Zonex SYSTEMS

comfort you control

Installation Guide

DigiTract 4-2

Two Stage Heat/Cool Comfort Control System

Zoning Systems

That's all we do.

Part #DT4MAN
Rev. April 2003

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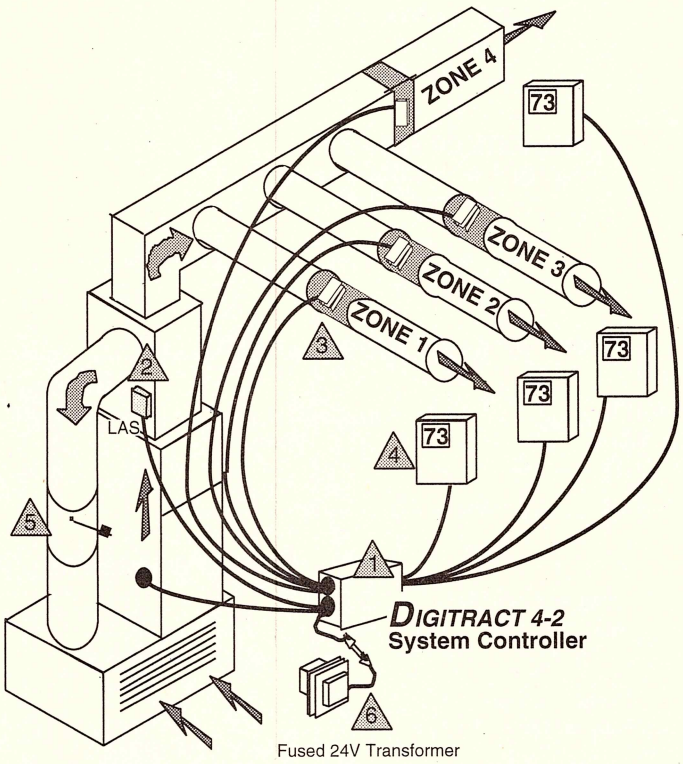
INTRODUCTION

The Zonex Systems Digitract 4-2 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. To provide economical, effective and simplified remote control and monitoring capability of one or more Digitract 4-2 zone control systems, the ZonexCommander may be used to manage up to 80 thermostat schedules. The ZonexCommander is a Windows® based thermal management system, which can integrate gas/electric and heat pump zone systems to include stand alone HVAC systems.

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



SYSTEM DESCRIPTION

The DigiTract 4-2 zoning system consists of a 2-stage System Controller with built-in Capacity Control (leaving air sensor), Zone Dampers, Zone Thermostats, Bypass Damper and Damper Transformer.

The **System Controller** is the heart of the Digitract 4-2 zoning system. It monitors the leaving air temperature, zone thermostats 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 staging and capacity control feature of the System Controller. It is a sensor placed in the leaving air of the HVAC system. The LAS monitors the leaving air temperature of the HVAC system and sends this information to the System Controller. The System Controller uses this information to stage and 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.

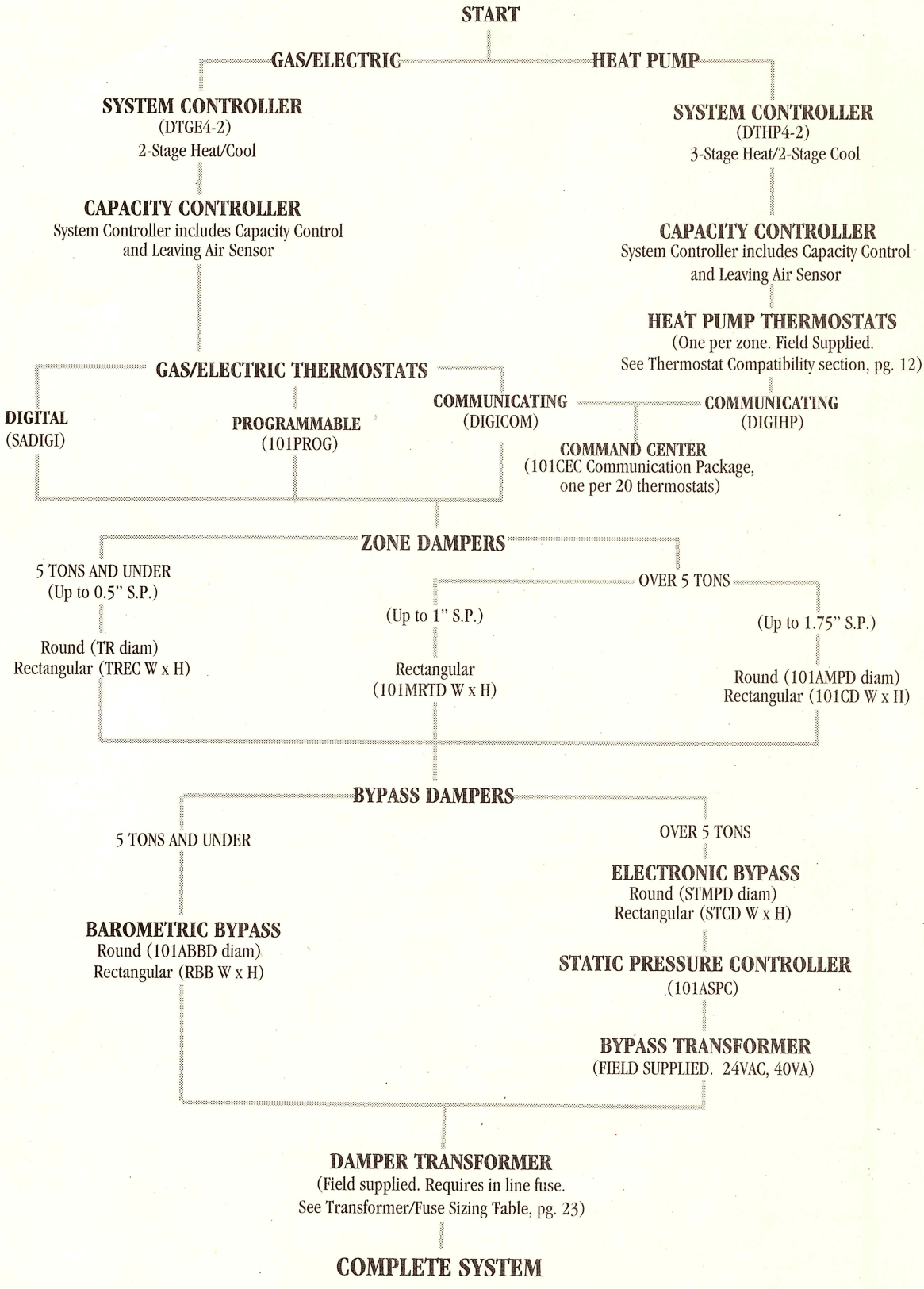
The **Zone Dampers** are air valves placed in the forced air duct work for each zone. They are controlled by the System Controller. While the HVAC system is running, the zone dampers for any zone thermostats not calling will close and zone dampers for the zones calling will remain open. Conditioned air 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 thermostat makes a cool call telling the System Controller that zone needs cooling. Two-stage thermostats are <u>not</u> required with the DigiTract 4-2 System. The System Controller will cycle staging and auxiliary strip heat based on leaving air temperature. 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 an in-line fuse. See Damper Transformer section, page 23.

Digitract 4-2 COMPONENT SELECTION GUIDE



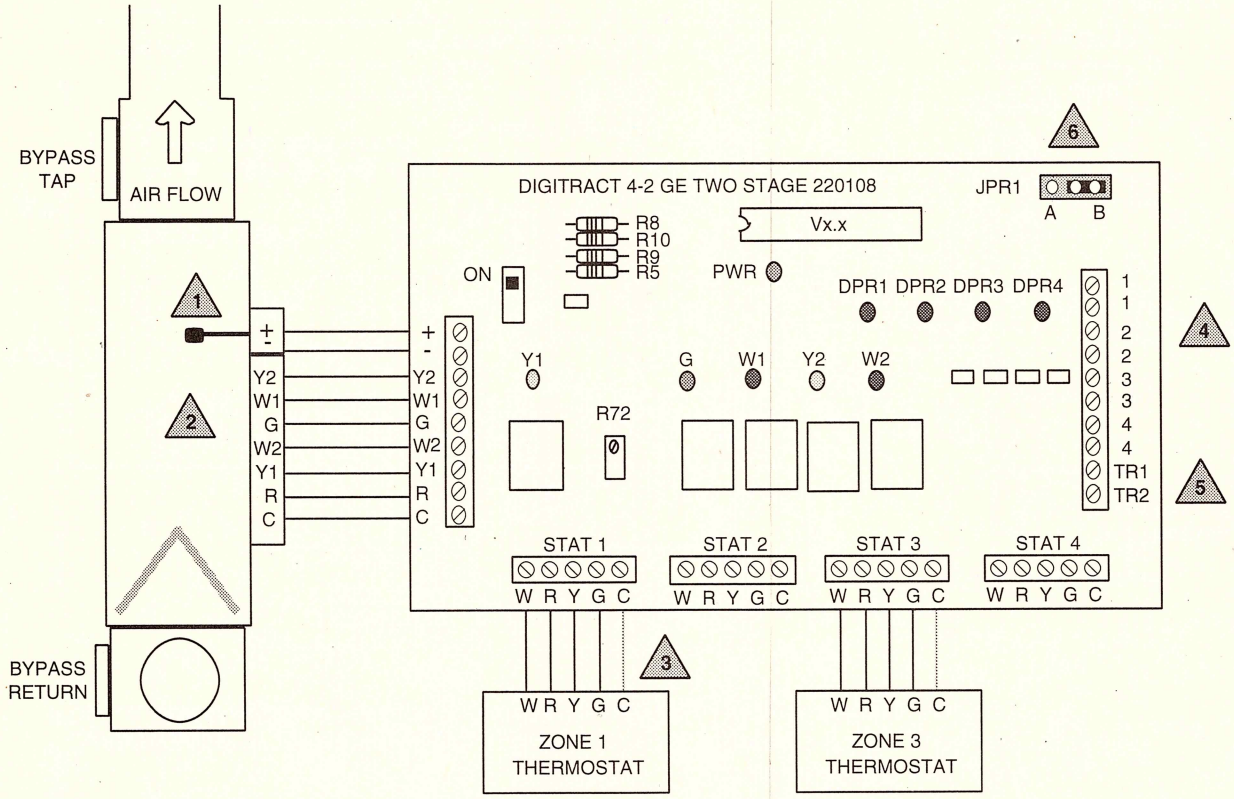
WIRING – GAS/ELECTRIC DTGE4-2

DigiTract 4-2 Gas/Electric 2-Stage Heat/Cool

HVAC unit and LAS terminals. Do not connect Y2 or W2 for single stage heat/cool systems.

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

Zone damper terminals. Refer to "Wiring – Zone Dampers" section, pg. 5.



1. LAS. Locate the leaving air sensor in the supply air stream, as far from the coil/heat exchanger as possible before the bypass takeoff. Do not locate the LAS downstream of the bypass takeoff. Ensure wire polarity is correct. Refer to "CAPACITY CONTROLLER- LAS INSTALLATION" on P. 11 for further information.
NOTE: Shielded conductor provided for installations with spark ignition or distances from controller to LAS beyond 10'. 18/2 thermostat wire may be used in most applications.

2. Connect W2 and Y2 of the DTGE4-2 only if there are two heat and/or two cool stages.

3. Connect C from the controller to the thermostat 24V AC common terminal if hard wired. Not required with use of battery operated thermostats. Refer to "THERMOSTATS- COMPATIBILITY" on P. 12 for further information.

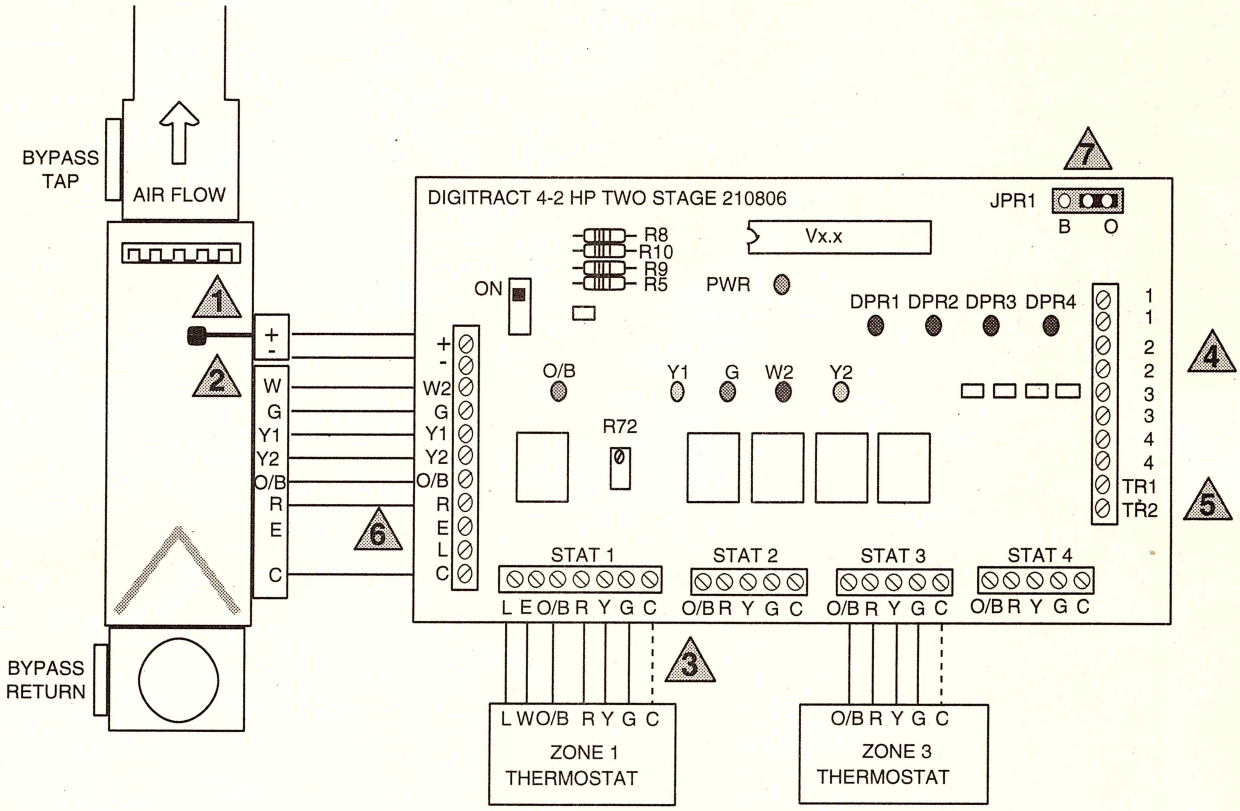
4. Zone damper terminals. Refer to "WIRING- ZONE DAMPERS" on P. 5.

5. Install one 24V AC transformer, sized and fused for the total number of zone dampers. See "DAMPER TRANSFORMER" on P. 23.

6. Fan cycling jumper: A – FAU fan control; B – electric heat, fan on with heat call

WIRING – HEAT PUMP DTHP4-2

DigiTract 4-2 HP 3-Stage Heat/2-Stage Cool



1. LAS. Locate the leaving air sensor between the refrigerant coil and the electric heat coil(s) or other auxiliary heat source. Verify that the polarity is correct. Refer to "CAPACITY CONTROLLER – LAS INSTALLATION" page 11, for further information.

2. Connect W2 from the controller to the unit's electric heat stage terminal designation. It is recommended to install an outdoor thermostat in series with any electric heat stages.

3. Connect C from the controller to the thermostat 24V AC common terminal if hardwired. Refer to "ZONE THERMOSTATS – COMPATIBILITY" page 12, for further information.

4. Zone damper terminals. Refer to "WIRING – ZONE DAMPERS" on page 5.

5. Install one 24V AC transformer, sized and fused for the total number of zone dampers. See "DAMPER TRANSFORMER" on page 23.

6. Emergency heat terminal, E. Use only if emergency heat source is different from auxiliary heat W2. If used, do not jumper to W2.

7. Reversing valve jumper: B – energize for heat; O – energize for cool
NOTE: Some combination thermostats do not have an E terminal. Connect W2 of the thermostat to the E terminal of STAT 1 terminal block.

WIRING – ZONE DAMPERS

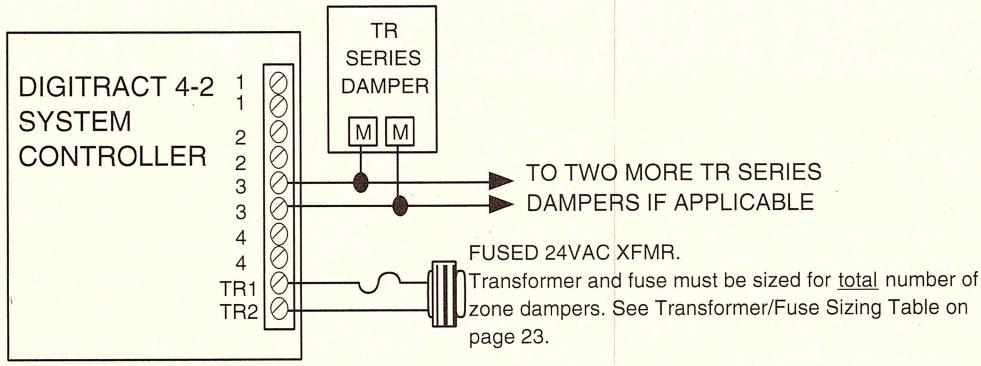
There are three methods of wiring the zone dampers. If necessary, you can mix wiring methods on different zones to suit your application.

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

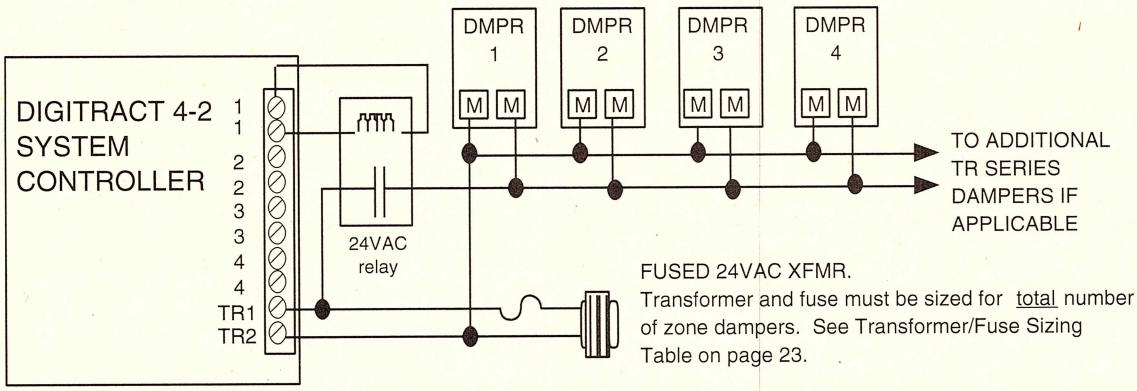
Method 2: If wiring more than three TR series dampers to a zone, use method 2. This method requires a 24V ac, SPNO relay.

Method 3: If using 101 series dampers with a DTGE4 controller, wire per method 3. Notice: 101 series dampers are required for all systems over 5 tons. Refer to Parts Selection Table, page 14.

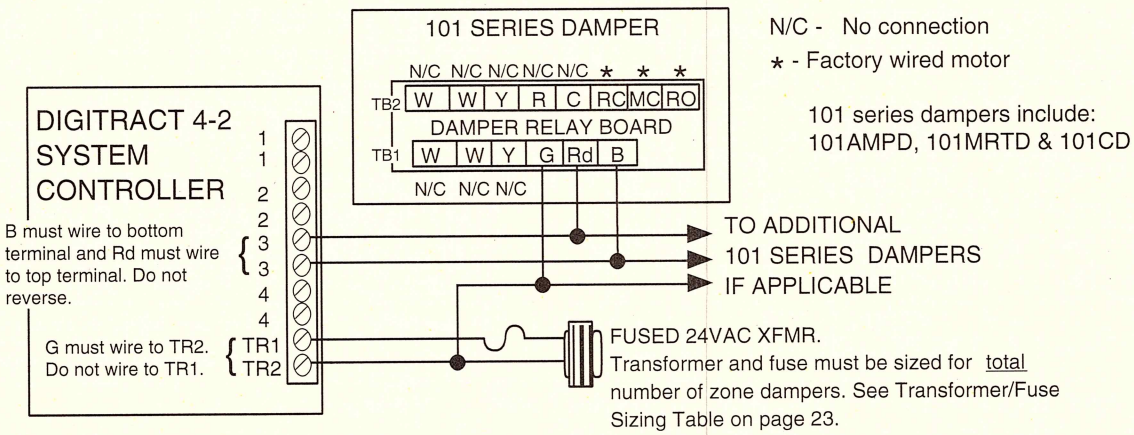
Method 1: Wiring Up to Three TR Series Dampers to a Zone



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



Method 3: Wiring 101 Series Medium/Heavy Duty Dampers to a Zone



SYSTEM CONTROLLERS

The DigiTract 4-2 System Controller is the heart of the Digitract 4-2 zoning system. It is an auto changeover, home run system with a built in staging and 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, 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 DigiTract 4-2 is available in two models, Gas/Electric 2-Stage Heat/Cool and Heat Pump 3-Stage Heat/2-Stage Cool.

SYSTEM CONTROLLER – GAS/ELECTRIC DTGE4-2

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 energizes the compressor(s) and indoor blower. This is indicated by the corresponding Y and G LEDs illuminating. Dampers for the zones not calling for cool are powered closed and the dampers for the zones calling for cool are left open. This is indicated by the DPR LEDs. If the DPR LED is illuminated on the damper terminal strip and damper terminal board, 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 a purge mode.

Heat mode – When running in the heat mode, the System Controller energizes the heat stage(s), indicated by the W LEDs illuminating. If the Fan Control Jumper is in the B position, the indoor blower will energize with heat, indicated by the G LED illuminating. Dampers for the zones not calling for heat are powered closed and the dampers for the zones calling for heat are left open. This is indicated by the DPR LEDs. If the DPR LED is on the damper terminal strip and damper terminal board, the corresponding damper is closed. 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 a purge mode.

Changeover – While the system is operating in one mode, and the System Controller receives a call for the opposite mode, the System Controller will continue to run in the current mode for 15 minutes or until all current calls are satisfied. Then the System Controller will go into a purge mode for 3 minutes, 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 LEDs off and the G LED 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 LEDs indicate which dampers are open and which are closed. If the DPR LED is on, the damper is closed. If the DPR LED 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 is energized (G made to R) and the G LED is on. This provides ventilation to all zones.

STATUS LEDS

Y1	Y2	G	W1	W2	PWR	DPR	MODE	FUNCTION
OFF	OFF	OFF	OFF	OFF	OFF	OFF	Off	Power off.
OFF	OFF	OFF	OFF	OFF	ON	OFF	On	Power on, blower off, all zones satisfied.
OFF	OFF	ON	ON	OFF	ON	0	Vent	Blower on, compressor(s) off, all zone dampers open.
OFF	OFF	ON	OFF	OFF	ON	1	Purge	Blower on, compressor(s) off. Dampers with LED on are closed.
ON	OFF	ON	OFF	OFF	ON	1	Y1 cool	1st stage cool, blower on. Dampers with LED on are closed.
ON	ON	ON	OFF	OFF	ON	1	Y2 cool	2nd stage cool, blower on. Dampers with LED on are closed.
OFF	OFF	A / B	ON	OFF	ON	1	W1 heat	1st stage heat, blower on. Dampers with LED on are closed.
OFF	ON	A/ B	ON	ON	ON	1	W2 heat	2nd stage heat, blower on. Dampers with LED on are closed.
OFF	OFF	ON	OFF	OFF	FL	1	Cap cut out	Blower on, all compressors off. Dampers with LED on are closed.

FL = Flashing **A** = On when JMPR1 is in A position **B** = OFF when JMPR1 is in B position

1 = One or more damper LED's on **0** = All damper LED's are off

COMPONENTS

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

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

W1: First stage heat. When energized (W1 made to R), energizes first-stage heat.

W2: Second stage heat. When energized (W2 made to R), energizes second-stage heat.

G: Blower. When energized (G made to R), energizes the indoor blower.

Y1: First stage cool. When energized (Y1 made to R), energizes first stage cooling.

Y2: Second stage cool. When energized (Y2 made to R), energizes second stage cooling.

R: HVAC unit 24V power. Powers the DigiTract 4-2 board 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 Digitract 4-2 to run in heat mode.

R: HVAC unit 24V power.

Y: Cool call. When energized (Y made to R), requests the Digitract 4-2 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.

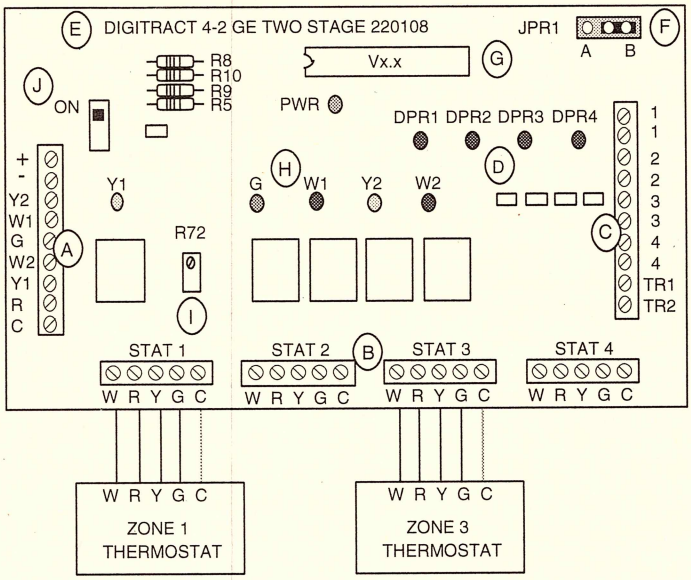
3 3: Zone damper 3.
When energized, powers zone damper 3 closed.

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

D. Damper Status LEDs – On when corresponding zone damper is being powered 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 is energized by the furnace when heat is energized (gas furnaces). In the B position, the blower is energized by the DTGE4-2 when heat is energized (electric furnaces).



G. Microcontroller – Responsible for activation and control of the unit based upon thermostat input. Occasionally software upgrades may become available. If so, the Digitract 4-2 software can be field upgraded by changing this microcontroller.

H. HVAC System Status LEDs – Indicates what the DTGE4-2 is energizing on the HVAC system.

Y1: Compressor, yellow. On when the first-stage cool is energized.

Y2: Compressor, yellow. On when the second-stage cool is energized.

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

W1: Heat, red. On when first stage heat is energized.

W2: Heat, red. On when second stage 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.

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

J. Power Switch – When OFF, power from the HVAC unit transformer is disconnected from the Digitract 4-2 and thermostats. When ON, power from the HVAC unit transformer is supplied to the Digitract 4-2 and the zone thermostats.

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 energizes the compressor(s), indoor blower 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) LEDs illuminating. 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 LEDs. If the DPR LED is illuminated, the damper terminal strip and damper terminal board, 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 a purge mode.

Heat mode – When running in the heat mode, the System Controller energizes the compressor(s), indoor blower 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) LEDs illuminating. 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 LEDs. If the DPR LED is on the damper terminal strip and damper terminal board, the corresponding damper is closed. After running in heat mode for 8 minutes, the System Controller will energize the auxiliary heat if the coil leaving air temperature drops below 88 degrees and will deenergize when the coil leaving air temperature rises above 97 degrees. The W2 LED 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 a purge mode.

Changeover – While the system is operating in one mode, if the System Controller receives a call for the opposite mode, the System Controller will continue to run in the current mode for 15 minutes or until all current calls are satisfied. Then the System Controller will go into a purge mode for 3 minutes, 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 and indoor blower will deenergize. This is indicated by the Y and G LEDs cycling off. If the reversing valve is energized, it will deenergize. This is indicated by the O/B LED turning off. The damper of the last calling zone will remain open and all other dampers will be closed. This provides a 3-minute time delay to prevent equipment short cycling. The DPR LEDs indicate which dampers are open and which are closed. If the DPR LED is on, the damper is closed. If the DPR LED is off, the damper is open.

Auxiliary heat – 8 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 LED illuminates. When the coil leaving air temperature rises above 97 degrees, the auxiliary heat is deenergized and the W2 LED cycles 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 is energized and the G LED 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 STAT 1, it will lock-out the compressors and energize the auxiliary heat strips and fan unless the system is already running in heat or cool mode. If the system is running, the unit's auxiliary heat will be energized based on leaving air temperature. Zones not calling for heat will close their dampers. When all zone temperatures are satisfied, the System Controller removes the auxiliary heat call and monitors all zones for the next call.

SYSTEM CONTROLLER – HEAT PUMP DTHP4-2

STATUS LEDs

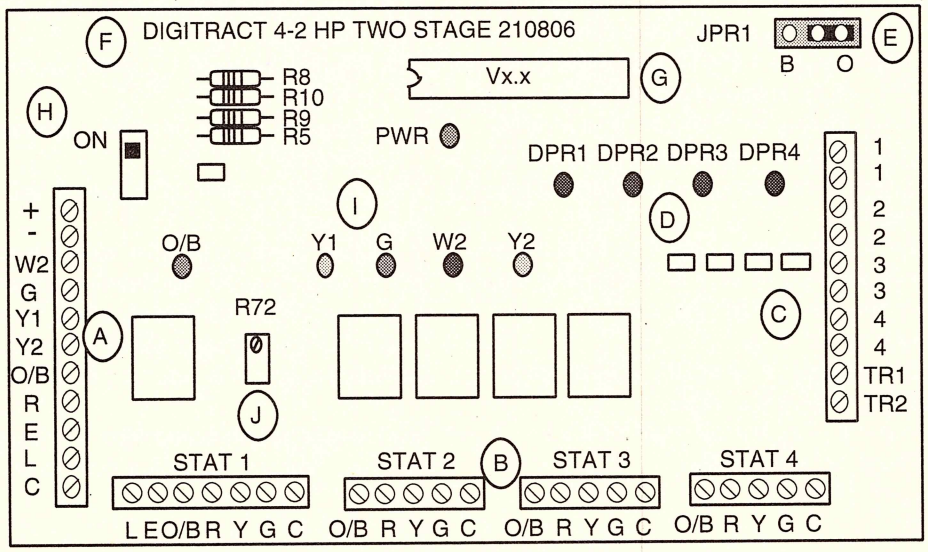
O/B	Reversing valve LED, yellow. On when the reversing valve is energized.
Y1	Compressor LED, yellow. On when the first compressor stage is energized.
Y2	Compressor LED, yellow. On when the second compressor stage is energized.
G	Indoor blower LED, green. On when the indoor blower is energized by the DTHP4-2 Controller.
W2	Auxiliary heat LED, red. On when the auxiliary heat is energized.
PWR	Power LED, orange. On when DTHP4-2 is powered. Flashing during capacity control cutout.
DPR	Damper status LED, red. One per damper. On when damper is closed.

STATUS LEDs								
O/B	**Y1**	**Y2**	**G**	**W2**	**PWR**	**DPR**	**MODE**	**FUNCTION**
OFF	OFF	OFF	OFF	OFF	OFF	OFF	Off	Power off.
OFF	OFF	OFF	OFF	OFF	ON	OFF	On	Power on, blower off, all zones satisfied.
OFF	OFF	OFF	ON	OFF	ON	0	Vent	Blower on, compressor(s) off, all zone dampers open.
OFF	OFF	OFF	ON	OFF	ON	1	Purge	Blower off, compressor(s) off. Dampers with LED on are closed.
A	ON	OFF	ON	OFF	ON	1	Y1 Cool	1st stage cool, blower on. Dampers with LED on are closed.
A	ON	ON	ON	OFF	ON	1	Y2 Cool	2nd stage cool, blower on. Dampers with LED on are closed.
B	ON	ON	ON	C	ON	1	Y1 Heat	1st stage heat, blower on. Dampers with LED on are closed.
B	ON	ON	ON	C	ON	1	Y2 Heat	2nd stage heat, blower on. Dampers with LED on are closed.
OFF	OFF	OFF	ON	ON	ON	0	Em. Heat	Auxiliary and emergency heat on.
OFF	OFF	OFF	ON	OFF	FL	1	Cap Cut out	Blower on, all compressors off. Dampers with LED on are closed.

FL = Flashing **A** = On when reversing valve jumper is in O position **B** = On when reversing valve jumper is in B position

C = On when auxiliary heat is energized **1** = One or more damper LEDs on **0** = All damper LEDs are off

COMPONENTS DTHP4-2



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. When energized (G made to R), turns on the indoor blower.

Y1: Compressor. When energized (Y1 made to R), turns on the heat pump first stage compressor.

Y2: Compressor. When energized, (Y2 made to R), turns on the heat pump second stage 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 Digitract 4-2 and thermostats.

E: Emergency Heat. Separate output (E made to R) to cycle additional stages (if applicable) when in the emergency heat mode.

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: Auxiliary/Emergency Heat. On STAT 1 only. Connected to E terminal on STAT 1. When thermostat 1 is in the emergency heat mode and making a heat call, Y is locked out and W is energized as the first stage of heat. The W2 and E outputs from the controller will be energized simultaneously.
NOTE: When the controller receives a STAT 1 E input from the thermostat W terminal when in the normal heat mode, it is ignored. The W2 output of the controller is cycled according to leaving air temperature.

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 DGHP4-2 energize the heat pump compressor.

G: Blower. When energized (G made to R), requests that the DTHP4-2 energize 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 Digitract 4-2 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 – Responsible for activation and control of the unit and dampers based upon thermostat input. Occasionally software upgrades may become available. If so, the Digitract 4-2 software can be field upgraded by changing this microcontroller.

H. Power Switch – When OFF, power from the heat pump transformer is disconnected from the Digitract 4-2 and thermostats. When ON, power from the heat pump transformer is supplied to the Digitract 4-2 and the zone thermostats.

I. Heat Pump Status LEDs – Indicates what the DTHP4-2 is energizing on the heat pump.

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

Y1: Compressor, yellow. On when the first stage compressor is energized.

Y2: Compressor, yellow. On when the second stage compressor is energized.

G: Blower, green. On when the indoor blower 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 Potentiometer – Turn to calibrate the leaving air sensor, if required. See Calibration, in Capacity Controller section.

STAGING AND CAPACITY CONTROL

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 Digitract 4-2 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.

COOLING OPERATION – DTGE4-2 AND DTHP4-2

Y1 Cool Operation – Upon a cool call, the controller will energize Y1 and operate with a minimum run time of 4 minutes, regardless of the leaving air temperature. At the completion of the minimum run time, if the leaving air temperature drops below 45°F., Y is deenergized; the Y LED is off and the PWR LED will flash. G will remain energized, upon which the leaving air temperature is rechecked after 4 minutes. If the leaving air temperature has recovered to 45°F. or greater, Y will be reenergized and the PWR LED will stop flashing. If the reversing valve jumper is in the O position, the O/B output will be energized simultaneously with Y, indicated by the O/B LED.

Y2 Cool Operation – After 8 minutes of continuous Y1 run time, the leaving air temperature, LAT is checked. If the LAT is above 60°F., Y2 will be energized and the Y2 LED will illuminate. Y2 will cycle off when the LAT drops below 50°F., or when all cool calls are satisfied.

HEAT OPERATION – GAS/ELECTRIC DTGE4-2

W1 Heat Operation – Upon a heat call, the controller will energize W1 if the leaving air temperature is less than 145°F. W1 will deenergize if the LAT exceeds 145°F. The W1 LED will then cycle off and the PWR LED will begin to flash indicating a capacity control cutout. After a 4-minute recycle timer has completed, W1 will energize if the LAT is below 145°F.

W2 Heat Operations – After W1 has operated continuously for 4 minutes and the LAT is 120°F or less, W2 will energize. W2 will remain energized until the LAT rises above 135°F or if all heat calls become satisfied. The W2 LED will then cycle off.

HEAT OPERATION – HEAT PUMP DTHP4-2

Y1 Heat Operation – Upon a heat call, the controller will energize Y1 and operate with a minimum run time of 4 minutes, regardless of the leaving air temperature. At the completion of the minimum run time, if the leaving air temperature rises above 120°F, Y1 is deenergized; the Y LED is off and the PWR LED will flash. G will remain energized, upon which the leaving air temperature is rechecked after 4 minutes. If the leaving air temperature has recovered to 120°F. or lower Y1 will recycle and the PWR LED will stop flashing. If the reversing valve jumper is in the O position, the O/B output will be energized simultaneously with Y, indicated by the O/B LED.

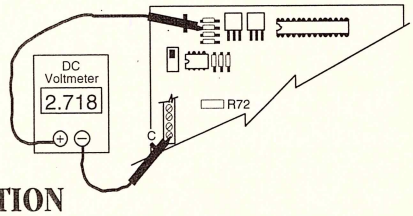
Y2 Heat Operation – After 4 minutes of continuous Y1 run time, the leaving air temperature, LAT is checked. If the LAT is below 95°F., Y2 will be energized and the Y2 LED will illuminate. Y2 will cycle off when the LAT rises above 105°F., or when all heat calls are satisfied.

Auxiliary Heat – After 8 minutes of continuous Y1 operation the leaving air temperature, LAT is checked. If the LAT is below 88°F., W2 will be energized and the W2 LED will illuminate. W2 will cycle off when the LAT rises above 97°F., or when all heat calls are satisfied.

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 digits 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 (R10) as shown in adjacent diagram.
3. Measured voltage should read 2.718 VDC. If the voltage is incorrect, slowly adjust potentiometer R72 until 2.718 VDC is obtained.
4. The LAS is now calibrated.



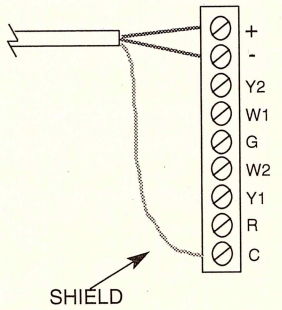
CAPACITY CONTROLLER – LAS INSTALLATION

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. For **heat pumps**, locate LAS downstream from indoor coil but before auxiliary heat strips.

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.

D. The cable between the LAS sensor and the controller must be installed separately from all 24 volt control and power wiring. Using the shielded cable provided, connect the LAS between the + and – terminals of the controller as shown. The shielded conductor is provided for installations with spark ignition or distances from controller to LAS beyond 10'. 18/2 thermostat wire may be used in most applications.
Terminate the shield ***at the controller end only*** on the "C" terminal of the equipment terminal block.
Important: The shield ***at the LAS end of the wire*** must not be grounded, or attached to any other terminal. The shield should be cut and taped off at the LAS end to prevent grounding.



ZONE THERMOSTATS

Each zone requires a zone thermostat. The following lists the types of thermostats to use with each Digitract 4-2 system, information on Zonex Systems thermostats and how to select a thermostat not manufactured by Zonex Systems.

ZONE THERMOSTATS – TYPES

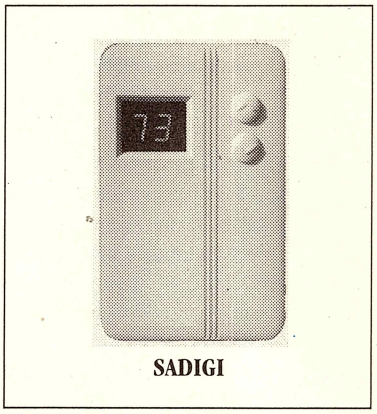
Gas/Electric DTGE4-2 – Use 24V ac single stage gas/electric thermostats. Zonex Systems offers three models: SADIGI, 101PROG and DIGICOM. If not using Zonex Systems thermostats, see Thermostat Compatibility section below.

Heat pump DTHP4-2 – Use 24V ac 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. See Thermostat Compatibility section below.

ZONEX SYSTEMS THERMOSTATS

Zonex Systems offers three thermostat models that can be used with the Gas/Electric Digitract 4-2 System Controller (DTGE4). These models are SADIGI, 101PROG and DIGICOM.

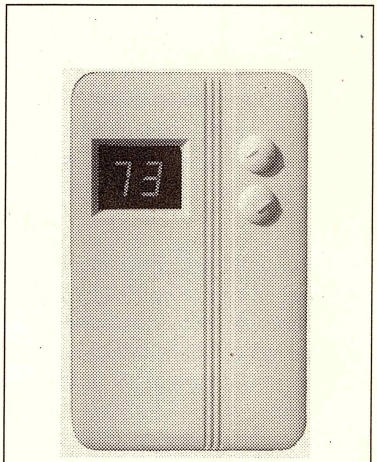
SADIGI: The SADIGI is a single stage gas/electric, hard wired (non-power robbing) thermostat. It can control one heat, one cool and blower fan. It can run in Heat, Cool, or Auto changeover mode. Setpoint range is from 55° to 86° Fahrenheit. The mode and setpoints are stored in nonvolatile memory so they 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.



SADIGI

101PROG: Programmable, dual setpoint, single stage heat/cool, electronic, 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. Requires four thermostat wires for installation. Color: White.

DIGICOM/DIGIHP: The DIGICOM and DIGIHP are auto changeover, communicating thermostats used exclusively in ZonexCommander thermal management systems. Using a computer and the ZonexCommander software, all thermostats in the system can be programmed and viewed. The DIGICOM/DIGIHP may be applied in stand alone unit control, from 1 to 20 split or packaged systems. When used with a modem, all ZonexCommander software functions can be controlled remotely. The DIGICOM/DIGIHP requires 24V AC power from either the zone system or HVAC unit transformer, with the addition of a two conductor, twisted pair cable for communications. Dimensions: 2-7/8" W x 4-1/2" H x 1" D.



DIGICOM/DIGIHP

ZONE THERMOSTATS – COMPATIBILITY

The DTGE4-2 gas/electric and DTHP4-2 heat pump controllers are compatible with most thermostats, offering a wide thermostat selection to the installing contractor. When using other than Zonex Systems thermostats, please refer to the following guidelines:

Electronic Thermostats: Digital thermostats requiring 24V AC power must be "Hard wired" with a separate R and C or common terminal. Power robbing type thermostats are not compatible. All types of battery operated thermostats may be used with any Digitract 4-2 control system.

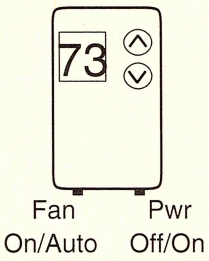
Mechanical Thermostats: When using a mechanical thermostat, ensure the cooling compensator (anticipator) is removed, and the heating anticipator is shorted or set to its lowest setting.

Please contact Factory Technical Support for additional thermostat compatibility information.

SADIGI THERMOSTAT OPERATING INSTRUCTIONS

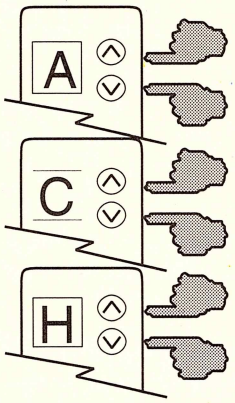
SLIDE SWITCHES

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.



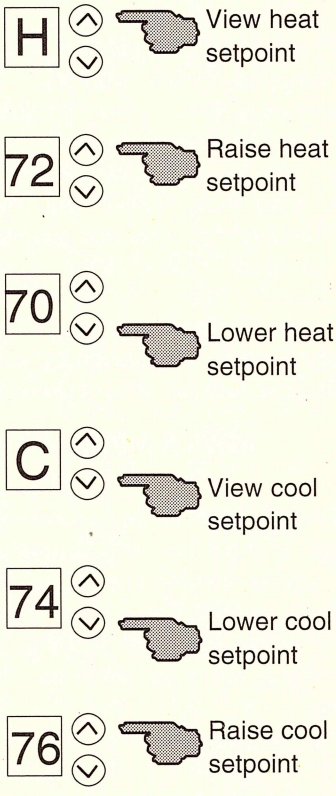
View mode: To view the current mode, press the top and bottom buttons simultaneously. The present mode will be displayed by the letter H, C or A.

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 until "C" appears and then release. To view in Cool mode, press either the top or bottom button until "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 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.

ZONE DAMPERS

Zonex Systems 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

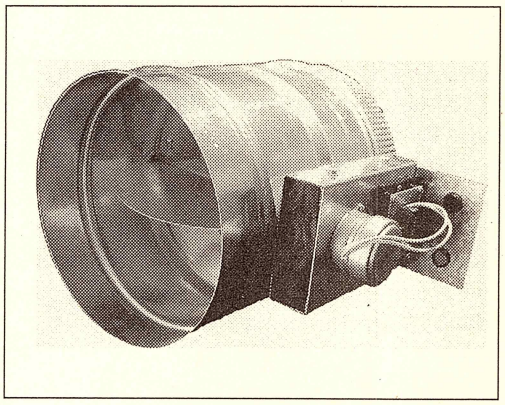
Maximum Differential Pressure refers to the maximum static pressure drop in inches of water column between the input (upstream) of the zone damper and the output (downstream) when the damper is closed.

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)

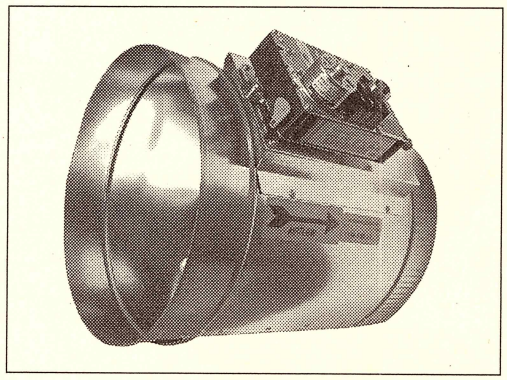
Zonex Systems round low pressure zone dampers can be used for systems up to 5 tons with a maximum differential static pressure of 0.5". These are two position, spring open, power close dampers for very simple operation. Round damper sizes 9 inches and under are manufactured from 24 gauge galvanized steel. 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 terminal 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. A red LED will be illuminated on the damper terminal board to indicate when the damper is being powered closed. The LED will remain on when the damper is fully closed and cycle off when the damper is opening or in the full opened position. 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)

Zonex Systems 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 pipe is furnished with one crimped end and one straight end for easy installation. A hat section supports a 35 lb./in. 24V, 6 VA power open, power closed actuator with a damper relay board interface. The actuator is designed for full stall operation, with a magnetic clutch to protect the internal gearing. The actuator is direct coupled to the damper shaft, which provides positive operation and offers replacement ease if required. Drive time from full open to full closed is 60 seconds.



MEDIUM PRESSURE (101AMPD diam)

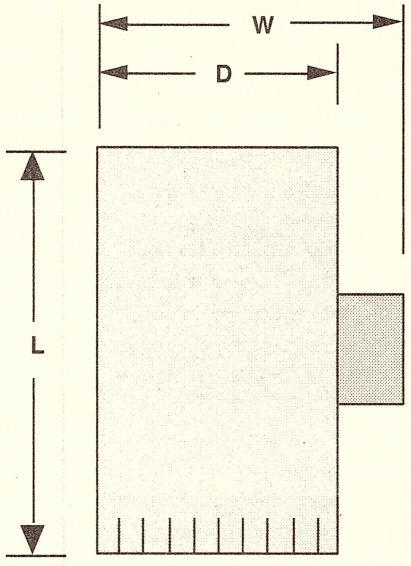
ROUND LOW & MEDIUM PRESSURE DAMPER SIZES

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"	9"
101AMPD08	8"	8"	10"	11"
101AMPD10	10"	10"	12"	13"
101AMPD12	12"	12"	14"	15"
101AMPD14	14"	14"	16"	17"
101AMPD16	16"	16"	18"	19"
101AMPD18	18"	18"	20"	21"



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

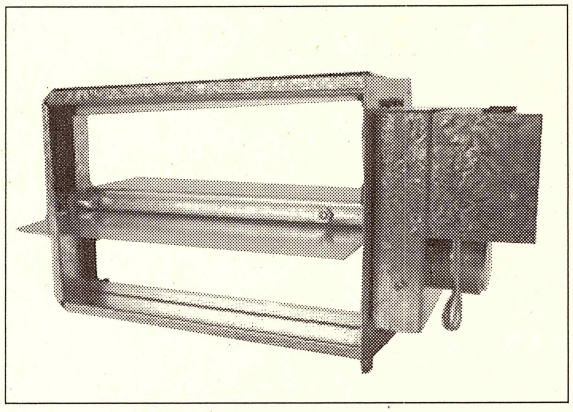
* These air quantities were derived from a duct sizing chart .1" friction loss per 100' of duct. All CFMs listed are approximate. For accurate selection use duct sizing table or device.

RECTANGULAR ZONE DAMPERS

The rectangular zone dampers are available in low, medium and heavy duty pressure ratings. For systems up to 5 tons or with .5" ESP blower capacity, use low pressure rated dampers. For systems up to 7.5 tons or with a 1.0" ESP blower capacity, use medium pressure rated dampers. For systems over 7.5 tons or up to 1.75" ESP blower capacity, use heavy duty rated dampers.

RECTANGULAR LOW PRESSURE ZONE DAMPERS (TREC W x H)

Zonex Systems 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 galvanized steel. The damper is a single blade type that slips into a 2-1/2" 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 terminal 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 shaft without a coupling or set screws. Motor drive time from full open to full close is 30 seconds. A red LED will be illuminated on the damper terminal board to indicate when the damper is being powered closed. The LED will remain on when the damper is fully closed and cycle off when the damper is opening or in the full opened position. Since this is a spring open damper, in the event of power failure the damper fails to the full open position.



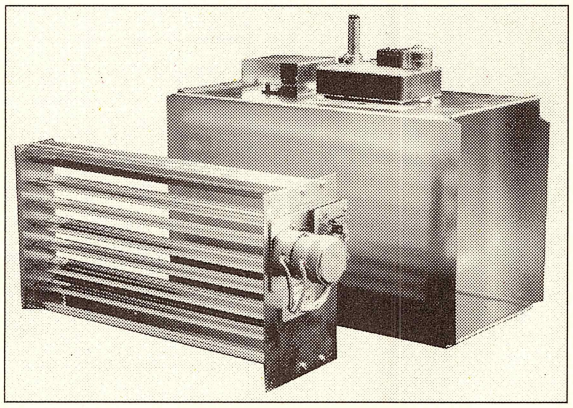
LOW PRESSURE (TREC W x H) RECTANGULAR DAMPER

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

Zonex Systems 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. Power consumption is 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)

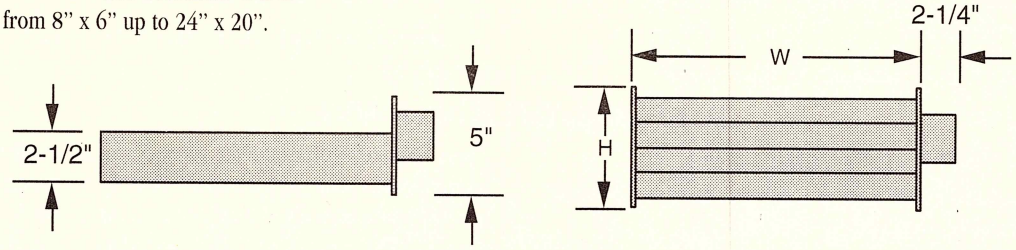
Zonex Systems rectangular heavy duty dampers are recommended for systems 7.5 tons or larger with a maximum differential static pressure of 1.75". These are power open, power close dampers made of 20 gauge "snap-lock" steel frame with S and Drive duct connections. Allow a 16" gap in the duct for the damper. 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

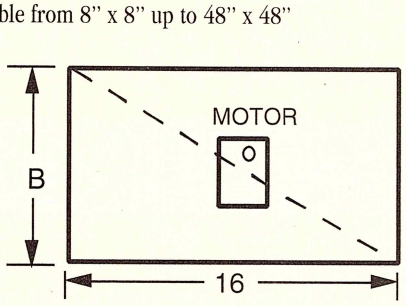
LOW AND MEDIUM PRESSURE RECTANGULAR DAMPER DIMENSIONS

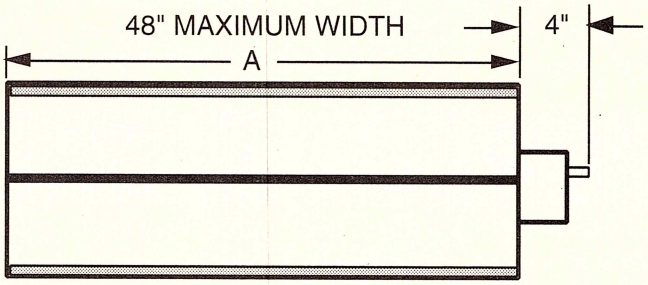
Part Number TREC W x H and 101MRTD W x H
Sizes available from 8" x 6" up to 24" x 20".



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 heavy duty 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 *Zonex Systems* 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 *Zonex Systems* 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" wide cutout in the ductwork.
7. Install TR round dampers to the motor in the 9 to 3 o'clock position. Do not install damper so the motor is in the 4 to 8 o'clock position.

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.

Zonex Systems 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:

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)

BAROMETRIC BYPASS SELECTION TABLE

Diameter	CFM
9"	650
10"	800
12"	1200
14"	1600
16"	2000

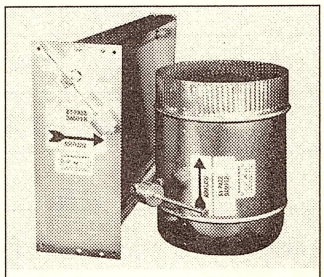
Step 2: Select damper from sizing table.

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 2000 CFM, use electronic bypass damper.

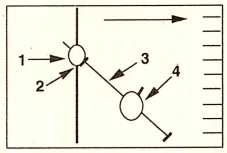
Example: You have a 4 ton system. Your smallest zone will use 500 CFM. The total CFM is 1600 CFM (400 * 4). Your bypass CFM is 1100 (1600 - 500). From the table, you determine that a 12" bypass damper is needed.

Do not use the barometric bypass in any system over 5 tons.
For systems over 5 tons, or to bypass more than 2000 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.

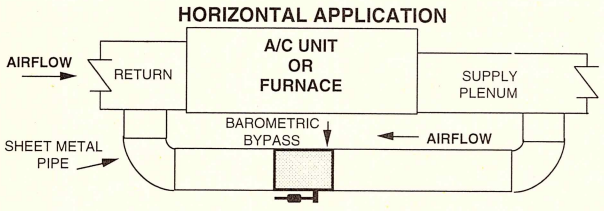
BAROMETRIC BYPASS STARTUP TEST

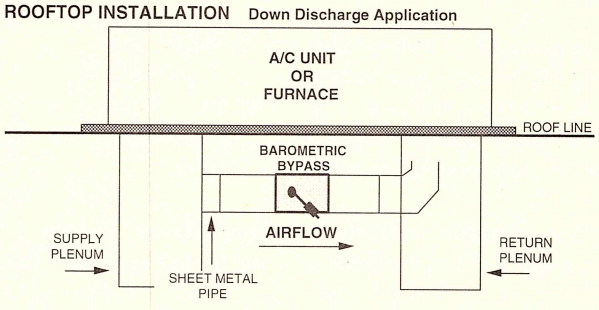
a) Have at least half of the zones call for either heating or cooling.

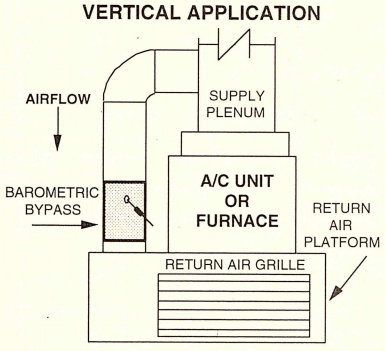
b) Check to be sure the calling zone dampers are open, (air is flowing).

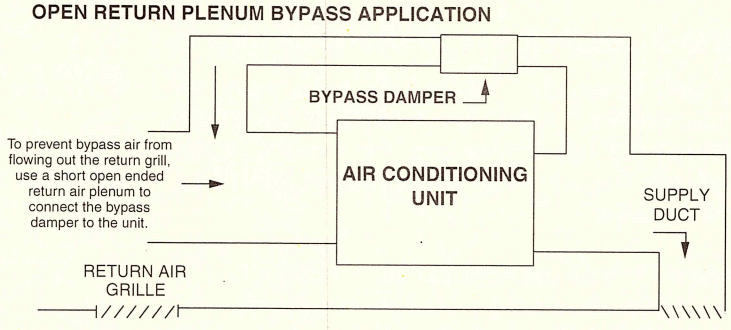
c) Verify the bypass damper is open. Note, the damper may not fully open.

d) If the open zones are not noisy, the bypass damper is set.







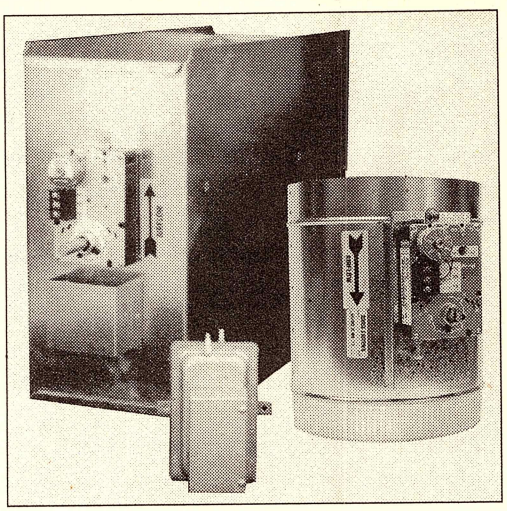


BYPASS DAMPERS – ELECTRONIC

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

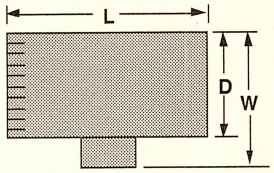
Diameter	CFM
6"	320
8"	560
10"	900
12"	1250
14"	1700
16"	2200

Example: We know the smallest zone air volume is 400 CFM and we have a four ton system. Thus the air volume we need to bypass is (400 * 4) – 400 which equals 1200 CFM. Using the ROUND BYPASS SELECTION TABLE, we would select a 12 inch bypass since it can handle up to 1250 CFM of air.

Never exceed 16 inches for the round bypass damper. If you need to bypass more than 2200 CFM, either use a rectangular bypass or slave multiple round bypass dampers.

ROUND DIMENSIONAL DATA

PART #	SIZE	D	L	W
STMPD06	6	6"	10"	9"
STMPD08	8	8"	10"	11"
STMPD10	10	10"	12"	13"
STMPD12	12	12"	14"	15"
STMPD14	14	14"	16"	17"
STMPD16	16	16"	18"	19"

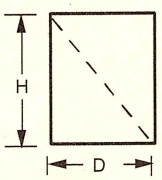


RECTANGULAR BYPASS DAMPER SELECTION

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.

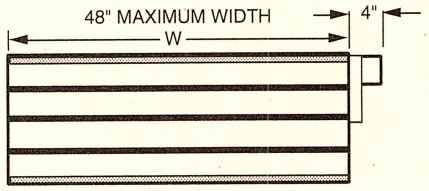
Example: We know the smallest zone air volume is 250 CFM and we have a 7-1/2 ton system. Thus the air volume we need to bypass is (400 X 7.5) -250) which equals 2750 CFM. Using the RECTANGULAR BYPASS SELECTION TABLE, we see the smallest damper we can use is a 12" x 22" or a 22" x 12".

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

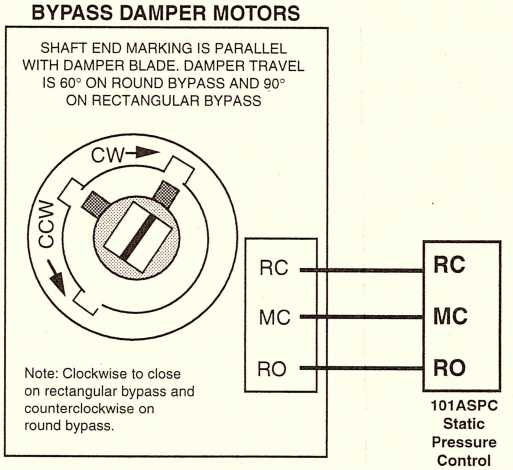
RECTANGULAR BYPASS SELECTION TABLE

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 INDICATOR

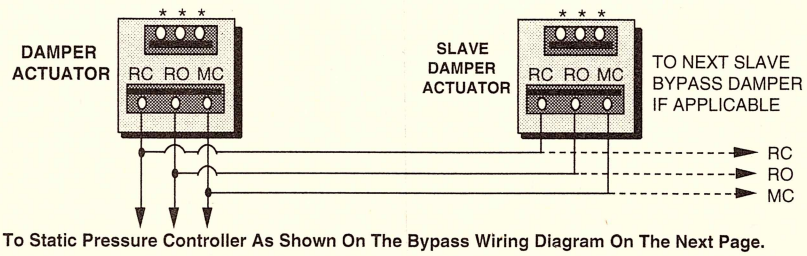
ROUND AND RECTANGULAR BYPASS DAMPER MOTORS



101ASPC Static Pressure Control
See Page 22

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.



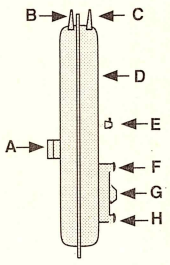
To Static Pressure Controller As Shown On The Bypass Wiring Diagram On The Next Page.

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.

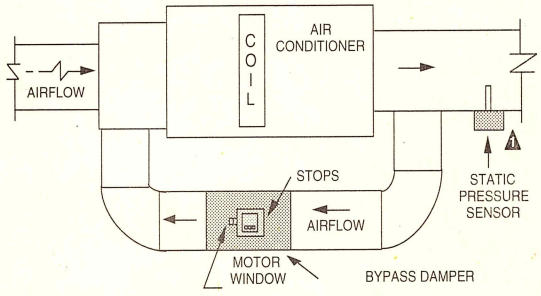
STATIC PRESSURE CONTROLLER DESCRIPTION

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.



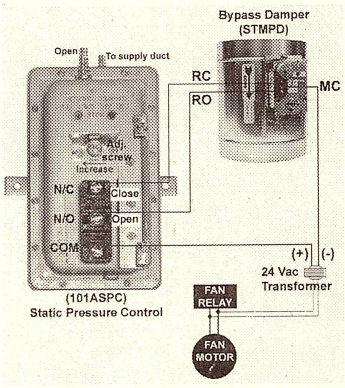
1 Insert the tube into the side of the duct, approximately 3". Make sure the tube is perpendicular to the air flow.

STATIC PRESSURE CONTROLLER SETUP

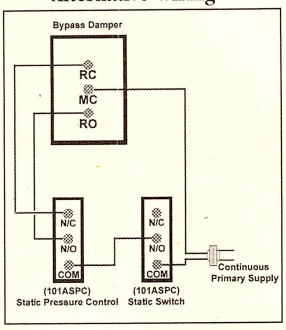
Note: 24V ac may be read on both terminals (RO & RC to MC) due to voltage bleeding thru the motor windings. Disconnect the RO or RC wire to determine which wire is energizing the motor.

a) Ensure all dampers are open and blower is running on high speed. *The DigiTract* controller should have the green blower LED **on** and all of the red damper LEDs **off**.

Zon :x Systems 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. An alternative wiring diagram is provided using an additional static pressure sensor to deenergize the bypass damper.



Alternative Wiring



b) Verify bypass damper is **Closed**. Bypass dampers using a square motor have a grey release lever on the bottom/side of the damper (near motor) to manually open or close the damper.
c) At 101ASPC Static Pressure Controller, remove the **NO** wire from the micro switch. Connect A/C voltmeter (or test light) to **COM** and **NC** terminals of static pressure controller. **Zero V ac** (no light) should be present, ensuring a connection is made between **COM** and **NC**. If 24V ac is present (light on), turn adjustment screw on 101ASPC Static Pressure Controller clockwise (**CW**) until connection is made and 0V ac (no light) is obtained. Do Not Overtighten Adjusting Screw.
d) Verify bypass damper is **Closed**. Slowly back out adjusting screw (**CCW**) until 24V ac (light on) is present ensuring no connection between **COM** and **NC**. STOP. Slowly turn adjusting screw in (**CW**) until 0V ac (no light) is present. STOP. Bypass damper should be on verge of opening but still closed with all zone dampers open and the blower fan on high speed.
e) If the bypass damper sizing and duct design are correct, this completes the bypass damper setup. Connect all wires and proceed to Bypass Checkout.

BYPASS CHECKOUT FOR STATIC PRESSURE CONTROLLER

a) Make a cool call at the zone thermostat of the smallest (damper size) zone.
b) Verify all zone dampers are closed except for calling zone.
c) Verify noise at zone register is not excessive. Adjust static pressure controller CCW to lower noise (airflow) or CW to increase airflow until too noisy.

DAMPER TRANSFORMER

The 24V transformer connected to TR1 and TR2 of the Digitract 4-2 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 DTGE4-2

1. If no heating system, go to step 12.
2. At System Controller:
   a. Disconnect LAS sensor at + - terminals and place jumper wire between + - terminals.
   b. Turn power switch ON.
3. Turn off all thermostats except zone 1.
4. At zone 1 thermostat:
   a. Set power switch on.
   b. Set to Heat mode.
   c. Set Fan switch to Auto mode.
   d. Set heat setpoint several degrees above room temperature.
5. At System Controller:
   a. Verify W and PWR lights are on. If not, cycle System Controller power switch OFF and then ON and recheck.
   b. If jumper JU1 is on B, verify G light is on.
   c. 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:
   a. Verify air is not coming out of register/diffuser.
   b. At thermostat:
      b-1 Set power switch on.
      b-2 Set to Heat mode.
      b-3 Set Fan switch to Auto mode.
      b-4 Set heat setpoint several degrees above room temperature.
   c. 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:
    a. Set power switch on.
    b. Set to Cool mode.
    c. Set Fan switch to Auto mode.
    d. Set cool setpoint several degrees below room temperature.

STARTUP TEST, GAS/ELECTRIC DTGE4 (Continued)

15. At System Controller:
    a. Verify Y, G and PWR lights are on. If not cycle System Controller power switch OFF and then ON and recheck.
    b. 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:
    a. Verify air is not coming out of the register/diffuser.
    b. At thermostat:
    b-1 Set power switch on.
    b-2 Set to Cool mode.
    b-3 Set Fan switch to Auto mode.
    b-4 Set cool setpoint several degrees below room temperature.
    c. 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 & DTHP4-2

1. At System Controller:
    a. Disconnect LAS sensor at + - terminals and place jumper wire between + - terminals.
    b. Turn power switch ON.
2. Turn off all thermostats except zone 1.
3. At zone 1 thermostat:
    a. Set power switch on.
    b. Set to Heat mode.
    c. Set Fan switch to Auto mode.
    d. Set heat setpoint several degrees above room temperature.
4. At System Controller:
    a. Verify Y, G and PWR lights are on. If not, cycle System Controller power switch OFF and then ON and recheck.
    b. If jumper O/B is on B, verify O/B light is on. Otherwise, verify O/B light is off.
    c. 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:
    a. Verify air is not coming out of register/diffuser.
    b. At thermostat:
        b-1 Set power switch on.
        b-2 Set to Heat mode.
        b-3 Set Fan switch to Auto mode.
        b-4 Set heat setpoint several degrees above room temperature.
    c. 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 LED is on at System Controller and the auxiliary heat is on, if LAT is below 88°F.
11. Disconnect jumper wire between the + - terminals of the System Controller.
12. Turn off all thermostats except zone 1.
13. At zone 1 thermostat:
    a. Set power switch on.
    b. Set to Cool mode.
    c. Set Fan switch to Auto mode.
    d. Set cool setpoint several degrees below room temperature.
14. At System Controller:
    a. Verify Y, G and PWR lights are on. If not cycle System Controller power switch OFF and then ON and recheck.
    b. If jumper O/B is on O, verify O/B light is on. Otherwise, verify O/B light is off.
    c. 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:
    a. Verify air is not coming out of register/diffuser.
    b. At thermostat:
        b-1 Set power switch on.
        b-2 Set to Cool mode.
        b-3 Set Fan switch to Auto mode.
        b-4 Set cool setpoint several degrees below room temperature.
    c. 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 4-2 TROUBLESHOOTING / SERVICE CHECKS

Malfunction	Probable Cause	Corrective Action
All thermostats will not call	Loss of 24V ac on R and C	Repair power source
Will not initiate cooling cycle	Controller in heat mode	15 minute delay prior to changeover
	Controller in changeover from heat mode	3 minute purge cycle must complete
	LAS polarity incorrect	Red lead to + terminal, white to – terminal
Cooling calls short cycle	LAS shorted (0V dc on + and – w/ LAS installed)	Replace LAS
	LAS wiring shorted (0V dc on + and – w/ LAS installed)	Repair LAS wiring
	Controller failure (0V dc on + and – w/ LAS removed)	Replace controller
	Thermostat has cooling anticipator (compensator)	Remove anticipator
	Air flow too low over evaporator	Isolate and correct air flow problem
	Bypass damper opening prematurely	Adjust bypass damper closed w/ all zone dampers open
	LAS out of calibration	Recalibrate LAS
Will not initiate heat calls	Controller in cool mode	15 minute delay prior to changeover
	Controller in changeover from cool mode	3 minute purge cycle must terminate
	LAS polarity incorrect	Red lead to + terminal, white to – terminal
	LAS electrical interference (Applicable to spark ignition)	Install shielded cable to LAS, terminate shield on C terminal ONLY
Heating calls short cycle	LAS open (5V dc on + and – w/ LAS installed)	Replace LAS
	LAS wiring open (5V dc on + and – w/ LAS installed)	Repair LAS wiring
	Heating anticipator incorrectly set	Set anticipator to lowest setting
	Bypass damper opening prematurely	Adjust bypass damper closed w/ all zone dampers open
	LAS out of calibration	Recalibrate LAS
Zone dampers will not close	Loss of 24V ac on TR1 And TR2	Repair power source
	Transformer VA too low	Replace w/ correct transformer
	Dampers incorrectly wired	Correct damper wiring
	No output on damper terminal(s)	Cycle power to controller. Verify thermostat inputs are correct. If problem persists, replace controller
Zone damper remains closed	Zone not calling while mode is active	Initiate thermostat call
	Triac shorted (Continuous 24V ac @ damper terminals)	Replace controller
W2 will not energize (DTHP4-2 only)	Discharge air temperature above 88° F.	Normal operation
	Relay contact failure (W2 LED on)	Replace controller
	Bypass damper opening prematurely Controller in cool mode	Adjust bypass damper closed w/ all zone dampers open Verify jumper JU1 position
Blower runs continually	Fan operation selected on any thermostat	Verify fan switch on all thermostats
	Fan relay contacts in controller seized	Replace controller, check 24 V AC

DIGITRACT 4-2 LAS VOLTAGE – TEMPERATURE CONVERSION CHART

Using a digital volt-ohm meter, place the red lead on the + terminal and the black lead on the - terminal of the equipment terminal strip. Set the voltmeter to the 20VDC scale, and convert the measured voltage to its corresponding temperature.

°F.	DC Volts	°F.	DC Volts	°F.	DC Volts	°F.	DC Volts
40	2.775	56	2.864	72	2.953	88	3.042
41	2.781	57	2.870	73	2.959	89	3.048
42	2.787	58	2.875	74	2.964	90	3.053
43	2.792	59	2.881	75	2.970	91	3.059
44	2.798	60	2.887	76	2.975	92	3.064
45	2.803	61	2.892	77	2.981	93	3.070
46	2.809	62	2.898	78	2.987	94	3.075
47	2.814	63	2.903	79	2.992	95	3.081
48	2.820	64	2.909	80	2.998	96	3.087
49	2.825	65	2.914	81	3.003	97	3.092
50	2.831	66	2.920	82	3.009	98	3.098
51	2.837	67	2.925	83	3.014	99	3.103
52	2.842	68	2.931	84	3.020	100	3.109
53	2.848	69	2.937	85	3.025	101	3.114
54	2.853	70	2.942	86	3.031	102	3.120
55	2.859	71	2.948	87	3.037	103	3.125

°F.	DC Volts	°F.	DC Volts	°F.	DC Volts	°F.	DC Volts
104	3.131	119	3.214	134	3.298	149	3.387
105	3.137	120	3.220	135	3.303	150	3.392
106	3.142	121	3.225	136	3.309	151	3.398
107	3.148	122	3.231	137	3.314	152	3.403
108	3.153	123	3.237	138	3.320	153	3.409
109	3.159	124	3.424	139	3.325	154	3.409
110	3.164	125	3.248	140	3.331	155	3.414
111	3.170	126	3.253	141	3.337	156	3.420
112	3.175	127	3.259	142	3.342	157	3.425
113	3.181	128	3.264	143	3.348	158	3.431
114	3.187	129	3.270	144	3.353	159	3.437
115	3.192	130	3.275	145	3.359	160	3.442
116	3.198	131	3.281	146	3.364		
117	3.203	132	3.287	147	3.375		
118	3.209	133	3.292	148	3.381		

DigiTract 4-2

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