

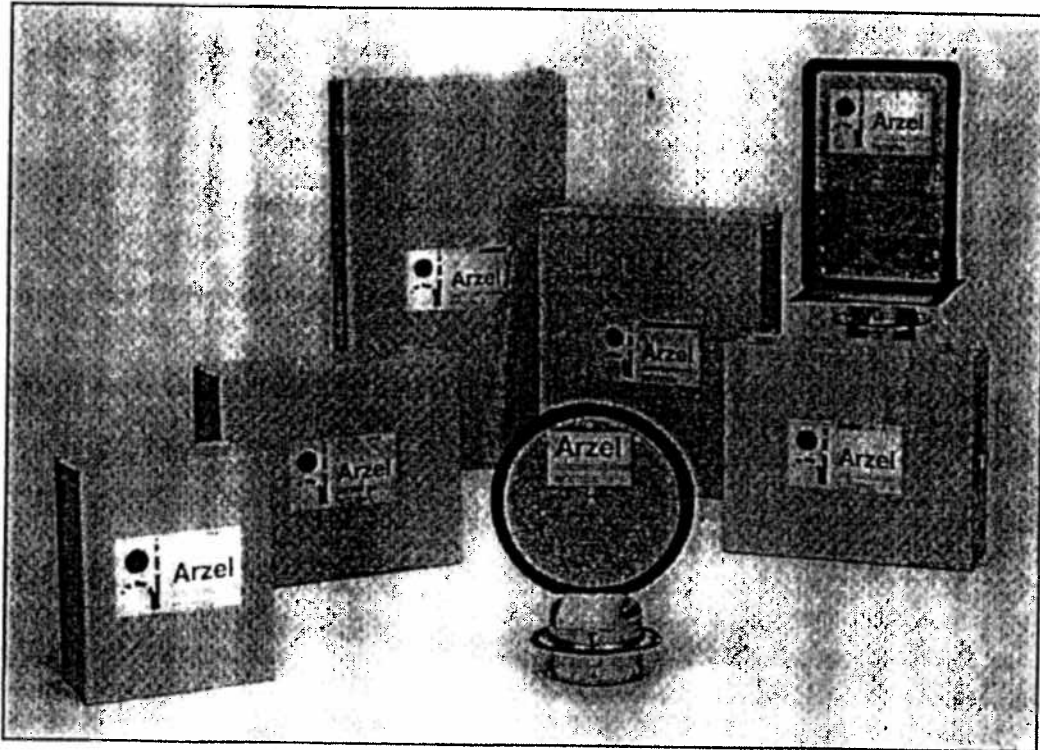
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Installation Instructions

ARZEL™ ZONING SYSTEM

Models 402, 403 & 404 T



*For
Comfort,
Reliability,
Ease of Installation.*

LAT Dip Switch
4 High
4 Low
PAGE 8

Installation Instructions

Arzel 400 Series Zoning System

402 - 2 Zone Unit, 403 - 3 Zone Unit, 404 - 4 Zone Unit

FEATURES

1. All zones have full function heating, cooling and fan capability from all thermostats.
 2. All systems have heat pump capability.
 3. Emergency Heat Back-up change over switch, (manual or remote) on PC board, for heat pump operation only.
 4. Single stage heating, cooling, & fan operation is available from all zones.
 5. Use any standard 4 or 5 wire thermostat, Programmable/Non-programmable, Auto Change-over. Heat pump thermostats are required on all zones for heat pump operation.
 6. Compressor time delay "OFF" (delay on break). When the compressor is turned off, it cannot restart for 4 to 5 minutes. This feature allows the refrigerant pressure to balance before restarting.
 7. Bypass damper terminals for optional pressure switch operated Bypass damper.
 8. Built in heating and cooling leaving air temperature sensors, (LAT). Two LAT Sensors with 15 ft cable are included.
 9. Diagnostic capability for easy temperature read-out of "LAT" temperatures in the supply ducts.
 10. On board heating cooling temperature selection with easy to set Dip-switches for leaving air temperature control (LAT). Range is 35° to 55° for cooling and 110° to 175° for heating.
 11. Slave zone(s) can be added for additional control. A slave zone thermostat controls dampers only. Does not control the HVAC equipment.
 12. Dampers remain open in the last zone that called for heating or cooling, to take advantage of additional energy savings from blower over-run features that exist on all heating equipment and some cooling equipment.
 13. Built-in heating/cooling and fan priority system
 14. Round and rectangular blade damper system
 15. Damper position indicator for round and rectangular dampers
 16. "FAN ON HEAT" switch, to start fan if immediate fan operation is desired on a call for heating.
 17. A 40 VA 24 VAC transformer is provided to power all Arzel equipment & all dampers.
- Note: The Arzel zoning system uses a self contained, very low pressure air operation, which provides noiseless, long life and economical service.

SELF DIAGNOSTIC & LED INDICATORS:

- LED light for power ON indication
- LED lights to indicate output signal on Heating, Cooling, Fan and O/B Signal for reversing valve (W, Y, G, O/B)
- LED lights to indicate when a zone solenoid valve is energized (Calling for service, zones 1, 2, 3, 4)
- LED light to indicate vacuum and pressure mini pump operation (Pump, Red)
- LED light to indicate Automatic Bypass Damper Operation (Bypass Solenoid, Red)
- LED light to indicate that Emergency Heat Back-up mode is being used (Emer. Heat, Red)
- Flashing LED light to indicate 4 to 5 minute "lockout" of Compressor (Comp. Lockout, Yellow)
- Flashing LED light to indicate LAT interruption of the Cooling Mode (LAT Low, Yellow)
- Flashing LED light to indicate LAT interruption of the Heating Mode (LAT High, Red)
- Low Voltage "DC Test" to verify Sensor Temperature Settings (see Temperature Chart)

GENERAL OPERATION INFORMATION

The logic board is designed for heating to have priority over cooling and cooling to have priority over fan operation. Any zone calling for heating will be served immediately. Any zone calling for cooling will be served immediately if no other zone wants heating. Any zone can have constant fan if no other zone wants either heating or cooling.

A call from any zone thermostat will turn on the HVAC equipment, energize the solenoid air valve and open the dampers for its zone. Both pumps, vacuum and pressure, are energized at the same time to position the dampers either open or closed as required. The vacuum pump opens the dampers and the pressure pump closes the dampers.

When the thermostat is satisfied, the air pumps, the HVAC equipment and the solenoid air valve are turned off. Dampers will remain in whatever position they were in when the last thermostat call was finished. Leaving the dampers open in the last zone served allows the HVAC system to utilize the residual energy in the system in both the heating and cooling cycles.



CONTROL PANEL DANGER!

WHEN INSTALLING THIS PRODUCT...

1. Read these instructions carefully. Failure to follow them could damage the zoning system or cause a hazardous condition.
2. Disconnect power supply to the HVAC system and the ARZEL system before making any wiring connections to prevent danger, electrical shock and equipment damage. (See Wiring Note #1)
3. The Arzel System is designed for indoor use only.
4. You must touch a grounded metal object before handling the Arzel Control Panel to avoid potential loss of internal programs, due to electro-static discharge.
5. Install in ambient temperature between 32°F and 120°F, in a non-condensing area.
6. Be sure that the manufacturers operating specification for the HVAC equipment are compatible for zoning equipment.
7. Check out all system operations after installation is complete.
8. All wiring must comply with all applicable electrical codes, ordinances and regulations.
9. Use properly grounded tools, safety glasses and gloves, when drilling or cutting sheet metal ducts, fiberglass or any hard objects.
10. Leave these instructions with installed system for future use.
11. Terminals may be AC or DC as required. Do not intermingle wires.

24 VOLT POWER SUPPLY

The Arzel 24 volt AC transformer (provided with the system) powers all zone thermostats plus the Arzel control panel. (See wiring Note #2).

The HVAC system transformer provides power for the heating and air-conditioning equipment only. Be sure to bring the Hot "R" side of the HVAC system transformer to the "R" output terminal on the Arzel PC board. (See Wiring Note #3, for 402/403 systems and #4 for 404 system).

LOCATING & MOUNTING THE CONTROL PANEL

Locate the control panel on a wall area near the HVAC air handling equipment (furnace - fan coil, etc.) 5 ft. above the floor. Do not mount on duct work or HVAC equipment. The control panel must be mounted vertically on an exterior wall to reduce noise. The wall must also be located in a non-condensing area where temperatures will not normally exceed 140o F.

IDENTIFYING THE ZONES

To avoid zone mix-ups, mark all supply ducts clearly with room designation and proper zone number.

THERMOSTATS

"Heat/Cool and Fan-Auto-On" sub-base switching is available from any zone thermostat. Use any standard 4 or 5 wire thermostat: Programmable/Non programmable/Auto change-over. Panel provides terminals for "O/B" signal. A "C" terminal (common) is available for all zones. Heat pump thermostats are required on all zones for heat pump operation.

LOCATING THERMOSTATS

Locate the thermostats for each zone in a central area within the zone on an inside wall, 5-ft. from an outside wall and 5-ft. from the floor. Avoid areas near register outlets, lights and other equipment that could cause a false reading.

THERMOSTATS, APPLIANCES & ACCESSORY WIRING

Wires coming from the zone thermostats must be connected to input terminals in the Arzel panel for their respective zones. (See Wiring Notes #10 for 402/403 and #17 for 404 system).

"Outputs" terminals are connected to the HVAC Equipment. (See Wiring Notes #3, 4, 5, 6 & 7 for 402/403 and # 4,5,6,7 & 8 for 404 system).

Accessory wires are connected as noted. (See Wiring Notes #9,11,12,13,14 & 15 for 402/403 systems and #10,11,12,13 & 14 for 404 system).

EMERGENCY HEAT-FOSSIL FUEL & HEAT PUMP-APPLICATION

An Emergency heat switch (change-over switch) is provided on all Arzel 400 System boards. When switch is turned on, it will convert all "Y" signals to "W" signals, thus bypassing heat pump operation. Terminals for switching Emergency Heat change-over by outdoor stat is also provided. See wiring Notes #8 & 9 for 402/403 systems and #18 & 19 for 404 system.

HEATING, COOLING & FAN PRIORITIZATION

Heating has priority over cooling and fan operation. A thermostat call in any zone will open its zone dampers and provide heating, cooling or fan service. The dampers in the last zone served stay open. Be sure to set heating anticipator to the shortest or lowest setting (if adjustable). Heating operation is indicated by LED light (W).

Cooling has priority over fan operation. If there are no heating calls, a cooling call from a thermostat will start the cooling cycle and will open its zone dampers. The dampers in the last zone served stay open. Compressor operation is indicated by LED light (Y).

Unless other zones call for heating or cooling, any thermostat(s) in the Fan "ON" position will start the fan and open its zone dampers for air circulation. All other zone dampers will be closed automatically. Fan operation is indicated by LED light (G).

ANTI RECYCLE - COMPRESSOR TIME DELAY "OFF"

All Arzel circuit boards have a 4-5 minute **Time Delay on Break** compressor lockout timer on the compressor circuit. When the compressor is turned off, it will stay locked out for 4 to 5 minutes. This allows the refrigerant pressures to equalize. Time delay operation is indicated by flashing LED light (Comp. Lockout).

Note: A momentary contact, Time Delay Override (TDO) switch is provided on the P.C. board to speed the checkout of the HVAC system. Before using the TDO switch, you must disconnect the HVAC "R" wire, in order to avoid short cycling the compressor & equipment.

FAN-ON-HEAT OPERATION

The Fan ON-HEAT switch can be used if immediate fan operation is desired on a call for heating, such as in electric furnace, hot water coils, steam coils, etc. (See **Wiring Notes #19 for 402/403 and #16 for 404 system**). Fan operation is indicated by LED light (G).

DEPARTMENT OF ENERGY, ENERGY SAVINGS REQUIREMENT

The dampers in the last zone serviced will remain open to receive all residual heating or cooling service. The fan will continue to run after a heating call (also after a cooling call on some cooling equipment) to deliver this residual energy.

AIR PUMP OPERATION

- Both pumps will start and position the dampers when service is required for heating, cooling or fan operation.
- Both pumps will stop when the cycle is completed. Pumps will restart for any call for heating, cooling or fan call from any thermostat. Pump operation is indicated by LED light (Pump).

SLAVE ZONES-NON-PRIMARY/SUB ZONE (SLAVE THERMOSTATS)

Slave zones may be added to any Arzel unit. The slave thermostat will only open and close the zone dampers. The slave thermostat does not control the HVAC equipment. When it needs service, the slave zone will open its dampers and wait for conditioned air from any zone that calls for service. When the slave zone is satisfied, it will close its dampers. A thermostat is needed for each slave zone addition. A slave zone operation is indicated by LED light on its PC board.

SLAVE ZONE WIRING AND TUBE CONNECTIONS

- Connect R W Y thermostat terminals to R W Y terminals on the slave zone PC Board.
- A slave zone thermostat must have heating-cooling sub-base switch if both heating and cooling services are used.
- A slave zone functions only when another zone is operating.

INSTALLING ROUND DAMPERS - TYPE R

The "R" damper is designed to be inserted from the bottom, top or side of round ducts without cutting off or removing sections of the duct. An adhesive template is provided with each damper. Remove backing paper and place template on duct, observing direction of air flow arrow on the template. Cut out required triangle. Insert damper blade with blade facing the long side of triangle. Rotate damper so that the flat side of the blade (not the side with the connecting rods) is positioned to face air flow. Fasten with four sheet metal screws.

INSTALLING SQUARE & RECTANGULAR DAMPERS - TYPE S

The "S" damper is designed to be inserted in existing or new rectangular duct from the side, bottom or the top of the duct. Cut a slot 5" wide by any required length. The slot should be cut to 3/4 inch from each corner. This will avoid having to cut into the "Pittsburgh Lock" in the duct and leave sheet metal for the mounting plate screws. Place the damper in the duct. Position flat side of blade (not the side with the connecting rods) to face air flow. Fasten with sheet metal screws.

DAMPER POSITION INDICATOR

Observe the movements of the damper position indicator:

1. The damper indicator pointing down means the damper is closed.
2. The damper indicator pointing up means the damper is open.

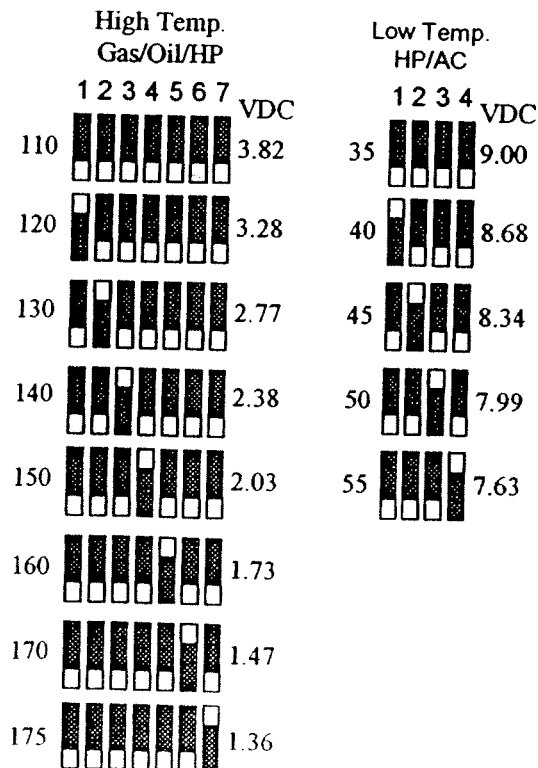
CONNECTING AIR TUBES TO DAMPERS

Each zone has one air line bulkhead fitting on the top of the Arzel panel. All additional dampers in each zone must be connected with a "T" fitting to its zone air line. The air line provides vacuum and pressure, as needed, to open and close the dampers. For example: Zone #1 air line must be connected to all the dampers in Zone #1. A cap or plug must be placed on any unused zone fittings or tubes.

LAT OVERHEATING - OVERCOOLING CONTROLS

(See wiring Notes # 13, 14, & 15 for 402/403 systems and #12, 13 & 14 for 404 systems).

Dip Switch Settings:



Both sensors

*Approx 9,500 ohms @ 70°
~ 9,800 ~ @ 75°*

LAT Temperature Setting & D.C. Voltage Reading Chart See Notes #13, 14 and 15

To Compare existing Duct Temperature With Voltage Reading:

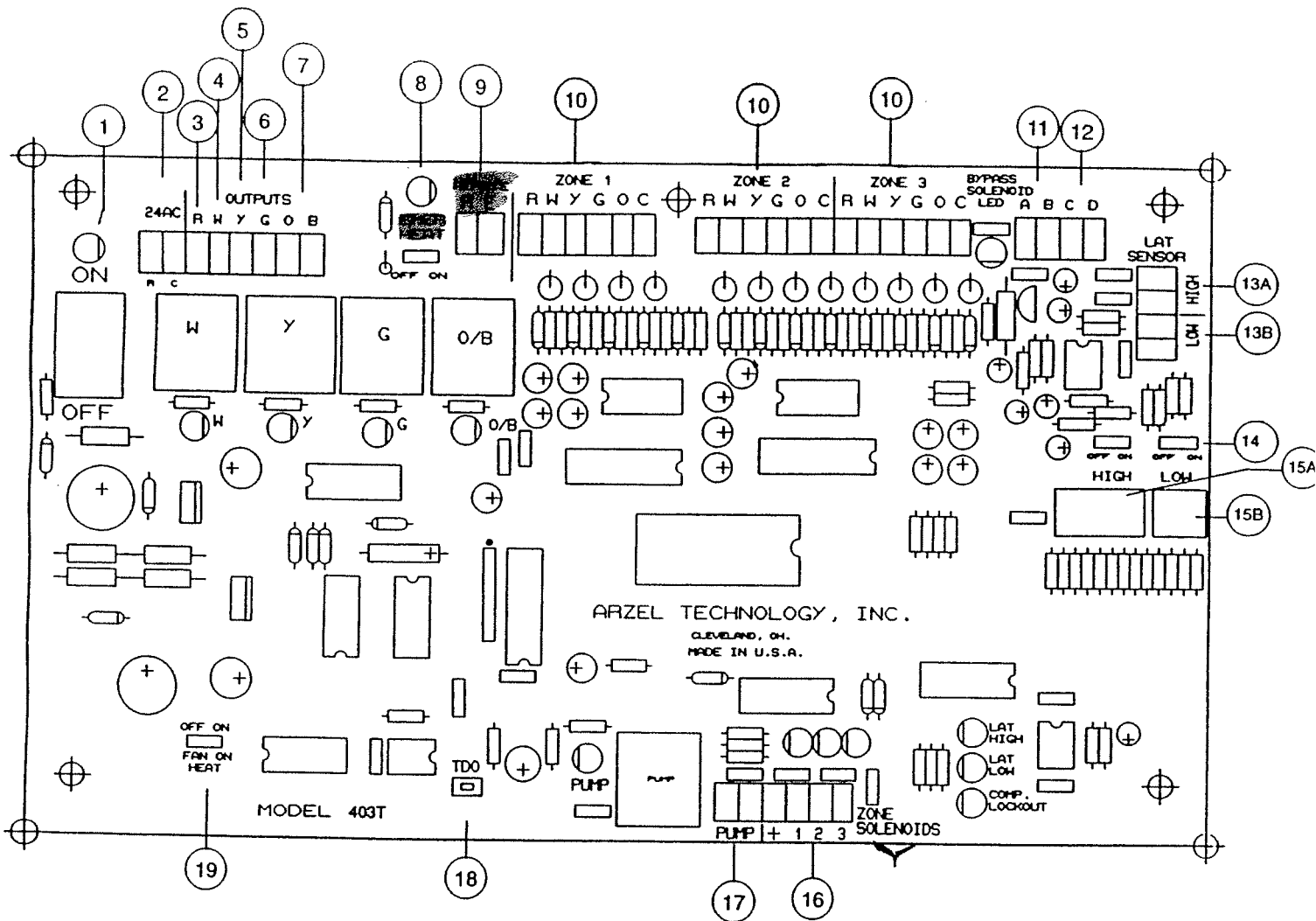
Proceed as follows:

1. Insert test thermometer into duct as near to LAT sensor as possible.
2. Measure DC Voltage across two respective LAT terminals, 13A & or 14A.
3. Voltage reading (chart on left) should indicate the same temperature as test thermometer, plus or minus 3 degrees.
4. Voltage readings for LAT temperatures between dip Switch Settings are as follows:

Degree F°	Voltage DC
65	6.81
70	6.52
75	6.15
80	5.78
85	5.49
90	5.08
95	4.74

WIRING LAYOUT & NOTES

402 & 403 Systems



- | | |
|---|---|
| <ol style="list-style-type: none"> 1. On/Off Switch
W/LED 2. 24 VAC Terminals 3. R Terminal 4. W Terminal 5. Y Terminal 6. G Terminal 7. O and B Terminals | <p>The Arzel System is powered by a 40 VA 24-VAC transformer (provided). This switch and the HVAC power switch must always be in the "Off" position when connecting wires to any terminals. (See control panel DANGER-SECTION). Control panel has a 20 second warm up period, when PC board is turned on.</p> <p>The Arzel 40 VA transformer (provided) must be connected to these two terminals.</p> <p>Connect Hot or + side of HVAC equipment transformer (24 VAC) to this terminal.</p> <p>Connect to gas valve or heat relay. (Back-up-heat terminal if Heat-Pump is installed).</p> <p>Connect to compressor contactor or relay</p> <p>Connect to equipment fan relay.</p> <p>(For heat pump installation only) Connect either "O" or "B" to heat pump reversing valve, as required by heat pump manufacturer</p> |
|---|---|

1. On/Off Switch W/LED
The Arzel System is powered by a 40 VA 24-VAC transformer (provided). This switch and the HVAC power switch must always be in the "Off" position when connecting wires to any terminals. (See control panel DANGER-SECTION). Control panel has a 20 second warm up period, when PC board is turned on.
2. 24 VAC Terminals
The Arzel 40 VA transformer (provided) must be connected to these two terminals.
3. Pump terminals
Factory connection for the miniature pressure and vacuum pumps. The pumps operate only when a thermostat calls for a Heat/Cool or Fan operation.
4. R Terminal
Connect Hot or + side of HVAC equipment transformer (24 VAC) to this terminal.
5. G Terminal
Connect to equipment fan relay.
6. Y Terminal
Connect to compressor contactor or relay.
7. W Terminal
Connect to gas valve or heat relay. (Back-up-heat terminal if Heat-Pump is installed).
8. O and B Terminals
(For heat pump installation only) Connect either "O" or "B" to heat pump reversing valve, as required by heat pump manufacturer.
9. Solenoid Terminals
Factory connection for zone solenoids.
10. Terminals A & B Bypass Damper Control
Terminals for pressure switch operated Bypass damper. Use the NORMALLY OPEN (NO) and the COMMON (C) terminals on the pressure switch. Pressure switch must be mounted in a vertical position. Pressure switch is included if factory-installed Bypass option is ordered.
11. Terminals C & D
Factory installed Bypass damper solenoid. This solenoid is included if Bypass option is ordered.
12. LAT Sensors (2)
Drill a 1/4" hole in duct for each sensor. Carefully push the solid state sensor through the hole, snap the locking bushing into place. Connect the two wires from each sensor to these terminals. Run LAT wires separate from other wires. **Caution, use Arzel sensor only.** Sensors come with-15 ft. leads. Thermostat wire may be added to extend sensor lead wires up to 30 ft. Sensors should be placed downstream and as close to the AC coil and heat exchanger as possible. On Heat Pump installations, be sure that the LAT sensor is located between the refrigeration coil and the Backup electric heat coils. Sensors are interchangeable.
12 A. High
12 B. Low
13. LAT ON/OFF Switches
When using the LAT sensor the LAT switch must be in ON position. If LAT sensor is not used for either heating or cooling, the sensor switch must be in the OFF position, and the LAT leads must NOT be connected to the sensor terminals.
13 A. High
13 B. Low
14. LAT Temperature settings
See example & chart. Select your desired high and low temperature "DIP SWITCH" setting.

During the normal operation of zoning equipment the amount of air passing through the air conditioning coil or over the heat exchanger may be reduced to a point that undesirable air temperatures may develop in the duct system (too cold or too hot). Leaving Air Temperature (LAT) controls are used to cycle the AC compressor or the heating equipment to correct these temperature levels.

For Example: A low temp setting of 50° will break the Y circuit at 50°. The compressor will restart after 4 to 5 minutes delay. A high temperature setting of 150° degrees for gas/oil furnace will break the (W) circuit at 150°. The high temperature setting has a built-in non-adjustable 15° differential. In this example, the gas valve or heating relay will re-energize at 135°. (150° - 15° = 135°).

LAT Test
To verify LAT Sensor temperature readings, measure DC Voltage across respective LAT terminals. (See dip switch & LAT temperature setting conversion table).
15. Time Delay Override. T.D.O.
Note: This momentary contact, time delay override switch is provided on the P.C. board to speed the checkout of the compressor system. Before using this T.D.O. switch, you must disconnect the HVAC "R" wire, in order to avoid short cycling the equipment.
16. Fan-On-Heat Switch
This switch in "ON" position will start the fan if immediate fan operation is desired on a call for heating, such as electric furnace, hot water coils, steam coils, etc.

- | | |
|----------------------------------|---|
| 17. Thermostat Terminals | Connect thermostats to these terminals. A common "C" terminal is available, if needed. The "O" terminal of all heat pump thermostats must be used for heat pump operation. |
| 18. Emergency Heat Remote Switch | Emergency or, Back-up-Heat Change-over terminals, for remote switching by outdoor thermostat. This switch will allow change from Heat Pump operation to back-up heat or fossil fuel. If a heat pump is installed with a fossil fuel furnace, (without fossil fuel kit) do not connect the (W) wires from thermostats. |
| 19. Emergency Heat Manual Switch | Emergency Heat Change-over switch, to be used for bypassing heat pump and energizing the auxiliary heat on the call of the first bulb (heat pump application only, manual switching). |

FAN CHECK-OUT

1. Set all thermostats to the OFF position and all fan switches to AUTO before starting the fan system check out.
2. Turn the HVAC system and the ARZEL system power switch ON. The LED light above the switch will come on.
3. Turn Zone 1 thermostat fan switch ON. The Zone 1 Solenoid, the Fan and Pump output LED lights will come on. The fan in the HVAC system will turn on. The pressure and vacuum pumps will position all the dampers. Check all register outlets to determine that only Zone 1 dampers are open and all other dampers are closed.
4. Follow the above procedure for all other zones.

HEATING & COOLING CHECK-OUT

1. Set all thermostats to the OFF position and all fan switches to AUTO before starting heating system check out.
2. Set Zone 1 thermostat to the HEAT position. Turn thermostat up so that the thermostat is calling for heat. The Zone 1 Solenoid, the W output and the Pump LED lights will come on. The pressure and vacuum pumps will position all the dampers. Check to see that the heating valve or relay is energized. Check operation of Emergency Back-up heating, if heat pump is installed. Turn the thermostat down until the thermostat is satisfied. The LED lights will go out and the pumps will stop. Dampers will remain open in the last zone that called.
3. Set thermostat for Zone 1 to the COOL position. Turn thermostat down so that the thermostat is calling for cooling. The Zone 1 Solenoid, the Y and G and the pump output LED lights will come on. The pressure and vacuum pumps will position all the dampers. Check to see that the compressor relay or contactor is energized. Rapid cycle each zone to see that 4 to 5 minute lockout takes place.
4. Place Zone 1 thermostat in the OFF position.
5. Follow the above procedure for all other zones.

BYPASS DAMPER INSTALLATION, SIZES, ADJUSTMENT & CHECK-OUT

Barometric or pressure switch operated Bypass damper systems are installed to relieve excess air pressure that is sometimes caused by zoning. Excess air pressure may create high air velocity and air noise.

1. If a barometric Bypass damper is used instead of a pressure switch operated damper, set counter weight and adjust to suit the installation.
2. If a pressure switch operated Bypass damper system is used, connect the pressure switch to terminals A and B on PC board. Use NORMALLY OPEN and COMMON terminals on the pressure switch. Pressure switch must be mounted in a vertical position (See PC board wiring Note #11)
3. The Bypass solenoid is connected to terminals C & D (See Note terminals C & D, Factory Connection).
4. Minimum pressure required to activate the Bypass damper is 0.05 in. WC.
5. Adjust Bypass pressure switch setting to open Bypass damper to eliminate air noise. This is usually found when only the smallest zone is calling. A call for cooling or fan must exist to operate the furnace on high speed to set or adjust the pressure switch during this check out.

Recommended sizes for pressure switch operated Bypass Air - In Round Sizes:

2-Tons	6" Bypass
3-Tons	7" Bypass
4-Tons	8" Bypass
5-Tons	9" Bypass
6-Tons	10" Bypass
7 1/2-Tons	12" Bypass
12 Tons	14" Bypass

Note: A bypass duct is a duct installed directly between the supply air trunkline or plenum and the return air trunkline or plenum. The bypass supply air takeoff must be installed before any trunkline dampers. We recommend the bypass be installed as far away from the air handler as possible for optimum performance.

LED DIAGNOSTIC DISPLAY

LED Code	Function Indication	Problem	Check-Adjust-Correct
ON (PWR. SW.)	24 VAC is supplied to board. PC Board will power-up in 20 seconds	No LED Display	Check transformer output
W	Gas valve or heating relay is energized	No Heat	Check gas valve etc. "R" wire from HVAC system not connected to Arzel System
Y	Compressor contactor energized	No Cooling	Check compressor etc.
G	Fan relay is energized	No Fan	Check fan & fan relay
1-2-3-4	Zone solenoid is energized, dampers are open to zones, conditioned air is delivered to the requesting zones	Some dampers are not open	Check to see that zone dampers are properly connected. Possible mix-up of dampers
Pump(Air)	Vacuum & pressure pumps are running, zones are open or closed, as required by each thermostat	No Damper Action	Check for open airline. Check for air pressure. Manometer reading should be 20/40" WC in pressure & vacuum
Bypass Solenoid (Optional Equip.)	Bypass damper is activated by the pressure switch in the duct	Noisy air delivery to rooms	Adjust pressure switch so that no air-noise is heard when the smallest zone is served
"Flashing" LAT High	W circuit (or Y circuit in heat pump installation) is locked out, due to high LAT temp	Check LAT Setting Check DC Voltage for duct air temp.	W or Y will reconnect after a drop of 15 degrees in duct air temperature
"Flashing" LAT Low	Y circuit is locked out, due to low LAT temp.	Check LAT Setting Check DC Voltage for air duct temp.	Y circuit will reconnect after 4 to 5 minutes lockout
"Flashing" Comp. lockout	Compressor is locked out for 4 to 5 minutes. Compressor is in normal "Time delay Off"	None	This is your "Rapid Cycle Protection" in progress. If needed, the compressor will restart in 4 to 5 minutes

TROUBLE - SHOOTING - CHART

Problem	Possible Causes	Corrective Action
System is not working	Switch is in "Off" position	Turn switch to "ON" position
No power to System	Transformer shorted out	Replace transformer
No power to System	Transformer disconnected	Check transformer wiring
Pump is running but the dampers don't open or close.	Insufficient pressure in System Leakage in System	Plug up spare zones or open tubes Check airlines, repair leak Check for damaged dampers
Dampers open & close but HVAC system does not operate	Missing "R" wire from HVAC equipment transformer to Arzel output terminal	Bring hot "R" wire from HVAC equipment transformer to Arzel output "R" terminal See: 24V Power supply section
"LAT High" is flashing, but the HVAC System is not calling for service	The LAT probe is shorted (faulty) or LAT switch is in "Off" position	Check voltage at LAT terminal, per chart. High reading above 10 VDC indicates short. Replace the probe and recheck voltage per chart Turn on LAT switch
"LAT LOW" is flashing, but the HVAC System is not calling for service	The LAT probe is open (faulty)	Check voltage at test pad, per chart. No voltage indicates open probe. Replace the probe and recheck voltage per chart. Check LAT connection. Turn on LAT switch

* If you suspect a board failure, you can bypass the board by moving zone 1 or any other zone's thermostat wires directly to the appliance terminals. This way, the system will temporarily work without the benefit of the zoning system. You can open all the dampers by sucking out the air from any zone's tubing until they are all in the open position. Be sure to disconnect power to the Arzel system and keep the power off the Arzel control panel until the problem is corrected.

400 / 800 Air Diagram
Palf

