



Electronics Make
the Difference.®

ACT, Inc. Commercial Controller D'MAND CIRC®

DCKB-AP-CR-220 (3 Phase)

For Technical Training ONLY

Figure 1



Electronics Make the Difference®

Your ACT, Inc. D'MAND CIRC® is programmable for your commercial plumbing application. The ACT, Inc. D'MAND CIRC® System is commonly installed on a return line and can be adjusted to adapt to many applications on the line which services hot water supply lines from ¾" - 4" in diameter.

Warning: Can ONLY be used with pumps approved by Uniform Plumbing Code (UPC) Standards with pumps up to 2HP and 25Amps.

Note: To allow the controller to operate, be sure the overrides switch is in the "Up" or "Normal" position.

First we need to familiarize ourselves with the controls on the circuit board.

LED Displays:

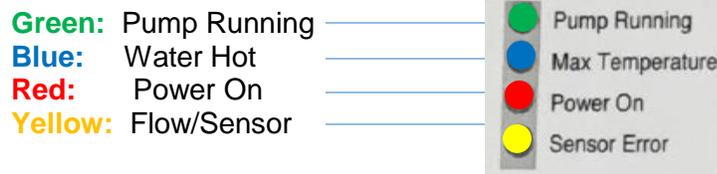


Figure 2

LED Indicators:

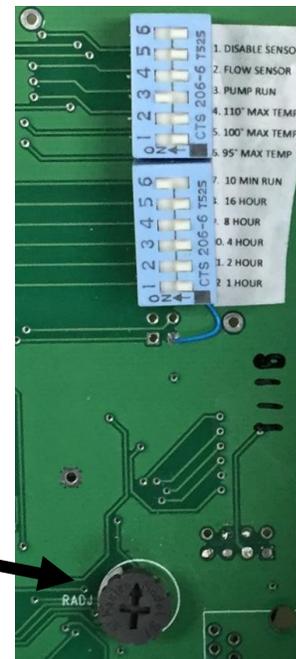
- Green:** **Pump running-** Allows you to monitor the pump in loud environments.
- Blue:** **Water Hot-** Water is above the shut down temperature on switches 1, 2 and 3. (Above 95-110°F)
- Red:** **Power On-** Power to control box.
- Yellow:** **Sensor Error-** Flashes when you depress the manual start button inside the box, or turn on the override switch.

- 6. Disable Thermistor
- 5. Type of Flow Sensor
- 4. Turn On Pump
- 3. 110° F Shut Down Temperature
- 2. 100° F Shut Down Temperature
- 1. 95° F Shut Down Temperature

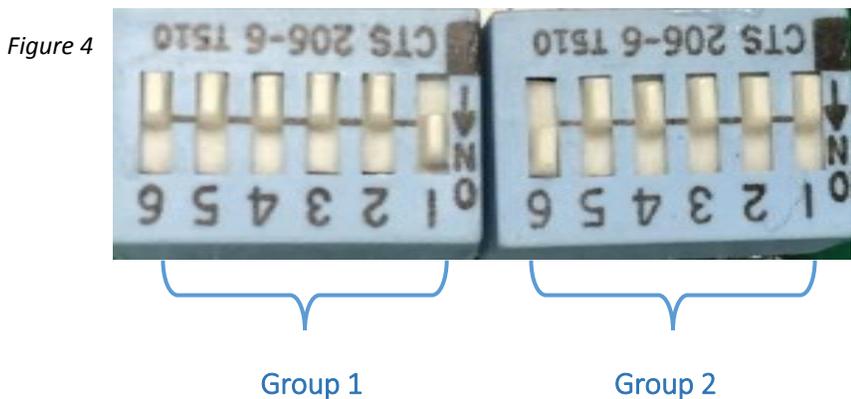
- 6. 10 min. run after start from 4 min.
- 5. 16 hour
- 4. 8 hour
- 3. 4 hour
- 2. 2 hour
- 1. 1 hour

Dial adjustment
Adjust sensitivity of OFF sensor

Figure 3



The down position of each white switch is the “ON”
The up position will turn each white switch “OFF”.



Upper Switch Terminal Block (Group 1)

6. The **Disable Thermistor** setting allows the user to run the pump to the designated time out without the pump's thermistor turning it off.
5. The **Type of Flow Sensor** can be used for an optional flow sensor type of activation (not currently available).
4. The **Turn ON Pump** allows the installer to turn the unit on despite conditions.
3. The **110°F Shut Down Temperature** switch allows for a turn off of 110° F and will not allow the pump to run past this setting.
2. The **100°F Shut Down Temperature** switch allows for a turn off of 100° F and will not allow the pump to run past this setting.
1. The **95°F Shut Down Temperature** switch allows for a turn off of 95° F and will not allow the pump to run past this setting.

Lower Switch Terminal Block (Group 2)

6. The **10 minute run after start from 4 minutes** allows the unit to run a maximum of 10 minutes instead of the standard run time of 4 minutes.
5. The **16 Hour** switch enables/disables the Delta T (ΔT) function of the controller.
4. The **8 Hour** switch sets controller to operate on a 90% setting (i.e. 13 min off, 1 min, and 30 seconds on).
3. The **4 Hour** switch sets the pump for manual intervals of 4 hours between start times.
2. The **2 Hour** switch sets the pump for manual intervals of 2 hours between start times.
1. No Function.

Dial Adjustment

- The dial rotates ¼ turn clockwise or counter-clockwise. This adjustment is used to adjust the pump's sensitivity or Delta T (ΔT) setting.
- Turning the dial clockwise will make the System more sensitive to hot water temperature increases, and will cause the System to shutdown quicker.
- Conversely, moving the dial counter-clockwise will remove some sensitivity from the System and allow the System to run longer.

****Note:** *Typically this is used to overcome "hot spots" in the plumbing line, or long runs of uninsulated piping which may cool down prematurely.*

Factory Default Settings

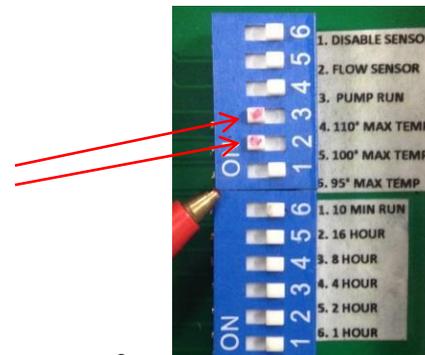
All units sold will have the following settings pre-programmed:

1. "Run till hot" start up.
2. 10 minute run time.
3. ***110°F shut down temperature setting (see Figure 16 & 17).
4. Dial setting in center position. This will allow us to move the System to change the run time to shorter or longer between cycles.

Maximum Temperature Override

Your ACT, Inc. D'MAND CIRC® controller can be set to 120°F by combining the 110°F and 100°F shut down temperature switches (see below). In applications that require higher shut off, an additional option is to set the unit above the 110°F.

Switching ON the 110° F + 100°F
Will give a shut down temperature of 120°F

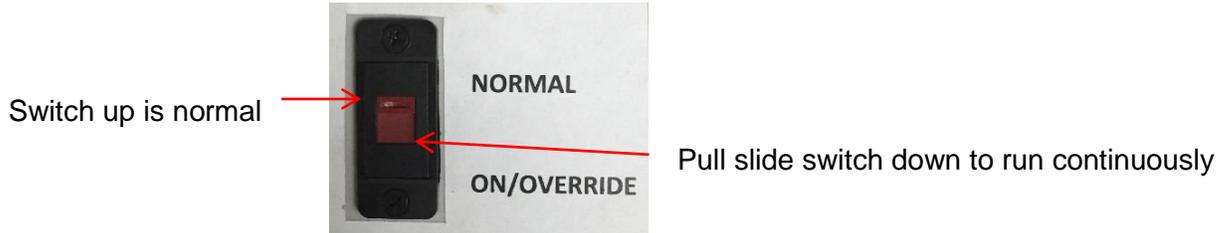


These settings are to ensure the ACT, Inc. D'MAND CIRC® Systems will universally satisfy the needs of the end user. Enhanced adjustments can be made by the installer/ user to increase the efficiency of the System.

Important: Power must be cycled for setting changes to take effect!

DCKB-AP-CR Operating Instructions

Figure 6



Your ACT, Inc. D'MAND CIRC[®] controller box should be mounted a minimum of 18" above floor level and have un-obstructed access to the unit free of debris, or durable hazards which could damage the weather box and expose wiring.

There is no maintenance or monitoring required for the D'MAND CIRC[®] controller it just needs consistent continuous regulated power. As a safeguard the System does incorporate an inline fuse (below) to safeguard the electronics in the case of a large spike in the incoming power supply. If the fuse has been broken it can be replaced with a 20A slow blow common glass fuse.



Figure 7

What do the LED lights mean?

Figure 8



Blue on/solid: Shut Down Temperature

1. Temperature sensor has reached shut down limit
2. Thermistor is NOT connected to controller (I.e. served wire or sensor)

Blue flashing: Shut Down Temperature

1. Water is within 9% of shut down limit
 - a. Will turn solid when meets limit

Green on/solid: Pump Running

1. Output power to pump

Yellow flashing: Sensor Error

1. When you depress the manual start button inside the box
2. Turn on the Override switch

Red on/solid: Power On

1. Power to controller

ACT, Inc. D'MAND CIRC[®] Controller

Tech sheet for 3 phase Applications

Sizing

The DCKB-AP-CR-220 will work WITH pumps approved by Uniform Plumbing Code (UPC) Standards with pumps up to 2HP and 25Amps.

AC Motor Full Load Running Current and Recommended Transformer																
Horsepower	110-120V				220-240V				440-480V				550-600V			
	Single phase		Three phase		Single phase		Three phase		Single phase		Three phase		Single phase		Three phase	
	Amps	KVA	Amps	KVA												
½	9.8	1.5			4.9	1.5	2.0	3			10	3			0.8	3
¾	13.8	2.0			6.9	2.0	2.8	3			14	3			1.1	3
1	16.0	3.0			8.0	3.0	3.6	3			18	3			1.4	3
1 ½	20.0	3.0			10.0	3.0	5.2	3			2.6	3			2.1	3
2	24.0	5.0			12.0	5.0	6.8	6			3.4	6			2.7	6
3					17.0	5.0	9.6	6			4.8	6			3.9	6
5					28.0	7.5	15.2	9			7.6	9			6.1	9
7 ½							22.0	15			11.0	15			9.0	15
10							28.0	15			14.0	15			11.0	15
15											21.0	30			17.0	30
20															22.0	30

Figure 9

How to Wire

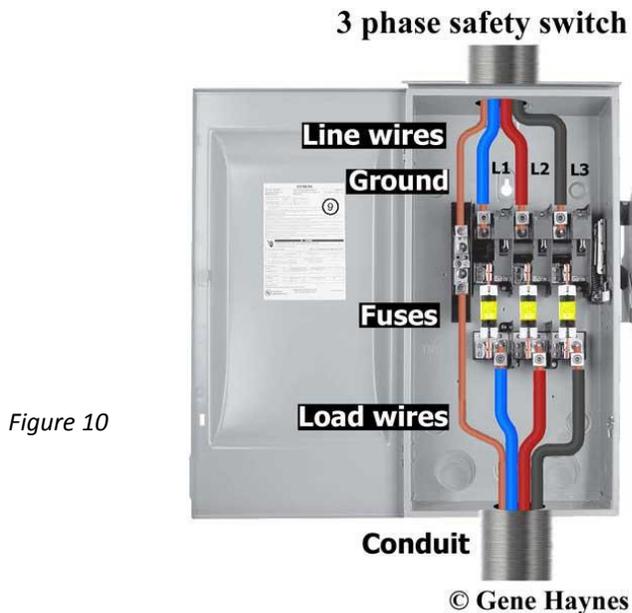


Figure 10

3 Phase Safety Switch

- Typical wiring for 3 Phase safety switch.
- Wire colors vary for service entrance and by type of 3 Phase connection.
- Safety switches can be fusible and non-fusible depending on local code.
- Terminals are marked for Line and Load side.

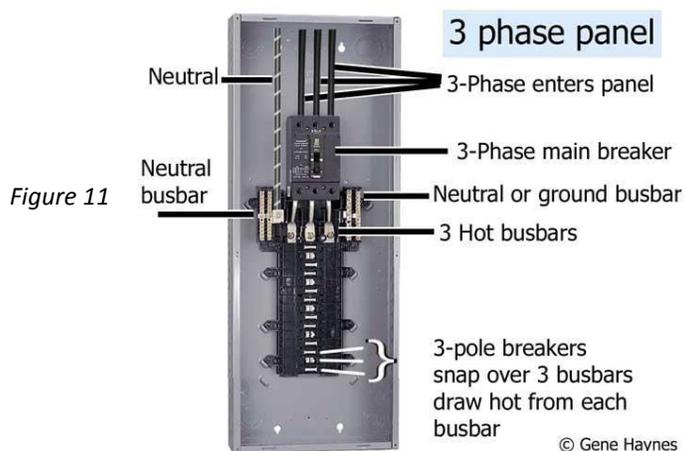


Figure 11

3 Phase Breaker Panel

- Generally 3 hot wires from meter attach to a 3-pole main breaker.
- Neutral connects to neutral busbar.

- Ground wire (not shown) connects to ground busbar.
- Some services do not have neutral wire, and neutral busbar might be used for grounding.
- If both busbars on either side of hot busbars are used for neutrals, then separate ground busbar is added inside panel.
- Neutrals and grounds must be on separate busbars to assure direct pathways for ground.
- 3 pole breakers fit over each 3 hot busbars.
- There are 3 hot busbars in 3 Phase panel, one busbar for each of the 3 hot wires that enter the breaker box.
- Each hot wire supplies power to separate busbar.
- Illustration shows where 3-pole breaker snaps into place. (See Figure 10).

Example 3 Phase Circuit

- Wire colors vary.
- 3 Phase breaker located in panel.
- 3 Phase 3-wire goes to contactor (or motor starter) and then to motor.
- Grounding indicated, but ground wire not shown.
- No neutral wire shown, and not needed for example motor circuit.
- 2 Hot wires pulled from 3 Phase go to double-pole switch or timer.
- Switch or timer activates motor starter or contactor, which starts motor.
- Fused disconnect added between breaker and starter and motor, and is located at motor.
- Required by code to protect anyone servicing motor and to protect wires and motor from overheat.
- Fused disconnect added between 3 Phase and double-pole switch or timer. Required by code to protect anyone working on circuit, and to protect wires, switch and contactor.

Figure 13



Figure 12

3-pole breaker

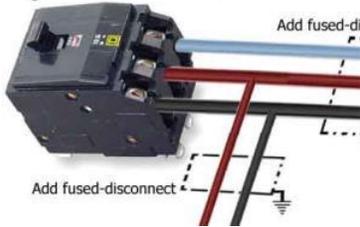
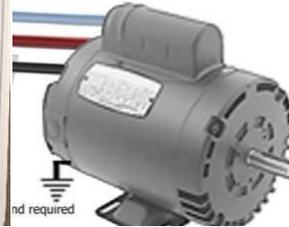


Figure 14

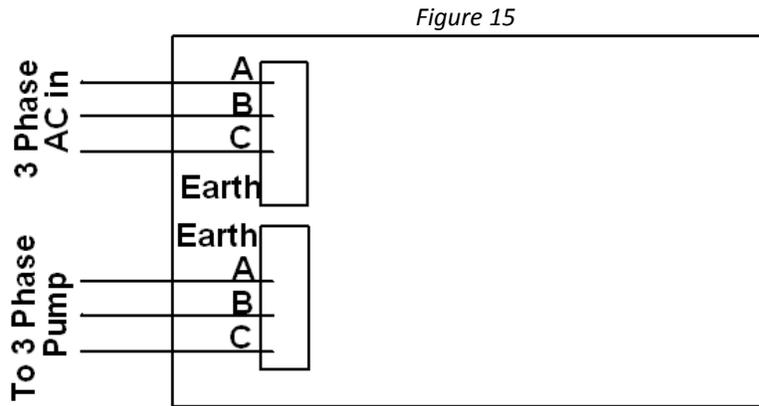
3-phase motor



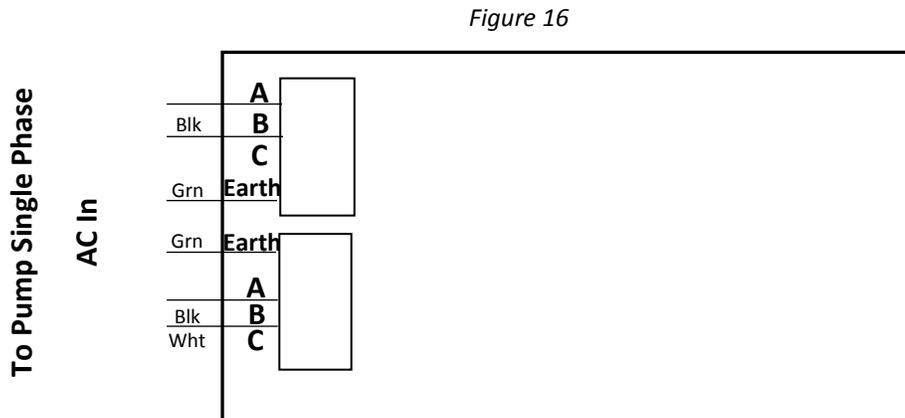
3 Phase Pump Connection

DCKB-AP-CR-220

3 Phase Wiring (see below)



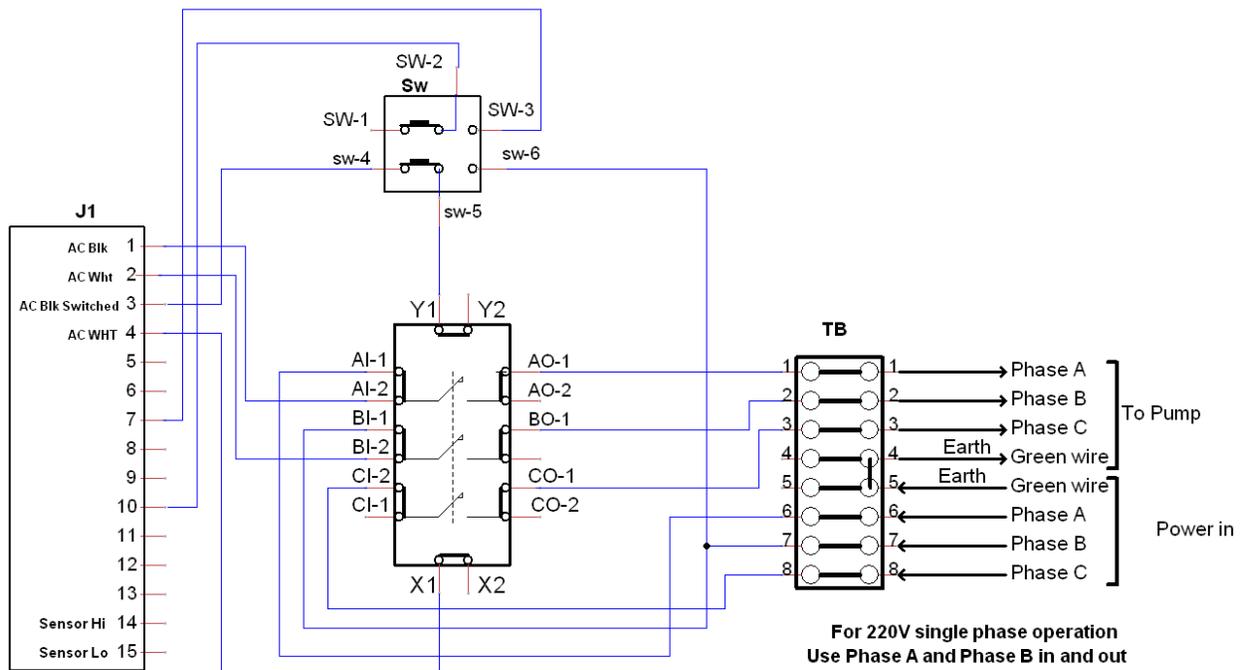
Single Phase Wiring (see below)



DCKB-AP-CR-220 Contactor

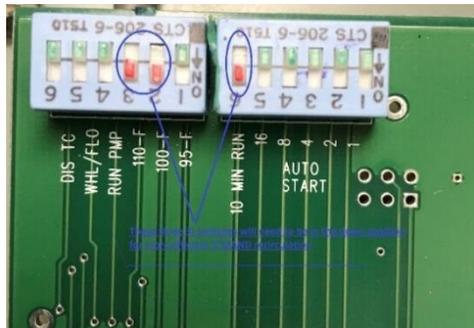
3 Phase Commercial Box Wiring

Figure 17



Below (figure 18), would be the recommended settings for initial set up.

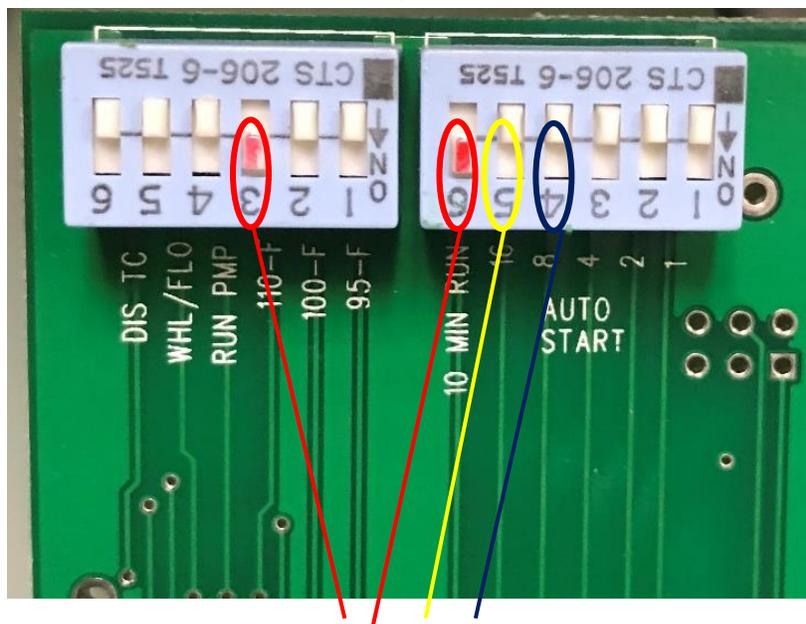
Figure 18



Note: These three (3) switches will need to be in the down position for more efficient D'MAND recirculation.

For more savings and a more “aggressive” setting we can move the “100-F” switch to the up/off position for shorter pump run times (See Figure 19 below).

Figure 19



Only the 110-F and 10 MIN RUN in the “ON” position.
No DeltaT (ΔT) switch
90% Run time switch

Note: Once wired, all power will need to be shut down and reinitialized to reset the values on the controller.

**This also applies to changes made on the controller/switches (i.e. for indicator LEDs to show proper readings).

Adjustments/Troubleshooting

Figure 20

<u>Problem</u>	<u>Remedy</u>
System shutting down pump too soon.	Action: To increase the temperature shut off value turn on the “100-F” switch (pull down if installed vertically) in addition to the “110-F” switch, as shown in <i>Figure 14</i>).
System needs to shut off at a specific temperature. <i>Figure 15</i>	Action: Pull down Switch: (Group 2; Switch 5) to the ON position. This will disable the DeltaT function and allow the System to ONLY shut off at a fixed temperature. The temperature can be adjusted by turning the round black potentiometer counter-clockwise for hotter temperatures, and clockwise for lower temperature shut off.
System shutting off with spikes in hot water, a fixed run time is desired regardless of water temperature. <i>Figure 15</i>	Action: Pull down Switch: (Group 2; Switch 4) for 90% run activation. This switch disables ALL other functions and allows the controller to run for 15 min continuously and off for 1:30 min (times are approximate and may vary). This adjustment will give the System a fixed 10% reduced run time. This adjustment should only be used in extreme environments.

Note: Power MUST BE CYCLED to the DCKB-AP-CR-220 controller for changes to take effect. If power is not cycled the adjustments will not change the controller.

**This can be achieved by a switch, a breaker to the electrical circuit the controller is connected to, or disconnecting the wiring on the incoming power.

Installing the ACT, Inc. D'MAND KONTROLS® Systems

Model DCKB-AP-CR-220

for

Standard recirculation lines on boiler systems

Installations shall be in accordance with the manufacturer's instructions per the requirements of the Uniform Plumbing Code (UPC)
Conforms to UL STD (508)
Certified to CSA STD C22.2 #14

BE CAREFUL

Do not connect power into an electrical receptacle until the System is installed and in place.

Pre-Installation Checklist

1. Check the package contents. Your ACT, Inc. D'MAND KONTROLS® DCKB-AP-CR-220 should include:

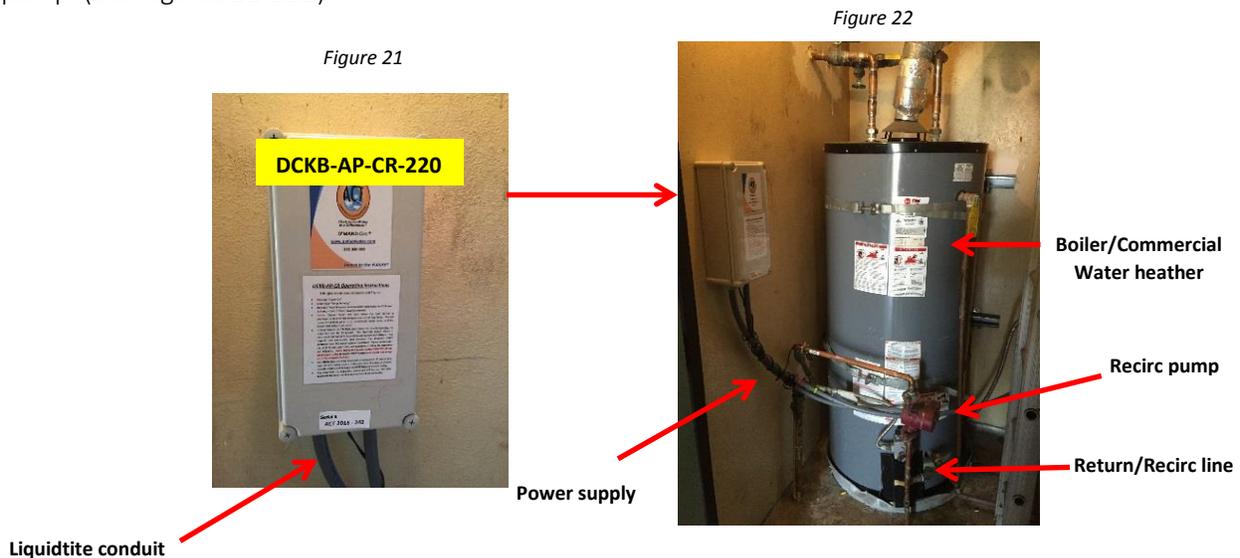
- A preassembled DCKB Controller
- Thermistor mounting clamp with zip ties
- Instructions

2. Make sure you have the tools to do the job:

- Wire/nuts for the appropriate size required by code
- Liquidite or conduit
- Small Phillips head and medium flat head screwdriver
- Wire strippers
- Drill
- Mounting screw and anchors

3. Determine where you will install the ACT, Inc. D'MAND KONTROLS® System:

Typically, this should be located between the recirculation pump and the power supply to the pump. (See Figures 21 & 22)



Placement

To connect your controller, we will need to locate the recirculation pump, the power supply to the pump, and the hot water return line. The best position for the unit is away from direct contact of heat or flame over 120°F or under 32°F. It is recommended that the unit be located at least 18" above ground on a firm and stable surface. These recommendations are in addition to any local electrical codes which must be followed in all applications.

Installing with Concealed Screw Wells

This is for installation of the ACT, Inc. DCKB-AP-CR-220 only. Be sure you have read the instructions carefully before proceeding with your installation. When removing or replacing the cover, do not use a power drill. Loosen with a Phillips screwdriver or hand loosen to ensure no damage to the threads.

Step 1:

Figure 23



Place DCKB-AP-CR-220 on wall and mark holes with a pencil or pen.

Step 2:

Figure 24



Drill the surface where marked and install appropriate anchors (not included).

Step 3:

Figure 25



Place DCKB-AP-CR-220 controller over the top and align with the wall anchors. Fasten to wall with appropriate screws until flat and secure.

Step 4:

Figure 26



Replace cover and secure all four (4) lid fasteners. Hand tighten and then $\frac{1}{2}$ - $\frac{3}{4}$ inch turn with a Philips screw driver to ensure a water tight seal.

Note: The unit can now be safely wired.

Commercial Thermistor Install

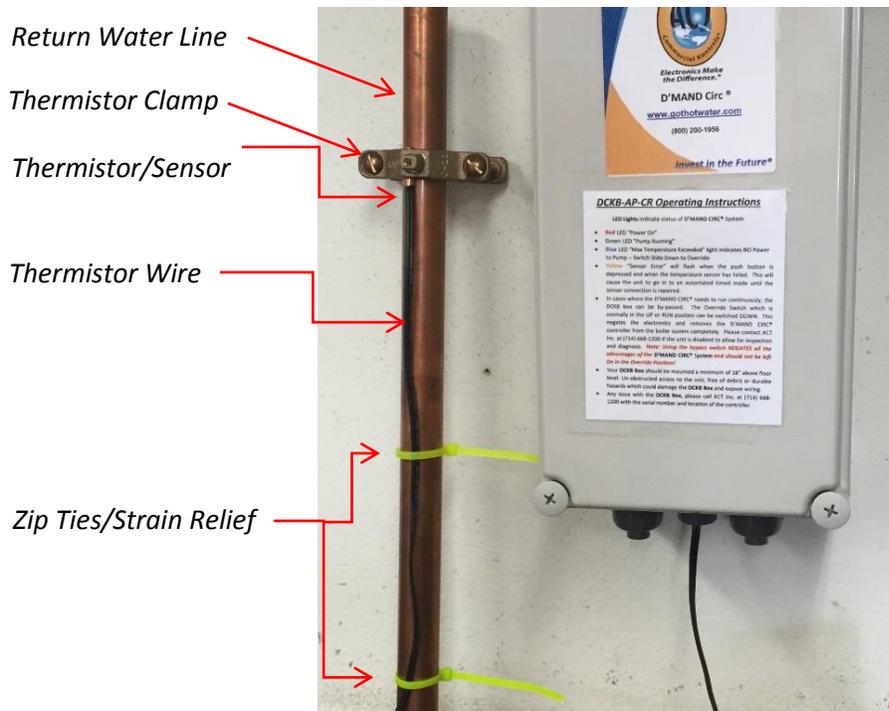
Placement/Installation of Temperature Sensor on Return Line

The sensor needs to be placed on the plumbing return line at a position before entering the pump and preferably before any check valves on the return line. Additionally, the sensor placement should be away from any external heat source (i.e. boiler, heat exhaust, hot outgoing pipe, direct sunlight etc.). In an optimum installation the sensor would be placed in a position that closely mimics the return line's median temperature.

Physical Install (see Figure 28)

To install the thermistor wire we will need to locate a clean smooth piece of piping (do not install on a fitting, tee or elbow). The copper sensor is simply laid flat on the piping with the provided clamp holding it firmly in place. **DO NOT OVER TIGHTEN** clamp as this could harm the enclosed sensor. Once secure we recommend using the supplied zip ties to affix the wire to the pipe for strain relief.

Figure 27



In cases where the return line is outdoors it is always recommended that the sensor is placed out of direct sunlight. Foil or insulation tape can also be used to shield the sensor from outside heat sources. (See Figure 28)

Figure 28

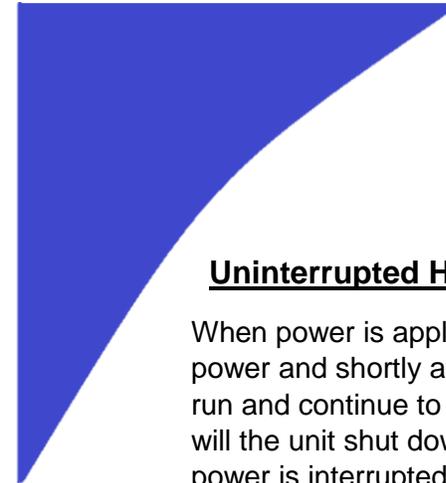


Below is a common installation on a return line indoors.

Figure 29



Note: Once the System is mounted and the sensor correctly installed then we can safely energize the System for use.



Uninterrupted Hot Water

When power is applied to the DCKB-AP-CR-220 Circ® controller you will see a red LED for power and shortly after a green LED when the power is distributed to the pump. The System will run and continue to run until the Sensor reaches a temperature of 110°F or higher. Only then will the unit shut down and begin in controlled start/stop mode. This will happen every time that power is interrupted to the controller. In the case of a power outage, or interruption in power due to service or other issues, the DCKB-AP-CR-220 Circ® controller will ALWAYS deliver hot water first before starting the System's controlled mode. This is a critical feature to ensure all users are never deprived of hot water with the DCKB-AP-CR-220 Circ® System.

Once the System is powered and running, the ACT, Inc. DMAND Circ® System will measure and maintain hot water in the hot water line, but will NOT run if the line is already hot. Typically this can mean 60%-90% reduction of pump run time.



**Electronics Make
the Difference.®**

WARRANTY

ACT Inc. D'MAND KONTROLS® Systems

ACT, Inc. will replace without charge (at the Company's option) any ACT, Inc. D'MAND Kontrols® pump, valve, or component part which is proven defective under normal use. Models DCKB, DCKB-AP, DCKB-AP-CR: Warranty – (Five Years from date of purchase) Accessories: External Sensor(s) Warranty – (One Year from date of purchase.) Labor is not included with Limited Warranty.

In order to obtain services under this warranty, it is the responsibility of the purchaser to promptly notify the Company in writing and promptly deliver the item in question, delivery prepaid to the factory. The address for notification and delivery is ACT, Inc. D'MAND Kontrols® Systems, 3176 Pullman Street, Suite 119, Costa Mesa CA 92626. If the product or part in question contains no defects as covered in the warranty, the purchaser will be notified and billed for parts and labor charges in effect at the time of factory examination and repair.

Any product or part not installed or operated in conformity with instructions or which has been subject to misuse, misapplication, the addition of petroleum based fluids or certain chemical additives to the System, or other abuse, will not be covered by this warranty.

ACT, Inc. D'MAND KONTROLS® Systems OFFERS THIS WARRANTY IN LIEU OF ALL OTHER EXPRESS WARRANTIES. ANY WARRANTY IMPLIED BY LAW INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS IS IN EFFECT ONLY FOR THE DURATION OF THE EXPRESS WARRANTY SET FORTH IN THE PARAGRAPH ENTITLED "LIMITED WARRANTY" AS SHOWN ABOVE.

THE ABOVE WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR STATUTORY, OR ANY OTHER WARRANTY OBLIGATION ON THE PART OF ACT, INC. D'MAND KONTROLS® SYSTEMS.

ACT, INC. D'MAND KONTROLS® SYSTEMS WILL NOT BE LIABLE FOR ANY SPECIAL INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF ITS PRODUCTS OR ANY INCIDENTAL COSTS OF REMOVING OR REPLACING DEFECTIVE PRODUCTS.

This warranty gives you specific rights, and you may have other rights, which vary from state to state. Some states do not allow limitations on how long an implied warranty lasts or on the exclusion of incidental or consequential damages, so those limitations or exclusions may not apply to you.

For any ACT, Inc. D'MAND CIRC® questions please call us at (800) 200-1956, or (714) 668-1200, or email us at: info@GotHotWater.com

Please refer to our website at www.gothotwater.com for warranty and indemnification information.

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