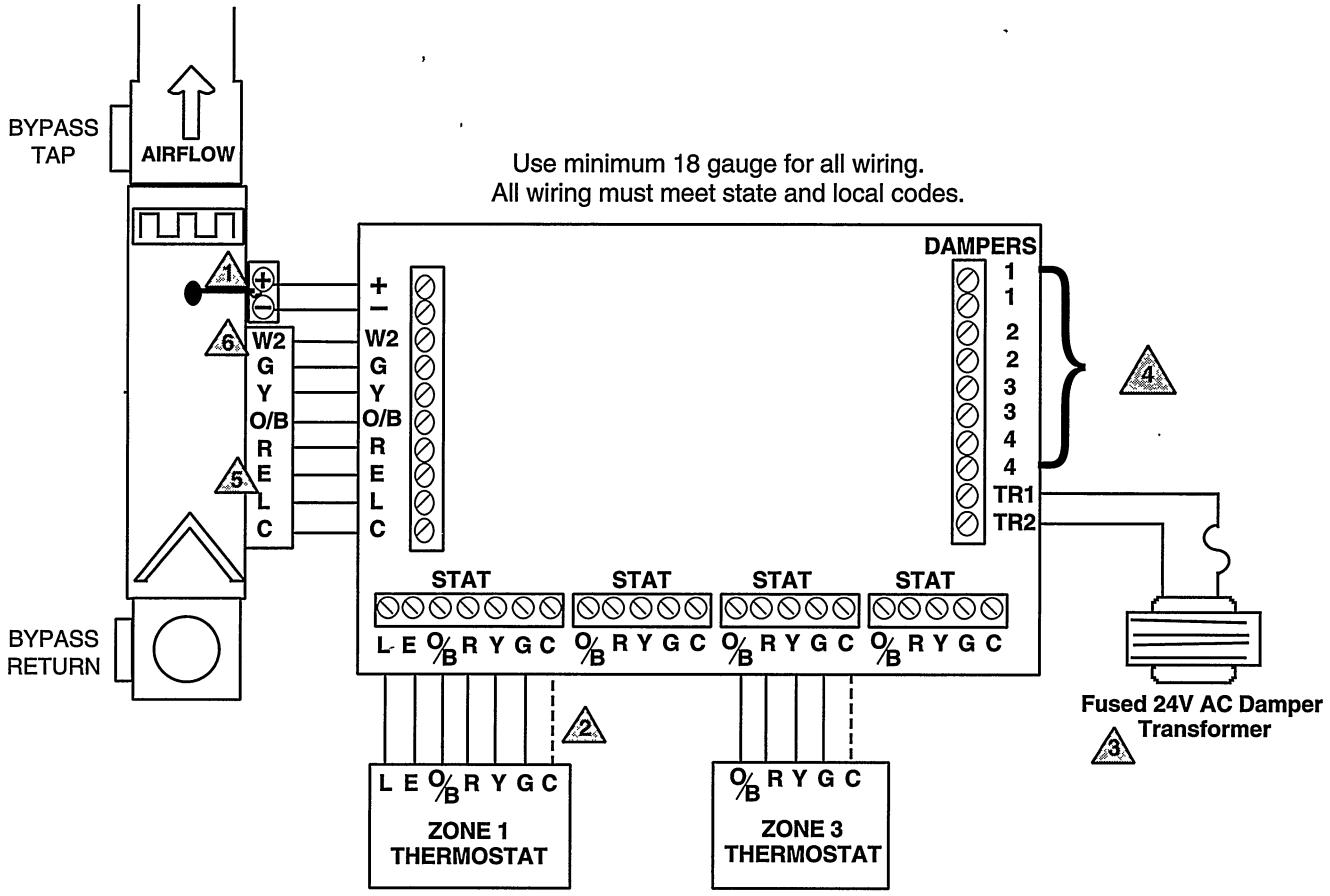
3. Leaving Air Sensor (LAS). Place in the leaving air stream, as far from the coil/heat exchanger as possible but not past the bypass tap. Ensure wire polarity is correct. Refer to Capacity Controller – LAS Installation section, page 11, for further information.





4. Using a field supplied 7 to 8 K ohm resistor, wire to the + - LAS terminals of the DigiTract4 System Controller in lieu of the LAS. Note: an LAS is supplied with both the DigiTract4 System Controller and the CAPL-2. Use only one LAS and wire to the CAPL-2 as shown.

WIRING – HEAT PUMP (DTHP4)



1. LAS. Place in the air handler between the coil and electric heat strip. Ensure wire polarity is correct. Refer to Capacity Controller – LAS Installation section, page 11, for further information.

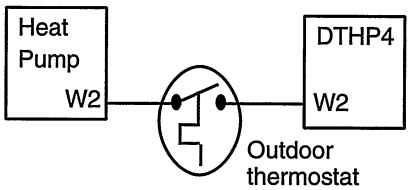
2. The C (24V return) is only used for electronic, hard wired thermostats. Refer to Zone Thermostats, page 12 – Compatibility section for further information.

3. Fused 24VAC transformer. Transformer and fuse must be sized for the total number of zone dampers. See Transformer/Fuse Sizing Table on page 23.

4. Zone damper terminals. Refer to "Wiring - Zone Dampers" section, page 5.

5. E, Emergency heat. Use only if emergency heat source is different than auxiliary heat (W2). If used, do not jumper to W2.

6. If the heat pump does not include an outdoor thermostat, it is recommended to run the W2 wire to the heat pump through an optional outdoor thermostat with a manual override as shown in the adjacent drawing.



WIRING – ZONE DAMPERS

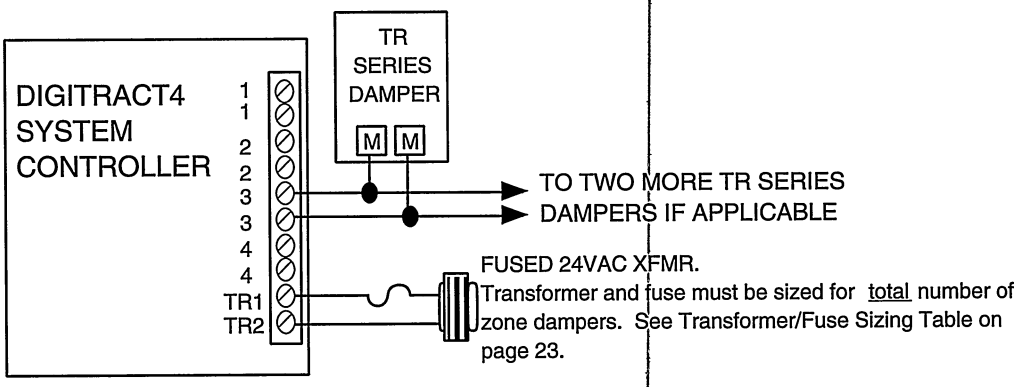
There are three methods of wiring the zone dampers. If necessary, you can mix wiring methods on different zones to suit your application.

Method 1: If wiring three or less TR series dampers to a zone, wire per method 1.

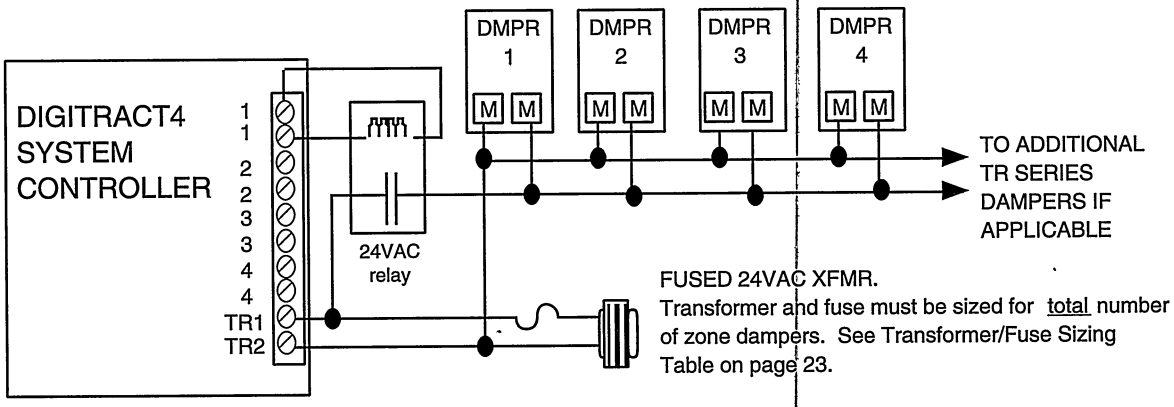
Method 2: If wiring more than three TR series dampers to a zone, use method 2. This method requires a 24VAC, SPNO relay. Note: An alternative method is to use 101 series dampers and wire per method 3 which doesn't require an additional 24V relay.

Method 3: If using 101 series dampers, wire per method 3. Notice: 101 series dampers are required for all systems over 5 tons. Refer to Parts Selection Table, page 14.

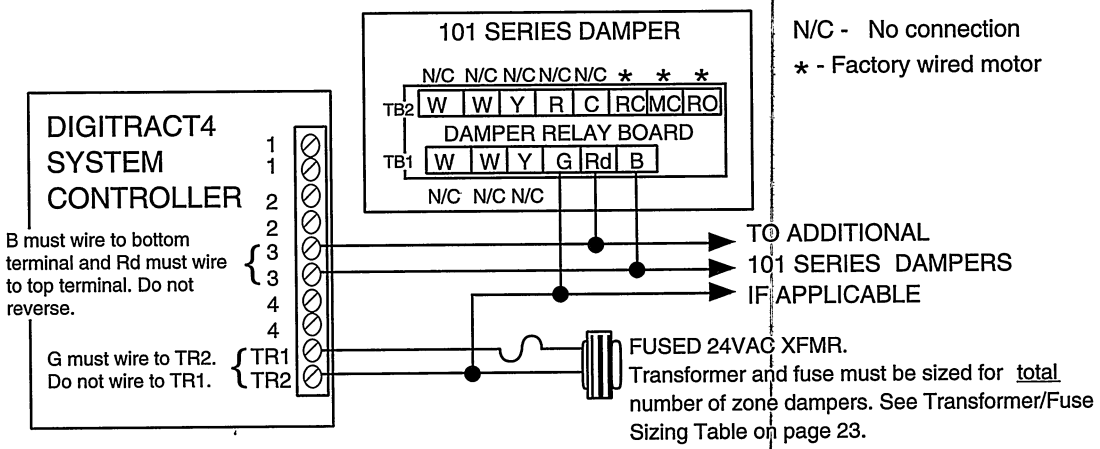
Method 1: Wiring Up to Three TR Series Dampers to a Zone



Method 2: Wiring More than Three TR Series Dampers to a Zone



Method 3: Wiring 101 Series Dampers to a Zone



SYSTEM CONTROLLERS

The DigiTract4 System Controller is the heart of the DigiTract4 zoning system. It is an auto changeover, home run system with a built in Capacity Controller. The function of the System Controller is to receive calls from the zone thermostats, operate the HVAC system in either heat or cool mode based on these calls, and close the zone damper(s) of the zones not calling for the operating mode. The mode of operation is determined by the first call received. If thermostats are calling for opposite modes, every 15 minutes it will change over to the other mode as long as there are opposing calls. The built in Capacity Controller maintains the supply air temperature within an operating range to prevent freeze ups and overheating. For heat pumps, the DTHP4 System Controller will also control the auxiliary heat to maintain an 88 degrees minimum coil leaving air temperature.

The DigiTract4 is available in two models, Gas/Electric (P/N DTGE4) and Heat Pump (P/N DTHP4).

SYSTEM CONTROLLER – GAS/ELECTRIC (DTGE4)

OPERATION

The System Controller will initially run in the mode requested by the first calling zone thermostat.

Cool mode – When running in the cool mode, the System Controller turns on the compressor and indoor blower fan. This is indicated by the corresponding Y and G lights turning on. Also, the dampers for the zones not calling for cool are closed and the dampers for the zones calling for cool are left open. This is indicated by the DPR lights. If the DPR light is on, the corresponding damper is closed. The system will continue to run in the cool mode until all calls are satisfied or changeover occurs. When all calls are satisfied or prior to changeover, the system will go into Purge mode.

Heat mode – When running in the heat mode, the System Controller turns on the heat, indicated by the W light turning on. If the Fan Control Jumper is in the B position, the indoor blower fan will also turn on, indicated by the G light turning on. Also, the dampers for the zones not calling for heat are closed and the dampers for the zones calling for heat are left open. This is indicated by the DPR lights. If the DPR light is on, the corresponding damper is closed. The system will continue to run in this mode until all calls are satisfied or changeover occurs. When all calls are satisfied or prior to changeover, the system will go into Purge mode.

Changeover – While the system is running in one mode, if the System Controller receives a call for the other mode then the System Controller will continue to run in the present mode for another 15 minutes or until all zones are satisfied for the present mode. Then the System Controller will go into Purge mode for 3 minutes and then change over to the new mode.

Purge mode – When all calls are satisfied or before changing modes, the System Controller will go into a three minute purge cycle. During this mode, the compressor or heat will turn off and the indoor blower fan will continue to run. This is indicated by the W and Y lights off and the G light on. The damper(s) of the last calling zones will remain open and all other damper(s) will be closed. This allows the supply air to adjust to room temperature before changeover or ventilation while providing a time delay to prevent short cycling. The DPR lights indicate which dampers are open and which are closed. If the DPR light is on, the damper is closed. If the DPR light is off, the damper is open.

Ventilation – When no zones are calling, all zone dampers are open. During this time, if any thermostat has the fan switch ON then the indoor blower fan is energized (G made to R) and the G light is on. This provides ventilation to all zones.

STATUS LIGHTS

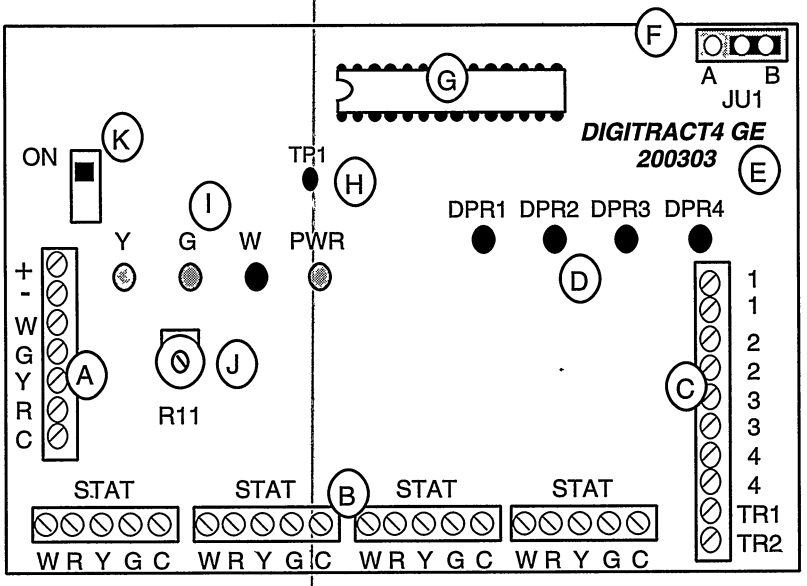
Y- Compressor light, yellow. On when compressor is energized.
G- Blower fan light, green. On when the indoor blower fan is energized by the DTGE4 Controller.
W- Heat light, red. On when heat is energized.
PWR- Power light, orange. On when DTGE4 is powered. Flashing during capacity control cutout.
DPR- Damper status lights, red. One per damper. On when damper is closed.

STATUS LIGHTS						
Y	G	W	PWR	DPR	MODE	FUNCTION
X	X	X	OFF	X	Off	Power off.
X	X	X	ON	X	On	Power on.
OFF	ON	OFF	ON	0	Ventilation	Blower fan on, HVAC unit off, all zone dampers open.
OFF	ON	OFF	ON	1	Purge	Blower fan on, HVAC unit off. Damper(s) with DPR light on are closed.
ON	ON	OFF	ON	X	Cool	AC energized. Damper(s) with DPR light on are closed.
OFF	B	ON	ON	X	Heat	Heat energized. Damper(s) with DPR light on are closed.
OFF	ON	OFF	FL	X	Cap. Cutout	Blower fan on, HVAC unit off. Damper(s) with DPR light on are closed.

X = Don't care, **FL** = Flashing, **B** = Light on if jumper JU1 in position B, **1** = One or more DPR lights on; **0** = All DPR lights off

SYSTEM CONTROLLER – GAS/ELECTRIC (DTGE4)

COMPONENTS



A. HVAC Unit/LAS Terminals – Connects to HVAC unit and Leaving Air Sensor (LAS).

±: LAS terminals. The LAS monitors the leaving air temperature.

W: Heat enable. When energized (W made to R), turns on heat.

G: Blower Fan. When energized (G made to R), turns on the indoor blower fan.

Y: Cool enable. When energized (Y made to R), turns on the air conditioner's compressor.

R: HVAC unit 24V power. Powers DigiTract4 and zone thermostats.

C: HVAC unit 24V power return.

B. Thermostat Terminals – Connects up to four zone thermostats.

W: Heat call. When energized (W made to R), requests the DigiTract4 to run in heat mode.

R: HVAC unit 24V power.

Y: Cool call. When energized (Y made to R), requests the DigiTract4 to run in cool mode.

G: Blower Fan- When energized (G made to R), requests the DigiTract 4 to turn on the indoor blower fan.

C: HVAC unit 24V power return.

C. Damper Terminals – Connects dampers for up to four zones and damper power supply.

TR1/

TR2: 24V AC transformer terminals. This transformer powers only the zone dampers.

1 1: Zone damper 1.
When energized, powers zone damper 1 closed.

2 2: Zone damper 2.
When energized, powers zone damper 2 closed.

3 3: Zone damper 3.
When energized, powers zone damper 3 closed.

4 4: Zone damper 4.
When energized, powers zone damper 4 closed.

D. Damper Status Lights – Light on when corresponding zone damper is closing or closed.

E. Board Number – This number indicates the circuit board number and revision. May need to know this number if conferring with technical support.

F. Heat Mode Fan Control Selection Jumper – In the A position, the blower fan is turned on by the furnace when heat is energized (gas furnaces). In the B position, the blower fan is turned on by the DigiTract4 when heat is energized (electric furnaces).

G. Microcontroller – Brains of the DigiTract4 and where the program resides. Occasionally software upgrades may become available. If so, the DigiTract4 software can be field upgraded by changing this microcontroller.

H. Leaving Air Sensor Test Point – Calibration test point for the leaving air sensor. See Calibration, in Capacity Controller section.

I. HVAC System Status Lights – Indicates what the DigiTract4 is energizing on the HVAC system.

Y: Compressor, yellow. On when the compressor is energized.

G: Blower fan, green. On when the indoor blower fan is energized.

W: Heat, red. On when the heat is energized.

PWR: Power, orange. On when power at R and C and the Power Switch is on. Flashing when in Capacity Control cut out mode.

See Status Lights section, page 6, for further information.

J. Leaving Air Sensor Potentiometer – Turn to calibrate the leaving air sensor. See Calibration in Capacity Controller section.

K. Power Switch – When OFF, power from the HVAC unit transformer is disconnected from the DigiTract4 and thermostats. When ON, power from the HVAC unit transformer is supplied to the DigiTract4 and the zone thermostats.

SYSTEM CONTROLLER – HEAT PUMP (DTHP4)

OPERATION

The System Controller will initially run in the mode requested by the first calling zone thermostat.

Cool mode – When running in the cool mode, the System Controller turns on the compressor and indoor blower fan and energizes the reversing valve (O/B made to R) if the reversing valve selection jumper is in the O position. This is indicated by the corresponding Y, G and O/B (if jumper in O position) lights are turning on. Also, the dampers for the zones not calling for cool are closed and the dampers for the zones calling for cool are left open. This is indicated by the DPR lights. If the DPR light is on, the corresponding damper is closed. The system will continue to run in the cool mode until all calls are satisfied or changeover occurs. When all calls are satisfied or prior to changeover, the system will go into Purge mode.

Heat mode – When running in the heat mode, the System Controller turns on the compressor and indoor blower fan and energizes the reversing valve if the reversing valve selection jumper is in the B position. This is indicated by the corresponding Y, G and O/B (if jumper in B position) lights are turning on. Also, the dampers for the zones not calling for heat are closed and the dampers for the zones calling for heat are left open. This is indicated by the DPR lights. If the DPR light is on, the corresponding damper is closed. After running in heat mode for 4 minutes, the System Controller will turn on the auxiliary heat if the coil leaving air temperature drops below 88 degrees and will turn it off when the coil leaving air temperature rises above 97 degrees. The W2 light is on when the auxiliary heat is energized. The system will continue to run in the heat mode until all calls are satisfied or changeover occurs. When all calls are satisfied or prior to changeover, the system will go into Purge mode.

Changeover – While the system is running in one mode, if the System Controller receives a call for the other mode then the System Controller will continue to run in the present mode for another 15 minutes or until all zones are satisfied for the present mode. Then the System Controller will go into Purge mode for 3 minutes and then change over to the new mode.

Purge mode – When all calls are satisfied or before changing modes, the System Controller will go into a 3 minute purge cycle. During this mode the compressor will turn off and the indoor blower fan will continue to run. This is indicated by the Y light turning off and the G light staying on. If the reversing valve is energized, it will de-energize. This is indicated by the O/B light turning off. The damper of the last calling zone will remain open and all other dampers will be closed. This allows the supply air to adjust to room temperature before changeover or ventilation while providing a time delay to prevent short cycling. The DPR lights indicate which damper is open and which are closed. If the DPR light is on, the damper is closed. If the DPR light is off, the damper is open.

Auxiliary heat – 4 minutes after the System Controller has run in heat mode, if the coil leaving air temperature is below 88 degrees, the auxiliary heat is energized and the W2 light turns on. When the coil leaving air temperature rises above 97 degrees, the auxiliary heat is de-energized and the W2 light turns off.

Ventilation – When no zones are calling, all zone dampers are open. During this time, if any thermostat has the fan switch ON then the indoor blower fan is energized and the G light is on. This provides ventilation to all zones.

Emergency heat – Emergency heat mode is controlled by STAT1 only. To make an emergency heat call, STAT1 must be in Emergency Heat mode and making a heat call. When the System Controller receives an emergency heat call from STAT1, it will go into emergency heat mode immediately if not already running in heat or cool mode. If heat or cool mode is running when an emergency heat call is received, then purge mode will be run for 3 minutes prior to entering emergency heat mode. In emergency heat mode, auxiliary heat, emergency heat and the indoor blower fan are energized. This is indicated by the corresponding W2 and G lights turning on. All zone dampers will be open (all DPR lights off). The Capacity Controller is disabled in this mode. When the emergency heat call is satisfied, the System Controller will immediately shut down if there are no calls from any other zones. If there are calls from other zones, then it will immediately change over to the new mode.

It is recommended to turn off all thermostats except STAT1 when running emergency heat.

SYSTEM CONTROLLER – HEAT PUMP (DTHP4)

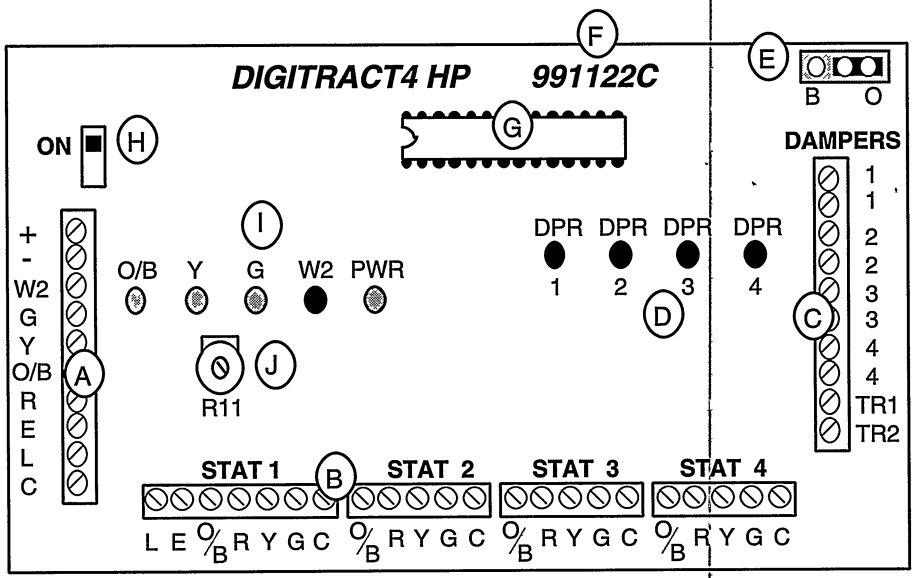
STATUS LIGHTS

O/B- Reversing valve light, yellow. On when the reversing valve is energized.
Y- Compressor light, yellow. On when the compressor is energized.
G- Indoor blower fan light, green. On when the indoor blower fan is energized by the DTHP4 Controller.
W2- Auxiliary heat light, red. On when the auxiliary heat is energized.
PWR- Power light, orange. On when DTHP4 is powered. Flashing during capacity control cutout.
DPR- Damper status lights, red. One per damper. On when damper is closed.

STATUS LIGHTS							
O/B	Y	G	W2	PWR	DPR	MODE	FUNCTION
X	X	X	X	OFF	X	Off	Power off.
X	X	X	X	ON	X	On	Power on.
OFF	OFF	ON	OFF	ON	0	Ventilation	Blower fan on, heat pump off, all zone dampers open.
OFF	OFF	ON	OFF	ON	1	Purge	Blower fan on, pump off. Damper(s) with DPR light on are closed.
A	ON	ON	OFF	ON	X	Cool	Compressor , blower fan on. Damper(s) with DPR light on are closed.
B	ON	ON	C	ON	X	Heat	Compressor, blower fan on. Damper(s) with DPR light on are closed.
OFF	OFF	ON	ON	ON	0	Emerg. Heat	Aux. heat and Emerg. Heat on. All zone dampers are open.
OFF	OFF	ON	OFF	FL	X	Cap. Cutout	Blower fan on, Ht Pmp unit off. Damper(s) with DPR light on are closed.

X = Don't care; **FL** = Flashing; **A** = Light on if Reversing Valve Selection jumper in O position; , **B** = Light on if Reversing Valve Selection jumper in B position; **C** = Light on if aux. heat energized; **1** = one or more DPR lights on; **0** = all DPR lights off.

COMPONENTS



SYSTEM CONTROLLER – HEAT PUMP (DTHP4)

COMPONENTS (Continued)

A. Heat Pump Unit/LAS Terminals – Connects to Heat Pump and Leaving Air Sensor (LAS).

+/-: LAS terminals: The LAS monitors the heat pump coil leaving air temperature.

W2: Auxiliary Heat. When energized (W2 made to R), turns on the heat pump auxiliary heat.

G: Blower Fan. When energized (G made to R), turns on the indoor blower fan.

Y: Compressor. When energized (Y made to R), turns on the heat pump compressor.

O/B: Reversing Valve. When energized (O/B made to R), engages the heat pump reversing valve.

R: Heat pump unit 24V power. Powers DigiTract4 and thermostats.

E: Emergency Heat. Connected to E of STAT1 terminal. See B.

L: Compressor Fail Flag. Connected to L of STAT1 terminal. See B.

C: Heat pump unit 24V power return.

B. Thermostat Terminals – Connects up to four zone heat pump thermostats.

L: Compressor Fail Flag. On STAT1 only. Connected to L of Heat Pump Unit terminal (see A). If the heat pump compressor fails, the heat pump will energize L (R made to L) which will turn on an indicator light on thermostat 1. This feature is not available on all heat pumps and/or thermostats.

E: Emergency Heat. On STAT1 only. Connected to E of Heat Pump Unit terminal (see A) When thermostat 1 is in the emergency heat mode and making a heat call, E is energized (R made to E). This will disable the the heat pump compressor and energize the auxiliary heat. This feature is not available on all heat pumps and/or thermostats.

O/B: Mode control. For O thermostats, thermostat is in cool mode when energized (O/B made to R) and in heat mode when not energized. The reverse is true for B thermostats.

R: Heat pump unit 24V power. See A.

Y: Compressor. When energized (Y made to R), requests that the DigiTract4 turn on heat pump compressor.

G: Blower Fan. When energized (G made to R), requests that the DigiTract4 turn on the indoor blower fan.

C: Heat pump unit 24V power return.

C. Damper Terminals – Connects dampers for up to four zones and damper power supply.

TR1/

TR2: 24V AC transformer terminals. This transformer powers only the zone dampers.

1 1: Zone damper 1. When energized, powers zone damper 1 closed.

2 2: Zone damper 2. When energized, powers zone damper 2 closed.

3 3: Zone damper 3. When energized, powers zone damper 3 closed.

4 4: Zone damper 4. When energized, powers zone damper 4 closed.

D. Damper Status Lights – Light on when corresponding zone damper is closed.

E. Reversing Valve Selection Jumper – Configures DigiTract4 to energize reversing valve in cool mode or heat mode. Place on O and center pin to energize reversing valve in cool mode. Place on B and center pin to energize in heat mode.

F. Board Number – This number indicates the circuit board number and revision. May need to know this number if conferring with technical support.

G. Microcontroller – Brains of the DigiTract4 and where the program resides. Occasionally software upgrades may become available. If so, the DigiTract4 software can be field upgraded by changing this microcontroller.

H. Power Switch – When OFF, power from the heat pump transformer is disconnected from the DigiTract4 and thermostats. When ON, power from the heat pump transformer is supplied to the DigiTract4 and the zone thermostats.

I. Heat Pump Status Lights – Indicates what the DigiTract4 is energizing on the heat pump.

O/B: Reversing valve, yellow. On when the reversing valve is energized.

Y: Compressor, yellow. On when the compressor is energized.

G: Blower fan, green. On when the indoor blower fan is energized.

W2: Auxiliary heat, red. On when the auxiliary heat is energized.

PWR: Power, orange. On when power at R and C and the Power Switch is on. Flashing when in Capacity Control cut out mode.

See Status Lights section, page 9, for further information.

J. Leaving Air Sensor Calibrator – Turn to calibrate the leaving air sensor. See Calibration, in Capacity Controller section.

CAPACITY CONTROLLERS

The HVAC system is sized to handle the load of the entire home or building. Because of this, when all the zones are not calling, the load to the HVAC system can diminish below its designed capacity. Left unchecked, the HVAC unit could freeze up or overheat. To compensate for this, the DigiTract4 is furnished with a built in Capacity Controller.

The basic function of the Capacity Controller is to monitor the leaving air temperature and cycle the unit off when the air is out of operating range and, after a minimum four minute time delay, turn the unit back on when the air temperature has returned within operating range. Additionally, for heat pumps the Capacity Controller will turn on the heat pump auxiliary heat if the coil leaving air temperature is not hot enough in heat mode.

CAPACITY CONTROLLER – GAS/ELECTRIC (DTGE4)

Cool cut out – If the leaving air temperature drops below 45° Fahrenheit in cool mode, the compressor is de-energized (Y broken from R), the Y light is turned off and the PWR light starts flashing. While cut out, once every four minutes the leaving air temperature is checked. When checked, if the leaving air temperature has risen above 45 degrees, the compressor is reenergized (Y made to R), the Y light is turned on and the PWR light stops flashing.

Heat cut out – If the leaving air temperature rises above 145°Fahrenheit in heat mode, the heat is de-energized (W broken from R), the W light is turned off and the PWR light starts flashing. Also, if jumper JU1 is in the A position, the G light will turn on and the blower fan will be kept energized by the System Controller (G made to R). While cut out, once every four minutes the leaving air temperature is checked. When checked, if the leaving air temperature has dropped below 145°, the heat is reenergized (W made to R), the W light is turned on and the PWR light stops flashing. Also, if jumper JU1 is in the A position, the G light will turn off and the furnace will resume blower fan control (G broken from R).

CAPACITY CONTROLLER – HEAT PUMP (DTHP4)

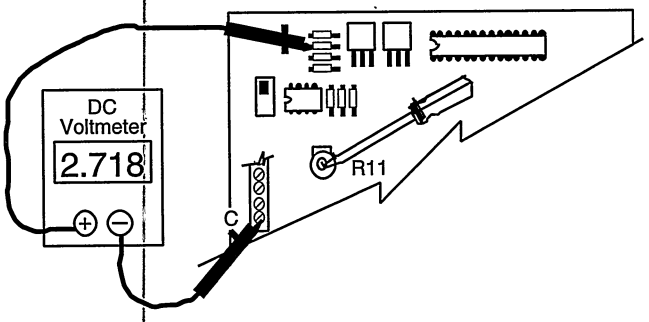
Cool cut out – If the leaving air temperature drops below 45° Fahrenheit in cool mode, the compressor is de-energized (Y broken from R), the Y light is turned off and the PWR light starts flashing. If the Reversing Valve Selection Jumper is on O, the reversing valve will also de-energize (O/B broken from R) and the O/B light will turn off. The indoor blower fan remains powered (G light on). While cut out, once every four minutes the leaving air temperature is checked. When checked, if the leaving air temperature is above 45°, the compressor is reenergized (Y made to R), the Y light is turned on and the PWR light stops flashing. If the reversing valve was de-energized, it will reenergize (O/B made to R) and the O/B light will turn back on.

Heat cut out – If the leaving air temperature rises above 118° Fahrenheit in heat mode, the compressor is de-energized (Y broken from R), the Y light is turned off and the PWR light starts flashing. If the Reversing Valve Selection Jumper is on B, the reversing valve will also de-energize (O/B broken from R) and the O/B light will turn off. The indoor blower fan remains powered (G light on). While cut out, once every four minutes the leaving air temperature is checked. When checked, if the leaving air temperature has dropped below 118°, the compressor is reenergized (Y made to R), the Y light is turned on and the PWR light stops flashing. If the reversing valve was de-energized, it will reenergize (O/B made to R) and the O/B light will turn back on.

CAPACITY CONTROLLER – CALIBRATION

The Capacity Controller comes factory calibrated. However, if field calibration is ever necessary, perform the following:

1. Use a digital, DC voltmeter with 3 digit to the right of the decimal accuracy.
2. On the System Controller, place - probe of voltmeter to C terminal and + probe to left side of second resistor from top as shown in adjacent diagram.
3. Voltage should be 2.718. If not, turn potentiometer R11 until it is.
4. The LAS is now calibrated.

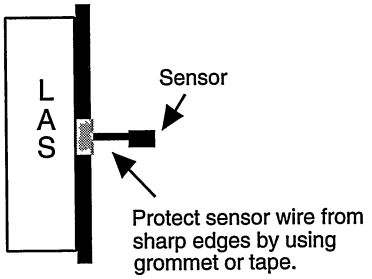


CAPACITY CONTROLLER – LAS INSTALLATION

A. Cut or drill a hole in selected location large enough to fit sensor through.

B. Select location to install the LAS. For gas/electric HVAC systems, sensor must be in leaving air duct, preferably as far from the coil/heat exchanger as possible but not past the bypass tap.

C. Place sensor through hole made in duct and mount Capacity Controller to duct with screws. Use grommet or tape to protect sensor wire from sharp edges.



ZONE THERMOSTATS

Each zone requires a zone thermostat. The following list the types of thermostats to use with each DigiTract4 system, information on California Economizer thermostats and how to select a thermostat not manufactured by California Economizer.

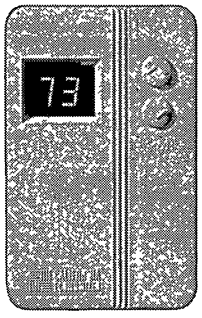
ZONE THERMOSTATS – TYPES

Gas/Electric (DTGE4) – Use 24VAC single stage gas/electric thermostats. California Economizer offers three models: SADIGI, 101PROG and 101COMM. If not using California Economizer thermostats, see Thermostat Compatibility section below.

Heat pump (DTHP4) – Use 24VAC single stage heat, single stage cool heat pump thermostats. If emergency heat feature is preferred then the thermostat for Stat1 must have the emergency heat mode feature. If the heat pump has the compressor fail flag feature, STAT1 should also have a compressor fail light. California Economizer does not manufacture any heat pump thermostats. See Thermostat Compatibility section below.

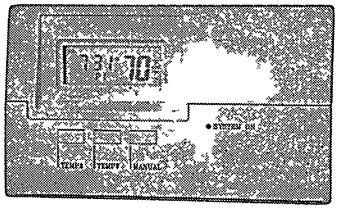
ZONE THERMOSTATS – CALIFORNIA ECONOMIZER GAS/ELECTRIC MODELS

California Economizer offers three thermostat models that can be used with the Gas/Electric DigiTract4 System Controller (DTGE4). These models are SADIGI, 101PROG and 101COMM.



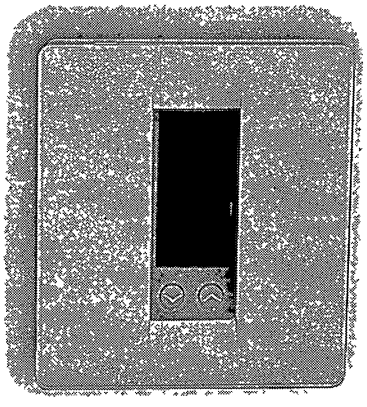
SADIGI

SADIGI: The SADIGI is a single stage gas/electric, hard wired (non-power robbing) thermostat. It can control one heat, one cool and blower fan. It can run in Heat, Cool, or Auto changeover mode. Setpoint range is from 52° to 86° Fahrenheit. The mode and setpoints are stored in nonvolatile memory so they will be remembered even if power is interrupted. It has a bright and easy to read digital display and is simple to operate. Up and down push buttons select the mode and setpoint(s). Under the cover of the thermostat there are two mode status lights: one red and one green. The red light is on when the thermostat is making a heat call. The green light is on when the thermostat is making a cool call. The dimensions are: 2⅞"W x 4½"H x 1"D, the color is off white. Terminal designations are: R, C, Y, W and G. Requires 5 conductor thermostat wire. Can be ordered with remote sensor; p/n SADIGIRS.



101PROG

101PROG: Programmable, dual setpoint, single stage heat/cool, electronic, non power robbing, auto changeover, weekday/weekend (5,1,1) programmable, manual override capable. Thermostat includes a large LCD that displays time, day, program, setpoints and room temperature. Can program up to four different schedules per day. Battery backup memory. Dimensions are: 6"W x 3½"H x 1¾"D. Requires five thermostat wires for installation. Color: White. Can be ordered with remote sensor; p/n 101PROGRS.



101COMM

101COMM: This is an auto changeover, communicating thermostat with an easy to read vertical LCD that displays complete operating status. Using Thermostat Adapter 101ADM and a PC the setpoints and room temperature can be remotely programmed and room temperature viewed. Adding a modem permits off site remote control and status viewing. This attractive thermostat provides a low profile, ultra slim white ABS plastic case. Selectable Fahrenheit or Celsius display. Requires five conductor thermostat wire with the addition of a two wire twisted pair (CAT 5 wire) for communications. Dimensions are: 4"W X 4½"H x 0.90"D.

ZONE THERMOSTATS – COMPATIBILITY

Because small amounts of leakage current from a thermostat can create a false call to the DigiTract4, if not using California Economizer thermostats ensure that the thermostats you choose meet the following criteria.

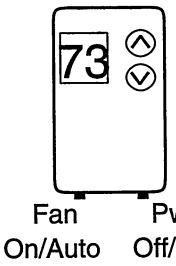
Electronic thermostats must be either hardwired (have a 24V return terminal, usually labeled C) or battery operated. Don't confuse battery backup with battery operated.

Mechanical thermostats must have the cooling compensator resistor removed.

SADIGI THERMOSTAT OPERATING INSTRUCTIONS

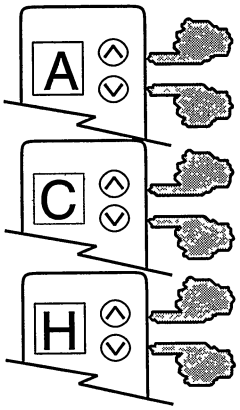
SLIDE SWITCHES

There are two switches located on the bottom of the thermostat. The switch on the left controls the fan and the switch on the right powers the thermostat. Sliding the fan switch to the left turns the indoor blower fan on continuously. Sliding it to the right runs the fan only when the air conditioner is on. Slide the power switch to the right to turn on the thermostat and to the left to turn it off.



MODE

The SADIGI thermostat can operate in three different modes: Heat, Cool or Auto. In Heat mode, the SADIGI can only make heat calls and only the heat setpoint can be viewed or changed. In Cool mode, the SADIGI can only make cool calls and only the cool setpoint can be viewed or changed. In Auto mode, the SADIGI can make either heat or cool calls and both the heat and cool setpoints can be viewed.



View mode: To view the current mode, press the top and bottom buttons simultaneously. The present mode will be displayed by the letter H, C or A.

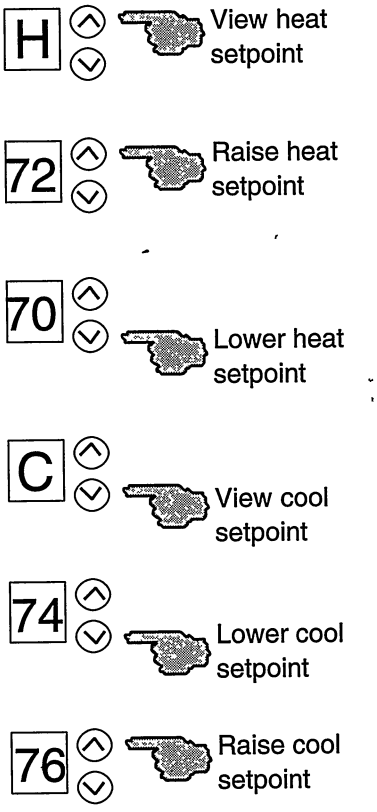
Change mode: To change the mode, continue simultaneously pressing both the top and bottom buttons until at the mode desired, then release both buttons.

SETPOINTS

When the SADIGI thermostat is in Auto or Heat mode, the thermostat will make a heat call when the room temperature drops two degrees below the heat setpoint and, after running a minimum of 2 minutes, turn off when the temperature has risen to the heat setpoint. When in Auto or Cool mode, the thermostat will make a cool call when the room temperature rises two degrees above the cool setpoint and, after running a minimum of 2 minutes, turn off when the temperature has dropped to the cool setpoint.

View/change heat setpoint: The heat setpoint can be viewed when in either Auto or Heat mode. To view the current heat setpoint in Auto mode, press the top button until "H" appears and then release. To view in Heat mode, press either the top or bottom button until "H" appears and then release. The heat setpoint is displayed after "H". To change the setpoint, immediately after the setpoint is displayed press and hold either the top or bottom button until the setpoint is at the desired value and then release. Approximately two seconds after the button is released the current room temperature will be redisplayed.

View/change cool setpoint: The cool setpoint can be viewed when in either Auto or Cool mode. To view the current cool setpoint in Auto mode, press the bottom button till "C" appears and then release. To view in Cool mode, press either the top or bottom button till "C" appears and then release. The cool setpoint is displayed after "C". To change the setpoint, immediately after the setpoint is displayed press and hold either the top or bottom button till the setpoint is at the desired value and then release. Approximately two seconds after the button is released the current room temperature will be redisplayed.



ZONE DAMPERS

California Economizer zone dampers are used in cooling/heating systems to provide room by room zone control. The damper is provided with a factory mounted relay board and zone actuator. Each zone damper is controlled by a zone thermostat. More than one damper can be controlled by one zone thermostat; see Slaving Dampers. Use the table below to determine which zone dampers to use.

SYSTEM SIZE	MAXIMUM DIFFERENTIAL PRESSURE	ROUND DAMPER	RECTANGULAR DAMPER
5 TONS OR UNDER	0.5"	LOW PRESSURE	LOW PRESSURE
UNDER 7.5 TONS	1"	MEDIUM PRESSURE	MEDIUM PRESSURE
7.5 TONS OF LARGER	1.75"	MEDIUM PRESSURE	HEAVY DUTY

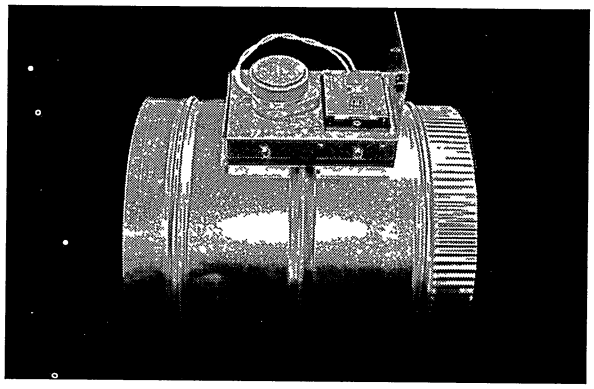
Maximum Differential Pressure refers to the maximum static pressure drop in inches of water column between the input (upstream) of the zone damper and the output (downstream) when the damper is closed.

ROUND ZONE DAMPERS

There are two styles of round zone dampers, low pressure or medium pressure. For systems 5 tons or under with a maximum differential static pressure of 0.5", use low pressure dampers. Otherwise use medium pressure for up to 1.75" differential pressure on any system over 5 tons.

ROUND LOW PRESSURE ZONE DAMPERS (TR diam)

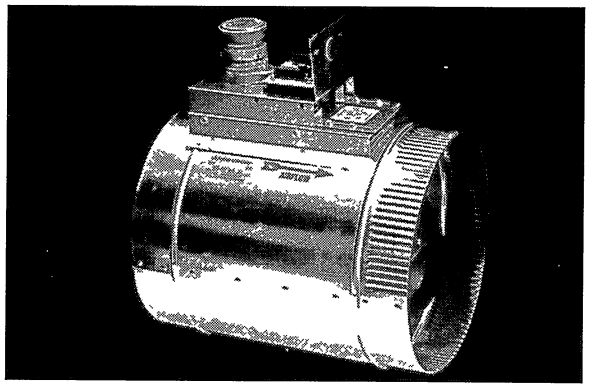
California Economizer round low pressure zone dampers can be used for systems up to 5 tons with a maximum differential static pressure of 0.5". These are two position, spring open, power close dampers for very simple operation. Round damper sizes 9 inches and under are manufactured from 24 gauge galvanized steel. Sizes 10", 12", 14" and 16" are made from 20 - 22 gauge steel. All sizes are designed with rolled-in stiffening beads for superior rigidity. The damper pipe is furnished with one crimped end and one straight end for easy installation. A hat section supports a synchronous 24V AC 60Hz 12VA motor and Relay Board. The motor is designed for continuous full stall operation. Special winding and heavy duty gearing provide for long motor life and easy spring open operation. A cross pin on the motor shaft provides positive direct drive to the damper blade shaft without a coupling or set screws, allowing for a quick and easy motor change if required. Motor drive time from full open to full close is 30 seconds. Since this is a spring open damper, in the event of power failure, the damper fails to the full open position.



LOW PRESSURE (TR diam)

ROUND MEDIUM PRESSURE ZONE DAMPERS (101AMPD diam)

California Economizer round medium pressure zone dampers are recommended for systems over 5 tons or with a maximum differential static pressure up to 1.75". This power open / power close damper is manufactured from 20-22 gauge galvanized steel with rolled-in stiffening beads for superior rigidity. Mechanical minimum and maximum set stops are provided and easily adjustable. The damper is elliptical, which allows the airflow to be tracked linearly. The damper pipe is furnished with one crimped end and one straight end for easy installation. A hat section supports two synchronous 24V AC 60Hz 6VA motors and a Relay Board. The motors are designed for continuous full stall operation. Special winding and heavy duty gearing provide for long motor life. A cross pin on the motor shaft provides positive direct drive to the damper blade gear without a coupling or set screws, allowing for a quick and easy motor change if required. Motor drive time from full open to full close is 90 seconds.



MEDIUM PRESSURE (101AMPD diam)

ZONE DAMPERS

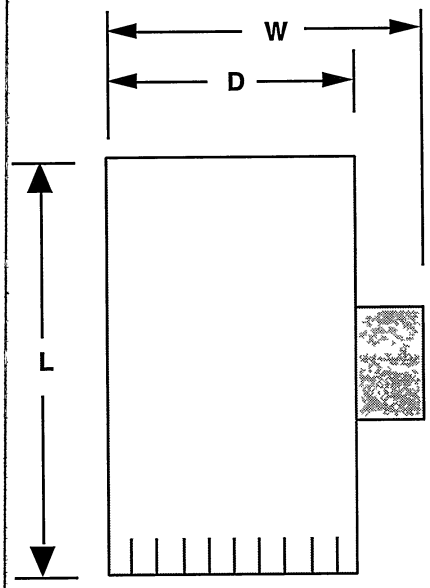
ROUND LOW & MEDIUM PRESSURE DAMPER SIZES

ROUND LOW PRESSURE DAMPER

PART #	SIZE	DIAMETER (D)	LENGTH (L)	WIDTH (W)
TR06	6"	6"	10"	9"
TR07	7"	7"	10"	10"
TR08	8"	8"	10"	11"
TR09	9"	9"	11"	12"
TR10	10"	10"	12"	13"
TR12	12"	12"	14"	15"
TR14	14"	14"	16"	17"
TR16	16"	16"	18"	18 1/2"

ROUND MEDIUM PRESSURE DAMPER

PART #	SIZE	DIAMETER (D)	LENGTH (L)	WIDTH (W)
101AMPD06	6"	6"	10"	10"
101AMPD08	8"	8"	10"	12"
101AMPD10	10"	10"	12"	14"
101AMPD12	12"	12"	14"	16"
101AMPD14	14"	14"	16"	18"
101AMPD16	16"	16"	18"	20"
101AMPD18	18"	18"	20"	22"



TYPICAL ROUND CAPACITIES*

Duct Diameter	Nominal CFM	Duct Velocity FPM	Damper ΔP " WC
6"	110	540	.014
7"	160	600	.014
8"	250	700	.015
9"	320	725	.015
10"	410	750	.015
12"	660	850	.022
14"	1000	925	.035
16"	1450	1070	.036
18"	2000	1100	.036

* These air quantities were derived from a duct sizing chart .1" friction loss per 100' of duct. All CFMs listed are approximate. For accurate selection use duct sizing table or device.

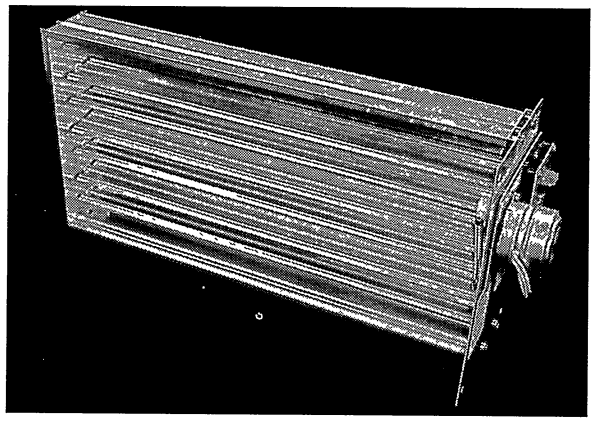
ZONE DAMPERS

RECTANGULAR ZONE DAMPERS

The rectangular zone dampers are available in low pressure, medium pressure, or heavy duty. For systems 5 tons or under use low pressure. For systems under 10 tons use medium pressure dampers. For systems 10 tons or over use heavy duty dampers. Motor drive time open and close is 90 seconds, except for the low pressure damper which springs open.

RECTANGULAR LOW PRESSURE ZONE DAMPERS (TR W x H)

California Economizer rectangular low pressure dampers can be used for systems up to 5 tons with a maximum differential static pressure of 0.5". These are two position, spring open, power close dampers. They are constructed from heavy duty aluminum and stainless steel. The damper is an opposed blade type that slips into a 3-1/4" wide cutout in the existing duct and attaches with screws via a duct mounting plate. The duct mounting plate is 5" wide. The drive assembly supports a synchronous 24V AC 60Hz 12VA motor and Relay Board. The motor is designed for continuous full stall operation. Special winding and heavy duty gearing provide for long motor life and easy spring open operation. A cross pin on the motor shaft provides positive direct drive to the damper blade gear without a coupling or set screws. Since this is a spring open damper, in the event of power failure the damper fails to the full open position.



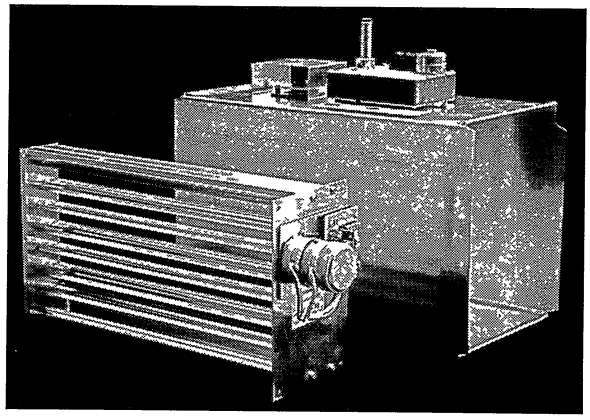
LOW PRESSURE (TR W x H) RECTANGULAR DAMPER

RECTANGULAR MEDIUM PRESSURE ZONE DAMPERS (101MRTD W x H)

California Economizer rectangular medium pressure dampers are recommended for systems under 7.5 tons with a maximum differential static pressure of 1". These are power open, power close dampers. They are constructed from heavy duty aluminum and stainless steel. The damper is an opposed blade type that slips into a 3-1/4" wide cutout in the existing duct and attaches with screws via a duct mounting plate. The duct mounting plate is 5" wide. They draw 6Va. The motors are designed for continuous full stall operation. Special winding and heavy duty gearing provide for long motor life.

RECTANGULAR HEAVY DUTY ZONE DAMPERS (101CD W x H)

California Economizer rectangular heavy duty dampers are recommended for systems 7.5 tons or larger with a maximum differential static pressure of 1.75". These are power open, power close dampers made of 20 gauge "snap-lock" steel frame with S and Drive duct connections. Allow a 16" gap in the duct for the damper. Formed steel blade stops incorporate a gasket for quiet operation and improved structural rigidity. Rectangular dampers under 10" in height incorporate a single blade design. Dampers 10" or over use opposed blade design. A full stall motor, drawing 6 VA and a relay board control the damper position.

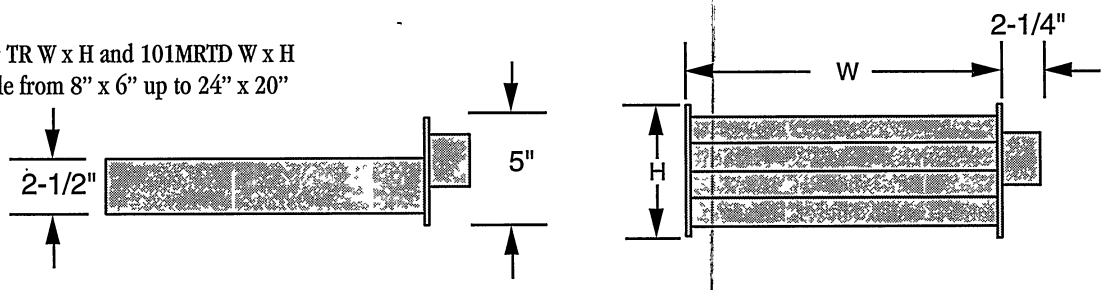


MEDIUM PRESSURE (101MRTD W x H) AND
HEAVY DUTY (101CD W x H) RECTANGULAR DAMPERS

ZONE DAMPERS

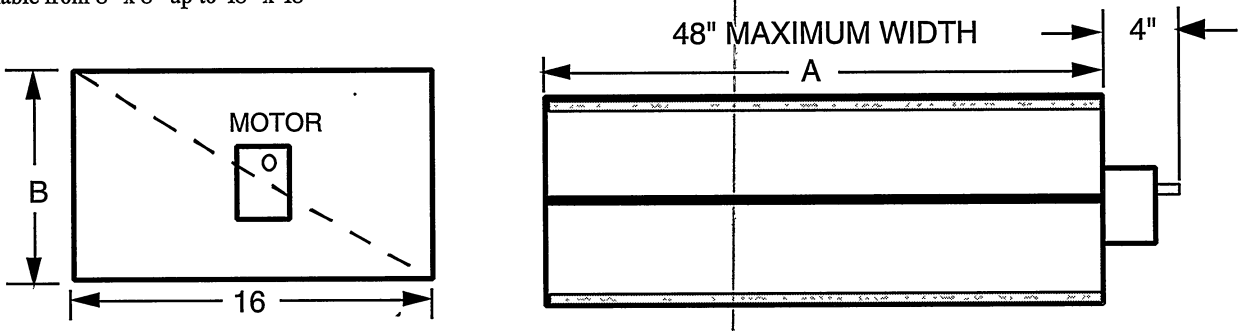
LOW AND MEDIUM PRESSURE RECTANGULAR DAMPER DIMENSIONS

Part Number TR W x H and 101MRTD W x H
Sizes available from 8" x 6" up to 24" x 20"



HEAVY DUTY RECTANGULAR DAMPER DIMENSIONS

Part Number 101CD W x H
Sizes available from 8" x 8" up to 48" x 48"



WIDTH	HEIGHT	DEPTH
A	B	16"

Rectangular dampers should operate at 1500 FPM.
E.G. A 24" x 12" damper = 2 square feet.
2 square feet X 1500FPM = 3000 CFM.

RECTANGULAR DAMPER CAPACITIES*

Dampers listed below are standard sizes. For larger sizes and capacities, contact the factory.

HEIGHT IN INCHES	WIDTH IN INCHES 8	10	12	14	16	18	20	22	24
6	200	250	310	390	440	500	570	630	700
8	280	390	490	590	680	770	900	960	1090
10	390	510	650	800	950	1100	1220	1400	1500
12	490	650	850	1000	1200	1400	1600	1850	2000
14			1000	1250	1500	1750	2000	2250	2500
16			1200	1500	1800	2100	2450	2300	3000
18			1400	1750	2100	2500	2850	3080	3600
20									4000

Motors on low and medium pressure dampers will be mounted on the Height (H) side. **Bottom mount motors will be located on the Width (W) side.**
*These air quantities were derived from a duct sizing chart .1" friction loss per 100' of duct. All CFMs listed are approximate. For accurate selection use duct sizing table or device.

ZONE DAMPERS

SIZING ZONE DAMPERS

If the ductwork already exists, simply size the damper to fit the ductwork. For new systems or retrofit jobs:

a) Determine CFM from heat gain or loss calculations.

b) Select damper size by using a duct sizing table or calculator.

c) Select a *California Economizer* damper to fit the duct size selected for that zone.

DAMPER INSTALLATION NOTES

1. Do not exceed 700 FPM in a register/diffuser branch duct.

2. If a damper is installed within 3 feet of register/diffuser, install sound attenuating flex duct between damper and outlet.

3. Zone dampers should be preceded by 2'-4' of straight pipe where possible.

4. In attic installations and high humidity areas, the *California Economizer* damper should be insulated along with the ductwork. The hat section on the damper is delivered with insulation between the hat section and pipe. Therefore, insulation should be applied to the round pipe and be butted against the hat section, (do not insulate the motor or relay board). Both motor and the relay board generate enough heat so no condensation will develop on the hat section.

5. Remember to allow a 16" gap in the duct for Heavy Duty rectangular dampers.

6. Low and Medium pressure rectangular dampers slide into a 3-1/4" wide cutout in the side of the preexisting ductwork..

BYPASS DAMPERS

Bypass dampers are used to provide constant air delivery through the air handling unit. This is done by bypassing excess air from the supply duct back to the return duct. As a zone is satisfied, its zone damper closes. When this happens, the bypass damper opens just enough to bypass the excess air. This will control static pressure and noise at the diffusers.

California Economizer offers two types of bypass dampers, Barometric and Electronic. Each is available in round or rectangular configuration. Barometric bypass dampers are limited to systems of 5 tons. Electronic dampers can be used on any size system. For systems 5 tons or smaller, the barometric bypass can be used. For systems over 5 tons, we recommend the electronic bypass.

BYPASS DAMPERS – BAROMETRIC

The barometric bypass damper is for systems 5 tons or under. It utilizes a weighted damper blade to maintain constant duct pressure. This allows for easy installation without the need for electrical power or wiring. The round barometric damper can be installed in any position. It is an efficient solution for small system fan capacity control.

SIZING: When only the smallest zone is calling, the maximum amount of excess supply air will flow through the bypass damper. To determine the proper size bypass damper to use, do the following steps:

BAROMETRIC BYPASS SELECTION TABLE

Diameter	CFM
9"	650
10"	800
12"	1200
14"	1600

Step 1: Calculate bypass air volume as follows.

A) Calculate total air volume at 400 CFM per ton.

B) Calculate air volume of smallest zone in CFM.

C) Calculate bypass air volume by subtracting the smallest zone air volume from the total.

(A - B = C)

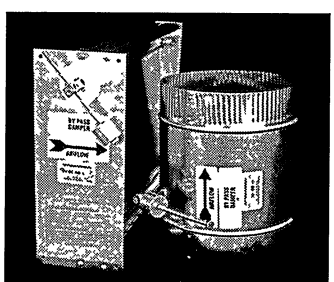
Step 2: Select damper from sizing table.

Once you have calculated the bypass air volume from Step 1, use the BAROMETRIC BYPASS SELECTION TABLE. From the table, select the bypass damper with the CFM rating equal to or greater than the value calculated in Step 1. For rectangular barometric dampers, use a ductulator to convert from round to rectangular.

If bypassing more than 1600 CFM, use electronic bypass damper.

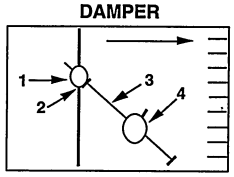
Example: You have a 4 ton system. Your smallest zone will use 500 CFM. The total CFM is 1600 CFM (400 * 4). Your bypass CFM is 1100 (1600 - 500). From the table, you determine that a 12" bypass damper is needed.

Do not use the barometric bypass in any system over 5 tons.
For systems over 5 tons, or to bypass more than 1600 CFM, use the electronic bypass.



RECTANGULAR & ROUND BAROMETRIC BYPASS

BAROMETRIC BYPASS DAMPER



1. Damper Shaft
2. Lock Nut
3. Lever Arm
4. Counter Weight

BYPASS DAMPERS – BAROMETRIC

INSTALLATION

The round barometric bypass damper can be installed in any position. This damper is factory set for horizontal installation and can be field modified for vertical installation. Do not run speed screws into damper housing. Screws may interfere with damper travel. Make sure counter weight is not obstructed in any way.

a) Install the bypass damper between the supply and return plenums of the unit. It must be the first tap off the supply plenum.
b) Be sure the air flows through the damper in the proper direction as indicated by the arrow on the damper. Airflow is always from supply to return plenum. Be certain the damper shaft is horizontal.
c) Loosen counter weight with allen wrench.
d) Loosen lever arm from damper shaft and allow to hang straight down.
e) Fully close damper by grabbing damper shaft on side attached to lever arm and turning clockwise until it stops.
f) While holding the damper fully closed, rotate the lever arm a little to the right (facing the damper) and then screw in to tighten to the damper shaft. Then tighten lock nut.
g) Be sure the damper is being held closed by the counter weight. Proceed to setup.

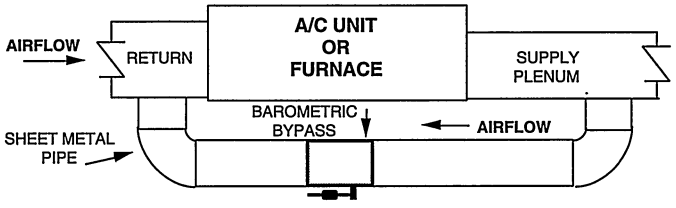
BAROMETRIC BYPASS SETUP

a) Turn off all thermostats.
b) Turn on Switching Center/Controller and set fan switch to "ON" position. Allow fan to run for 5 minutes to equalize pressure. Then make sure all dampers are open by checking for air flow out of each damper.
c) By moving counter weight up or down the lever arm, adjust it so that the damper just wants to start opening.
d) If the damper cannot be held closed with the counter weight all the way to the bottom of the lever arm, then hold the damper shaft, loosen the lever arm from the damper shaft, and rotate the lever arm farther to the right and retighten. Repeat Step C.
e) The barometric bypass damper is now calibrated.

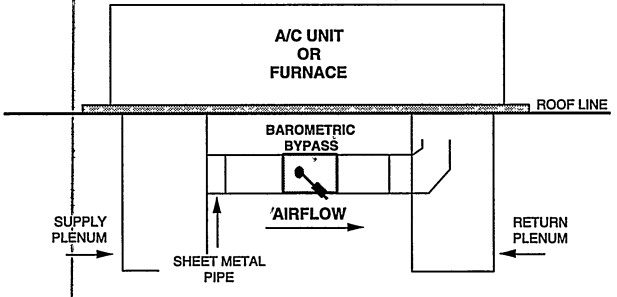
BAROMETRIC BYPASS STARTUP TEST

a) Have at least half of the zones call for either heating or cooling.
b) Check to be sure the calling zone dampers are open, (air is flowing).
c) Verify the bypass damper is open. Note, the damper may not fully open.
d) If the open zones are not noisy, the bypass damper is set.

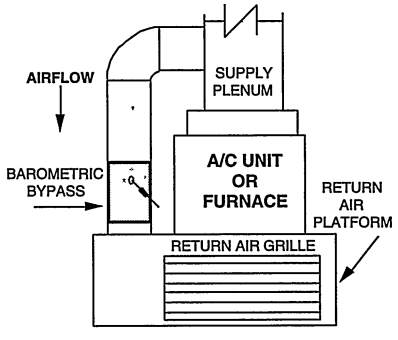
HORIZONTAL APPLICATION



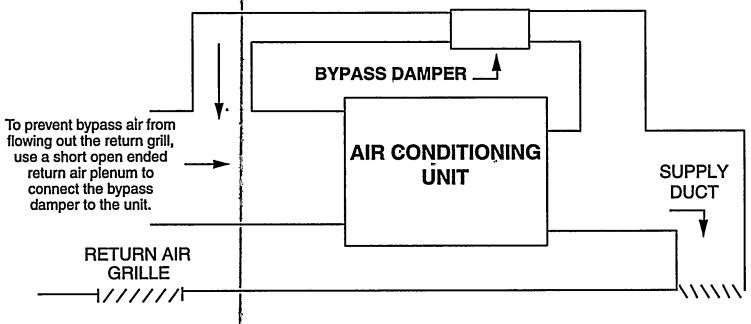
ROOFTOP INSTALLATION Down Discharge Application



VERTICAL APPLICATION



OPEN RETURN PLENUM BYPASS APPLICATION

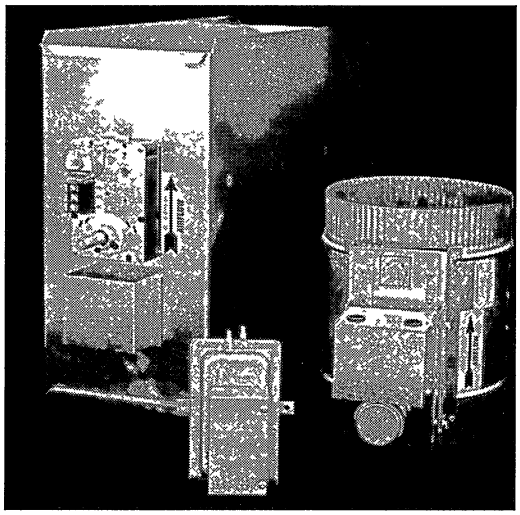


BYPASS DAMPERS – ELECTRONIC

ELECTRONIC BYPASS DAMPERS

Bypass dampers are used to provide constant air delivery through the air handling unit. This is done by bypassing excess air from the supply duct back to the return duct. As a zone is satisfied its zone damper closes. When this happens, the bypass damper opens just enough to bypass the excess air. This will control static pressure and noise at the diffusers.

The Electronic Bypass Damper can be used on any size system over 5 tons. The damper can be round or rectangular and multiple dampers can be slaved together. The Electronic Bypass Damper consists of a medium pressure round or a heavy duty rectangular damper and a static pressure sensor.



RECTANGULAR & ROUND BYPASS DAMPER WITH THE STATIC PRESSURE CONTROL

SIZING ELECTRONIC BYPASS DAMPERS

When only the smallest zone is calling, the maximum amount of excess supply air will flow through the bypass damper.

CFM CALCULATION

To determine the proper size bypass damper:

A) Calculate total air volume at 400 CFM per Ton.
B) Calculate air volume of smallest zone in CFM .
C) Calculate bypass CFM by subtracting the smallest zone air volume from the total. (A - B = C).

ROUND BYPASS DAMPER SELECTION

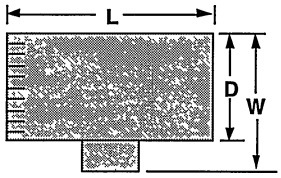
When you know the bypass CFM requirement as determined in the "CFM calculation" section, use the ROUND BYPASS SELECTION TABLE. From the table, select the bypass damper with the CFM rating equal to or greater than the value calculated in step C of CFM Calculation.

ROUND BYPASS SELECTION TABLE

Diameter	CFM
6"	437
8"	787
10"	1375
12"	1750
14"	2675
16"	3125

ROUND DIMENSIONAL DATA

PART #	SIZE	D	L	W
STMPD06	6	6"	10"	10"
STMPD08	8	8"	10"	12"
STMPD10	10	10"	12"	14"
STMPD12	12	12"	14"	16"
STMPD14	14	14"	16"	18"
STMPD16	16	16"	18"	20"



Example: We know the smallest zone air volume is 250 CFM and we have a four ton system. Thus the air volume we need to bypass is (400 X 4) -250) which equals 1350 CFM. Using the ROUND BYPASS SELECTION TABLE, we would select a 10 inch bypass since it can handle up to 1375 CFM of air.

Never exceed 16 inches for the round bypass damper. If you need to bypass more than 3125 CFM, either use a rectangular bypass or slave multiple round bypass dampers.

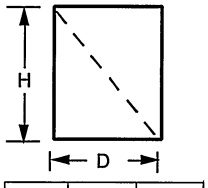
Example: Select round bypass dampers to bypass 5600 CFM. A 16 inch damper can only handle 3125 CFM. If a 16 inch damper is selected, then we still need a damper to handle 2475 CFM (5600-3125). The closest damper to 2475, but not under, is a 14 inch damper which can bypass 2675 CFM. In this case, use a 14 and a 16 inch damper to bypass 5600 CFM.

RECTANGULAR BYPASS DAMPER SELECTION

When you know the bypass CFM requirement as determined in the "CFM calculation" section, use the RECTANGULAR BYPASS SELECTION TABLE. From the table, select the bypass damper with the CFM rating equal to or greater than the value calculated in step C of CFM Calculation.

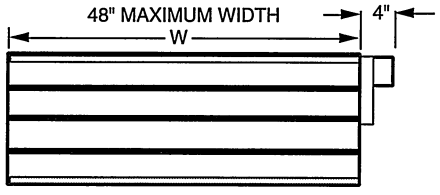
Example: We know the smallest zone air volume is 250 CFM and we have a 7-1/2 ton system. Thus the air volume we need to bypass is (400 X 7.5) -250) which equals 2750 CFM. Using the RECTANGULAR BYPASS SELECTION TABLE, we see the smallest damper we can use is a 12" x 22" or a 22" x 12".

RECTANGULAR BYPASS DAMPERS
SELECT FROM 8 X 8 THRU 48 X 48



WIDTH	HEIGHT	DEPTH
W	H	16"

Part Number STCD W X H



Rectangular bypass dampers should operate at 1500 FPM*
E.G. A 24" x 12" damper = 2 square feet.
2 square feet X 1500FPM = 3000 CFM.
* FPM = Feet Per Minute

BYPASS DAMPERS – ELECTRONIC

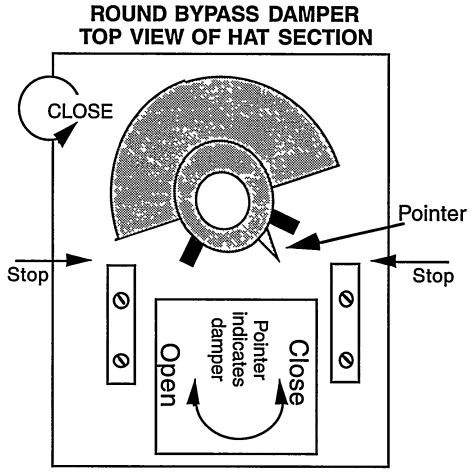
RECTANGULAR BYPASS SELECTION TABLE

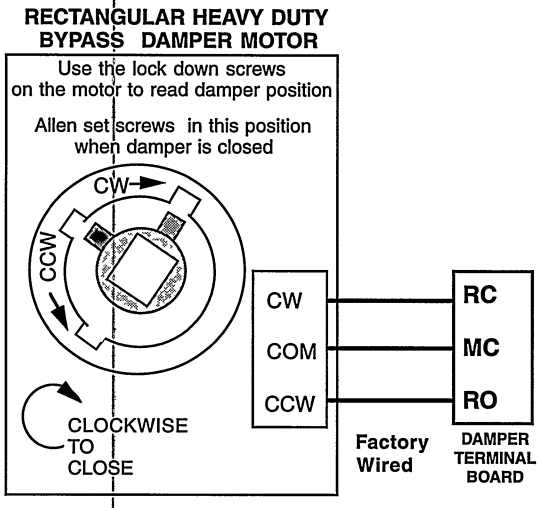
HEIGHT IN INCHES ↓ / WIDTH IN INCHES →	8	10	12	14	16	18	20	22	24	28	32	36	40	44	48
8	667	833	1000	1167	1333	1500	1667	1833	2000	2333	2667	3000	3333	3667	4000
10	833	1042	1250	1458	1667	1875	2083	2292	2500	2917	3333	3750	4167	4583	5000
12	1000	1250	1500	1750	2000	2250	2500	2750	3000	3500	4000	4500	5000	5500	6000
14	1167	1458	1750	2042	2333	2625	2917	3208	3500	4083	4667	5250	5833	6417	7000
16	1333	1667	2000	2333	2667	3000	3333	3667	4000	4667	5333	6000	6667	7333	8000
18	1500	1875	2250	2625	3000	3375	3750	4125	4500	5250	6000	6750	7500	8250	9000
20	1667	2083	2500	2917	3333	3750	4167	4583	5000	5833	6667	7500	8333	9167	10000
22	1833	2292	2750	3208	3667	4125	4583	5042	5500	6417	7333	8250	9167	10083	11000
24	2000	2500	3000	3500	4000	4500	5000	5500	6000	7000	8000	9000	10000	11000	12000
28	2333	2917	3500	4083	4667	5250	5833	6417	7000	8167	9333	10500	11667	12833	14000
32	2667	3333	4000	4667	5333	6000	6667	7333	8000	9333	10667	12000	13333	14667	16000
36	3000	3750	4500	5250	6000	6750	7500	8250	9000	10500	12000	13500	15000	16500	18000
40	3333	4167	5000	5833	6667	7500	8333	9167	10000	11667	13333	15000	16667	18333	20000
44	3667	4583	5500	6417	7333	8250	9167	10083	11000	12833	14667	16500	18333	20167	22000
48	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000	16000	18000	20000	22000	24000

Bypass air in CFM. Calculated at 1500 FPM.

Formula used: B = W X H / 144 X 1500, where B = Bypass air in CFM, W = damper width in inches, H= damper height in inches, 144 = 144 sq. inches per sq. ft., 1500 = 1500 FPM.

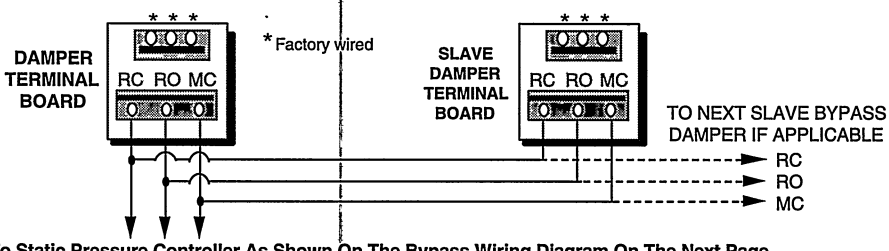
BYPASS POSITION INDICATORS





SLAVING BYPASS DAMPERS

Use only one Pressure Sensor when slaving two or more Bypass Dampers together. Connect the Pressure Sensor to one damper as described above. Connect the slave dampers in parallel as shown. Up to 4 dampers can be slaved to one Sensor. The slaved dampers will self synchronize each time the dampers reach full open or full close.



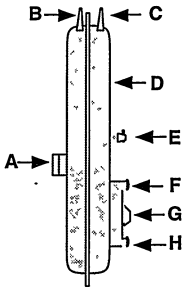
To Static Pressure Controller As Shown On The Bypass Wiring Diagram On The Next Page.

BYPASS DAMPER – STATIC PRESSURE CONTROLLER

The Static Pressure Controller controls a standard medium pressure round damper (STMPD) or the heavy duty rectangular damper (STCD) by maintaining constant static pressure in the duct downstream of the bypass takeoff. As the zone dampers close, the static pressure increases. When this happens, the static pressure controller opens the bypass damper to bring the static pressure back to the setpoint.

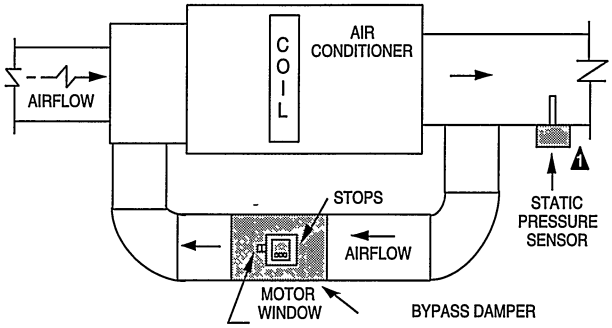
STATIC PRESSURE CONTROLLER DESCRIPTION

A: Mounting tabs.
B: Supply air barb.
C: Reference air, "LOW", barb.
D: Diaphragm must be mounted vertically.
E: Pressure adjusting screw.
F: Normally closed, N/C, terminal.
G: Normally open, N/O, terminal.
H: Common, COM, terminal.



STATIC PRESSURE CONTROLLER INSTALLATION

a) Select location for pressure sensor tube. Location should be in supply duct, downstream of bypass takeoff, upstream of any zone dampers and perpendicular to the air flow.
b) Drill 5/16" hole at selected location for pressure sensor tube.
c) Mount Static Pressure Controller near the drilled hole with the diaphragm of the sensor vertical. The controller must be mounted on a stable, non vibrating surface.
d) Attach 5/16" pressure sensor tube, supplied, to the barb of the Static Pressure Controller located closest to the mounting tabs. The other barb, labeled "LOW", is left open if the Controller is in the conditioned building. If the Controller is located outside the building, another tube, not provided, must be connected between the "LOW" barb and a location inside the building.
e) Remove the terminal cover and wire as shown in the wiring diagram.
f) Reattach terminal cover. Installation is complete. Proceed to Static Pressure Controller Setup.



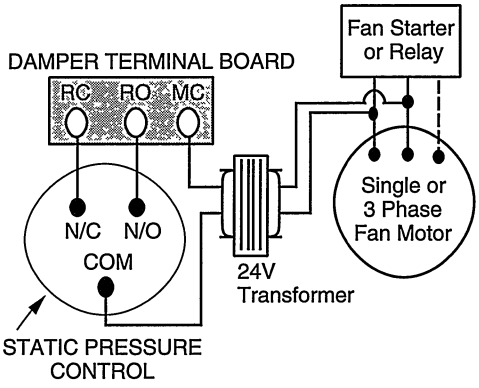
⚠ Insert the tube into the side of the duct, approximately 3". Make sure the tube is perpendicular to the air flow.

STATIC PRESSURE CONTROLLER SETUP

a) Connect A/C voltmeter to common and N/O terminals of the Static Pressure Controller.

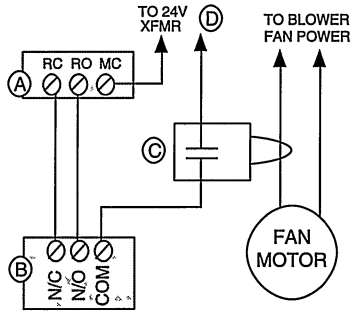
California Economizer recommends de-energizing the bypass damper when the blower fan turns off. If not installed as recommended, when the blower fan turns off the bypass will fully close. Then when the blower fan turns back on, there could be excessive air supplied to the calling zone, causing excessive air noise, until the bypass is able to open sufficiently.

HARD WIRED TO BLOWER FAN



ALTERNATE WIRING USING CURRENT SENSING RELAY

Ⓐ Bypass damper terminal board.
Ⓑ Static pressure controller.
Ⓒ Current sensing relay (field supplied).Sized at 0.25A per bypass damper.
Ⓓ Size 24VAC transformer to supply 6 VA per bypass damper.



b) Turn off all thermostats.
c) Turn on Controller and set fan switch to "ON" position. Allow fan to run for 5 minutes to equalize pressure. During this time, be sure all dampers are open by checking for air flow out of each damper.
d) Turn adjusting screw on the Static Pressure Controller clockwise until 24 volts is displayed on the meter. Do not overtighten. This will make the bypass damper(s) close. The adjusting screw is located next to the electrical terminals under the terminal cover.
e) Make sure the damper fully closes. This could take up to 90 seconds.
f) Turn adjusting screw slowly counterclockwise until the meter reads 0 volts. Then immediately turn screw clockwise until the meter reads 24 volts.
g) The Static Pressure Controller is now calibrated.

NOTE: Static Pressure Controller may be used with any medium pressure round or heavy duty rectangular damper.

BYPASS CHECKOUT FOR STATIC PRESSURE CONTROLLER

a) Have at least half of the zones call for heating or cooling.
b) Check to be sure the calling zone dampers are open (air is flowing).
c) Verify that the bypass damper is slightly open by looking at the pointer on the damper. See the drawing above.
d) If the open zones are not noisy, the pressure control is calibrated.

DAMPER TRANSFORMER

The 24V transformer connected to TR1 and TR2 of the DigiTract4 System Controller powers the zone dampers. The power rating of the transformer must be sufficient to power the number of dampers used. Also, a properly rated in line fuse must be used on the secondary of the transformer. To determine the power rating of the transformer and the amperage rating of the fuse, use the table below. If using a combination of spring open and power open dampers, size as if all dampers are spring open.

Note: *The System Controller and thermostats are powered by the HVAC unit transformer via terminals R and C.*

TRANSFORMER/FUSE SIZING

NUMBER OF DAMPERS	TR SERIES (SPRING OPEN) DAMPERS		MED. PRESSURE/HEAVY DUTY (POWER OPEN) DAMPERS	
	XFMR PWR	FUSE SIZE	XFMR PWR	FUSE SIZE
1	12 VA	1 AMP	6 VA	1 AMP
2	24 VA	2 AMP	12 VA	1 AMP
3	36 VA	2 AMP	18 VA	1 AMP
4	48 VA	3 AMP	24 VA	2 AMP
5	60 VA	3 AMP	30 VA	2 AMP
6	72 VA	4 AMP	36 VA	2 AMP
7	84 VA	5 AMP	42 VA	3 AMP
8	96 VA	5 AMP	48 VA	3 AMP
9	108 VA	6 AMP	54 VA	3 AMP
10	120 VA	6 AMP	60 VA	3 AMP
11	132 VA	7 AMP	66 VA	4 AMP
12	144 VA	7 AMP	72 VA	4 AMP

Notice: All wiring must meet state and local codes.

STARTUP TEST, GAS/ELECTRIC (DTGE4)

1. If no heating system, jump to step 12.
2. At System Controller:
   - 2.1 Disconnect LAS sensor at + - terminals and place jumper wire between + - terminals.
   - 2.2 Turn power switch ON.
3. Turn off all thermostats except zone 1.
4. At zone 1 thermostat:
   - 4.1 Turn on.
   - 4.2 Set to Heat mode.
   - 4.3 Set Fan switch to Auto mode.
   - 4.4 Set heat set point a couple of degrees above room temperature.
5. At System Controller:
   - 5.1 Verify W and PWR lights are on. If not, cycle System Controller power switch OFF and then ON and recheck.
   - 5.2 If jumper JU1 is on B, verify G light is on.
   - 5.3 Verify DPR 1 light is off and DPR 2 through DPR 4 lights are on.
6. At HVAC unit, verify furnace is on and blower fan is running. If the G light on System Controller is not on, the blower fan is controlled by the furnace and there will be a delay before it turns on.
7. At zone 1, verify air is coming out of the register/diffuser.
8. At next zone:
   - 8.1 Verify air is not coming out of register/diffuser.
   - 8.2 At thermostat:
     - 8.2.1 Turn on.
     - 8.2.2 Set to Heat mode.
     - 8.2.3 Set Fan switch to Auto mode.
     - 8.2.4 Set heat set point a couple of degrees above room temperature.
   - 8.3 Verify air is now coming out the register/diffuser.
9. At previous zone, turn thermostat off and verify air stops coming out of the register/diffuser.
10. Repeat steps 8 and 9 for all remaining zones.
11. If no cooling system, reconnect LAS to the + - terminals of the System Controller and test is complete.
12. Disconnect all wires from the + - terminals of the System Controller.
13. Turn off all thermostats except zone 1.
14. At zone 1 thermostat:
    - 14.1 Turn on.
    - 14.2 Set to Cool mode.
    - 14.3 Set Fan switch to Auto mode.
    - 14.4 Set cool set point a couple of degrees below room temperature.

STARTUP TEST, GAS/ELECTRIC (DTGE4) (Continued)

15. At System Controller:
    15.1 Verify Y, G and PWR lights are on. If not cycle System Controller power switch OFF and then ON and recheck.
    15.2 Verify DPR 1 light is off and DPR 2 through DPR 4 lights are on.
16. At HVAC unit, verify air conditioner is on and blower fan is running.
17. Verify air is being delivered to zone 1 and not to any of the other zones.
18. At zone 1, verify air is coming out of the register/diffuser.
19. At next zone:
    19.1 Verify air is not coming out of the register/diffuser.
    19.2 At thermostat:
        19.2.1 Turn on.
        19.2.2 Set to Cool mode.
        19.2.3 Set Fan switch to Auto mode.
        19.2.4 Set cool set point a couple of degrees below room temperature.
    19.3 Verify air is now coming out of the register/diffuser.
20. At previous zone, turn thermostat off and verify that air stops coming out of the register/diffuser.
21. Repeat steps 19 and 20 for all remaining zones.
22. At System Controller reconnect LAS to + - terminals.

Test complete.

STARTUP TEST, HEAT PUMP (DTHP4)

1. At System Controller:
    1.1 Disconnect LAS sensor at + - terminals and place jumper wire between + - terminals.
    1.2 Turn power switch ON.
2. Turn off all thermostats except zone 1.
3. At zone 1 thermostat:
    3.1 Turn on.
    3.2 Set to Heat mode.
    3.3 Set Fan switch to Auto mode.
    3.4 Set heat set point a couple of degrees above room temperature.
4. At System Controller:
    4.1 Verify Y, G and PWR lights are on. If not, cycle System Controller power switch OFF and then ON and recheck.
    4.2 If jumper O/B is on B, verify O/B light is on. Otherwise, verify O/B light is off.
    4.3 Verify DPR 1 light is off and DPR 2 through DPR 4 lights are on.
5. Verify heat pump is running in heat mode and the blower fan is running.
6. At zone 1, verify air is coming out of the register/diffuser.
7. At next zone:
    7.1 Verify air is not coming out of register/diffuser.
    7.2 At thermostat:
        7.2.1 Turn on.
        7.2.2 Set to Heat mode.
        7.2.3 Set Fan switch to Auto mode.
        7.2.4 Set heat set point a couple of degrees above room temperature.
    7.3 Verify air is now coming out of the register/diffuser.
8. At previous zone, turn thermostat off and verify air stops coming out of the register/diffuser.
9. Repeat steps 7 and 8 for all remaining zones.
10. If the heat pump has auxiliary heat, after the heat pump has been running at least 4 minutes, verify W2 light is on at System Controller and the auxiliary heat is on.
11. Disconnect jumper wire between the + - terminals of the System Controller.
12. Turn off all thermostats except zone 1.
13. At zone 1 thermostat:
    13.1 Turn on.
    13.2 Set to Cool mode.
    13.3 Set Fan switch to Auto mode.
    13.4 Set cool set point a couple of degrees below room temperature.
14. At System Controller:
    14.1 Verify Y, G and PWR lights are on. If not cycle System Controller power switch OFF and then ON and recheck.
    14.2 If jumper O/B is on O, verify O/B light is on. Otherwise, verify O/B light is off.
    14.3 Verify DPR 1 light is off and DPR 2 through DPR 4 lights are on.
15. Verify heat pump is running in cool mode and the blower fan is running.
16. Verify air is being delivered to zone 1 and not to any of the other zones.
17. At zone 1, verify air is coming out of the register/diffuser.
18. At next zone:
    18.1 Verify air is not coming out of register/diffuser.
    18.2 At thermostat:
        18.2.1 Turn on.
        18.2.2 Set. to Cool mode.
        18.2.3 Set Fan switch to Auto mode.
        18.2.4 Set cool set point a couple of degrees below room temperature.
    18.3 Verify air is now coming out of the register/diffuser.
19. At previous zone, turn thermostat off and verify air stops coming out of the register/diffuser.
20. Repeat steps 18 and 19 for all remaining zones.
21. At System Controller reconnect LAS to + - terminals.

Test complete.

DigiTract 4

Comfort Control System

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Zoning

Part #DT4MAN

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