

## DRY-O-TRON DA3 and DA4 Series Energy Recycling Dehumidifiers for Industrial and Commercial Applications

DRY-O-TRON is the original energy recycling dehumidifier. More than 8,000 units have been installed throughout the world, and DRY-O-TRON has become synonymous with quality, reliability and energy savings.

Dectron Inc., the inventor of DRY-O-TRON, is a company committed to being the absolute best at what they do - providing leading expertise and quality products to customers who need to control high humidity efficiently.

Today's DRY-O-TRON represents years of intensive research and development by a team of highly qualified experts. Dectron has the only large-scale dehumidifier testing and environmental simulation laboratory in the industry. Every DRY-O-TRON model line has been developed in this laboratory, and every customer's unit is fully factory tested before shipment.

### **IMPORTANT!**

**This manual contains vital instructions for installing, starting up, operating and maintaining the DRY-O-TRON system. Please read the entire manual carefully and if you have any questions contact your local Dectron representative. The warranty is valid only if conditions explained in this manual are met.**

	Page
Introduction	4.1
Installation	4.2
Start-Up	4.14
Operation	4.18
Maintenance	4.20
Troubleshooting	4.21
HVAC Reference	4.25
Start-Up Report and Warranty Registration	4.29
Warranty	4.31



### Humidity Control Solutions

Your DRY-O-TRON DA3 or DA4 Series energy recycling dehumidifier is a precision engineered product, finely tuned to the conditions in your application to achieve maximum performance and energy savings.

Your DRY-O-TRON has been fully tested at our factory by skilled personnel. The installation of this state-of-the-art equipment must be performed by an experienced heating, ventilation and air conditioning (HVAC) factory trained serviceman.

The DA3 and DA4 Series removes moisture from the air, reducing the relative humidity levels and lowering the room air dew point temperature. In conjunction with proper building design, this helps to reduce high humidity, condensation and their accompanying problems.

The DA3 unit has been designed for medium and high temperature industrial and commercial applications (64 to 100 °F).

The DA4 unit has been designed for low temperature industrial and commercial applications (40 to 74 °F).

#### The DA3 or DA4 Series:

- Δ Helps eliminate condensation.
- Δ Improves product/process quality.
- Δ Helps reduce building repair and production maintenance costs.
- Δ Provides a comfortably dry working environment.
- Δ Contributes to space heating.
- Δ Contributes to space cooling (DA3 only).

#### The DA3 or DA4 Series Features:

- Δ Remote operator panel (DA3 Only).
- Δ Engineered to be virtually maintenance free.
- Δ Simple to operate and energy efficient.
- Δ Easy to install.
- Δ Complete with standard air conditioning (DA3 only).
- Δ Fully automatic built-in defrost cycle rapidly removes ice build-up on the coils, eliminating long downtime (DA4 only).

### Sources of Humidity

There are four principle sources of humidity in an industrial or commercial facility:

- Δ Openings, infiltration and permeation allowing outdoor moisture in.
- Δ Outdoor air admitted for ventilation or make-up air purposes.
- Δ Moisture produced by occupants.
- Δ Moisture generated by products or processes.

Moisture migrates from areas of high concentration to areas of low concentration. In the summer, when the outdoor air is warm and humid, moisture will find a path to the interior of a structure. This could be from openings in the building such as doors, infiltration through cracks and poorly sealed joints, or permeation in the case of low quality or non-existent vapor retardant.

In many instances, the primary source of humidity is from outdoor air purposely brought into the structure to meet air quality standards, or to replace exhausted air which may contain high levels of contaminants.

Occupants can contribute to the moisture load in a building depending on the number of people and their activity. A worker involved in heavy lifting can generate seven times the moisture of a co-worker seated at rest. In agricultural structures, animals also produce a moisture load.

The type of product produced or processes used in the facility can also be a significant factor in determining the sources of moisture to be controlled. If the product has an affinity for water, then it may also release the moisture into the room (wet wood or certain fruits for example). Alternatively the processes used may generate moisture, for example production facilities with open tanks of water or cooking vessels.

The moisture inside the building will condense on any surface which has a temperature lower than the dew point temperature of the room air. This can lead to quality and productivity problems or damage to the building and plant equipment. Rust and corrosion

can occur on metal surfaces, electrical controls and contacts can be affected, all resulting in increased costs and even potentially hazardous conditions.

### How the DRY-O-TRON Works

In the DRY-O-TRON, warm humid air passes through the dehumidifying coil and is cooled below its dew point, thereby condensing moisture. The heat captured by this process is combined with the heat generated from the compressor power consumption. This recovered heat is then available for recycling back to the supply airstream, contributing to space heating.

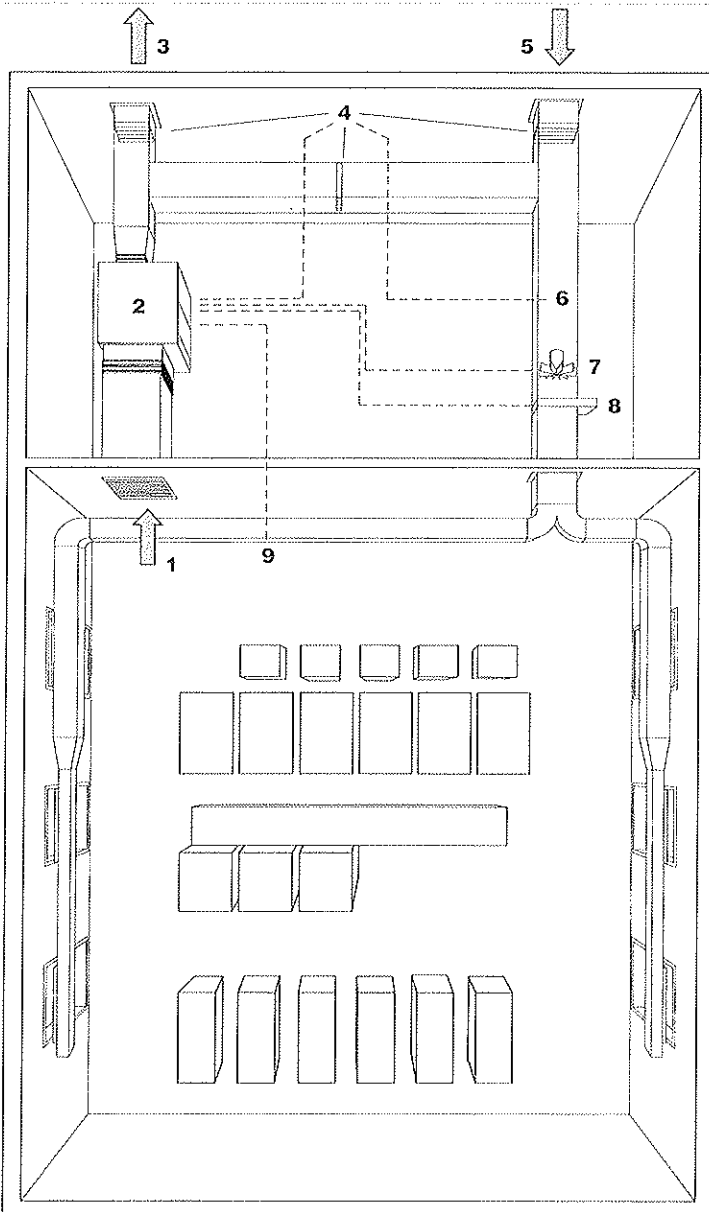
The DA3 unit is also capable of rejecting this heat to an air-cooled (standard) or water-cooled (optional) condenser, resulting in space cooling.

When properly installed according to Dectron's instructions, the DRY-O-TRON will give years of trouble-free operation.

DRY-O-TRON DA3 Series features standard microprocessor control. For the owner this means precise automatic control, high reliability and ease-of-use. For the installer and service person this means simpler installation and start-up and built-in diagnostics and troubleshooting in the unlikely event that service is required.

DRY-O-TRON DA4 Series operation is simple and effective. The coils have been designed to freeze the moisture out of the airstream at lower temperatures. Built-in automatic defrost is activated when needed to eliminate long downtime. The use of a humidistat at lower temperatures is not recommended due to their inaccuracy under these conditions. At low temperatures, the unit can be controlled by a straightforward on/off switch.

## Ventilation Requirements (DA3 Only)



- |   |   |
|---|---|
| 1. Return air   | 6. Modulating thermostat (by others)                                  |
| 2. DRY-O-TRON as return air blower  | 7. Supply blower (by others)  |
| 3. Exhaust air  | 8. Auxiliary space heater (by others) controlled by DRY-O-TRON        |
| 4. Modulating damper control, DRY-O-TRON provides dry contact for ventilation and optional power supply for ventilation | 9. Space temperature and humidity sensed and controlled by DRY-O-TRON |
| 5. Make-up air (provide air filters)  |   |

The mechanical system must ensure that adequate ventilation, including the introduction of outdoor air, is provided according to the latest building codes. The quality of the indoor air is extremely important to ensure user comfort.

DRY-O-TRON DA3 units can be used with external mixing boxes and damper arrangements (see drawing at left). The DRY-O-TRON system can optionally be equipped with control contacts and a power supply for ventilation to operate the damper motors.

All make-up air inlets must have a separate air filter installed near the air intake. Since cold outdoor air could be introduced into the enclosure under various conditions a modulating supply air thermostat should be installed. The DRY-O-TRON should operate as a return air blower. The outdoor air dampers must always be located in the supply air duct after the DRY-O-TRON. During outdoor air ventilation the humidity level in the enclosure will vary according to the outdoor air conditions.

## Moisture Migration

The enclosure must be suitable for year round operation at 40 to 60% relative humidity and built as per the latest building codes.

The DRY-O-TRON energy recycling dehumidifier is designed to maintain space humidity at specified design levels. If condensation appears, or building damage occurs, or uncomfortable conditions are experienced at normal humidity levels - it is not the dehumidifier that is at fault. Building design, in conjunction with proper duct design and air distribution, is critical to prevent condensation damage.

### Δ Vapor Retardant

Before the design of the roof and walls is finalized the enclosure temperature and relative humidity must be known, thus determining the dew point - the temperature at which condensation will occur. Any inside building surface below this dew point temperature will have condensation form on it.

### IMPORTANT!

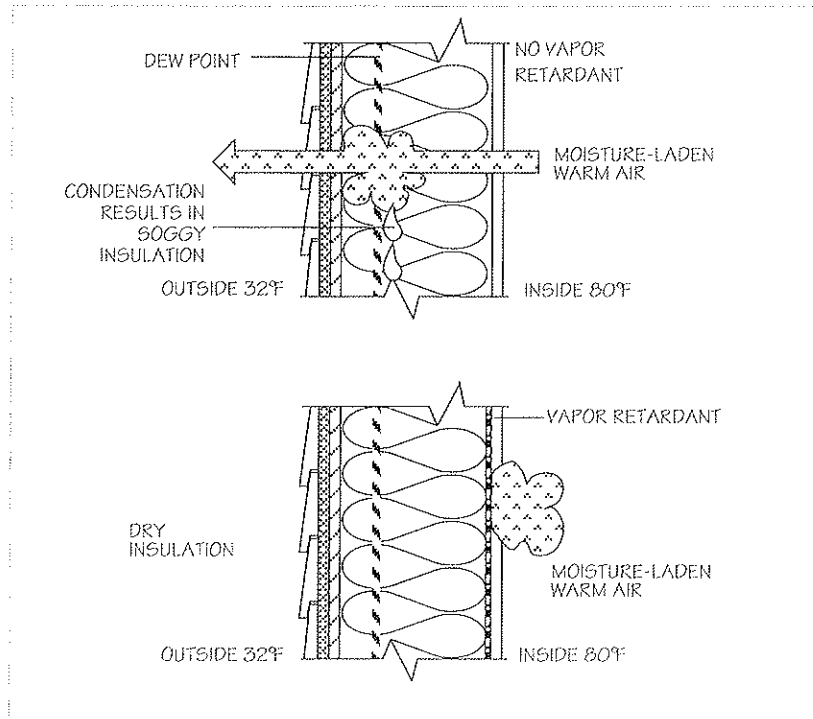
**Check the enclosure design (exterior walls AND ceilings) for proper vapor retardant location.**

When the outdoor air temperature is sufficiently low, there will be a point somewhere in the exterior wall or ceiling where the dew point temperature is reached. This point **MUST** be on the outdoor (or cold side) of the vapor retardant.

Failure to install the vapor retardant at the proper location will result in condensation forming in the structure with all its consequential damages including the possibility of roof collapse.

### Δ Window Design

Special attention must also be paid to the exterior glass components such as windows and patio doors. Due to their low insulation values, windows are usually the building element with the lowest inside surface temperature. Even a triple pane window can have an inside surface temperature below the room dew point.



The surface area of exterior windows **MUST** be blanketed with warm supply air from the perimeter air distribution system to raise the window's inside surface temperature above the dew point to prevent condensation. Windows must be designed to allow unobstructed air movement on the inside surface. Avoid recessed windows and heavy, protruding window frames which prevent proper air movement and result in condensation.

Other building elements which create thermal bridges must also be avoided or be blanketed with warm supply air or condensation damage will result. Skylights are especially vulnerable to condensation, as a direct air supply is very difficult to achieve.

## Duct Design

### IMPORTANT!

**Poor duct design resulting in uneven air distribution at a dehumidifier air inlet will reduce the moisture removal capacity, increase compressor running time and power consumption and reduce compressor life expectancy. The following duct design guidelines must be followed for your system to function correctly.**

Proper duct design is critical to achieve the necessary air distribution for the dehumidifier unit to function. Duct design and installation must conform to the latest ASHRAE low pressure, low velocity duct standards. If there is a question concerning duct design, sizing, choice of materials, air velocities or static pressures contact Dectron for assistance.

Velocities should be kept low to allow good air movement and low noise levels. Refer to the DRY-O-TRON specifications for required air volumes and available external static pressure. Higher static pressures result in higher power requirements and increased noise levels.

Select grilles, registers and diffusers for low static pressure loss, required throw and specified air flow. Choose hardware resistant to deterioration from the presence of contaminants in the enclosure atmosphere.

#### Δ Supply Air

Choose supply register locations carefully to distribute dry supply air (outside walls, exterior glass, areas where condensation may occur or spot drying is needed).

#### Δ Return Air

If the DRY-O-TRON is installed in a mechanical room, return air ductwork can be used with the optional return duct connection (includes filter rack).

As moist air rises, the return air inlet should be located 10 to 15 feet above the floor to recover the warm humid air and return it to the DRY-O-TRON for treatment and energy recovery. Do not locate the return air grille more than 15 feet above the floor as the return air may be too warm and reduce dehumidification efficiency. Prevent supply air short-cycling back to the return inlet.

For installations not requiring return air ductwork, construct a hanging platform for the DRY-O-TRON (see diagram page 3.7).

#### Δ Duct Material

The recommended duct material is standard galvanized sheet metal. All elbows must be supplied with aerofoil type turning vanes and acoustic insulation. Install 90° elbows with acoustic insulation on supply and return (if so equipped) of the DRY-O-TRON. Ductwork must be insulated on the outside if located in areas below normal room temperature with two-inch minimum fiberglass duct wrap with an FSK facing to prevent condensation and heat loss. The entire ductwork system must be designed to be dry, all seams must be sealed with an approved duct sealant.

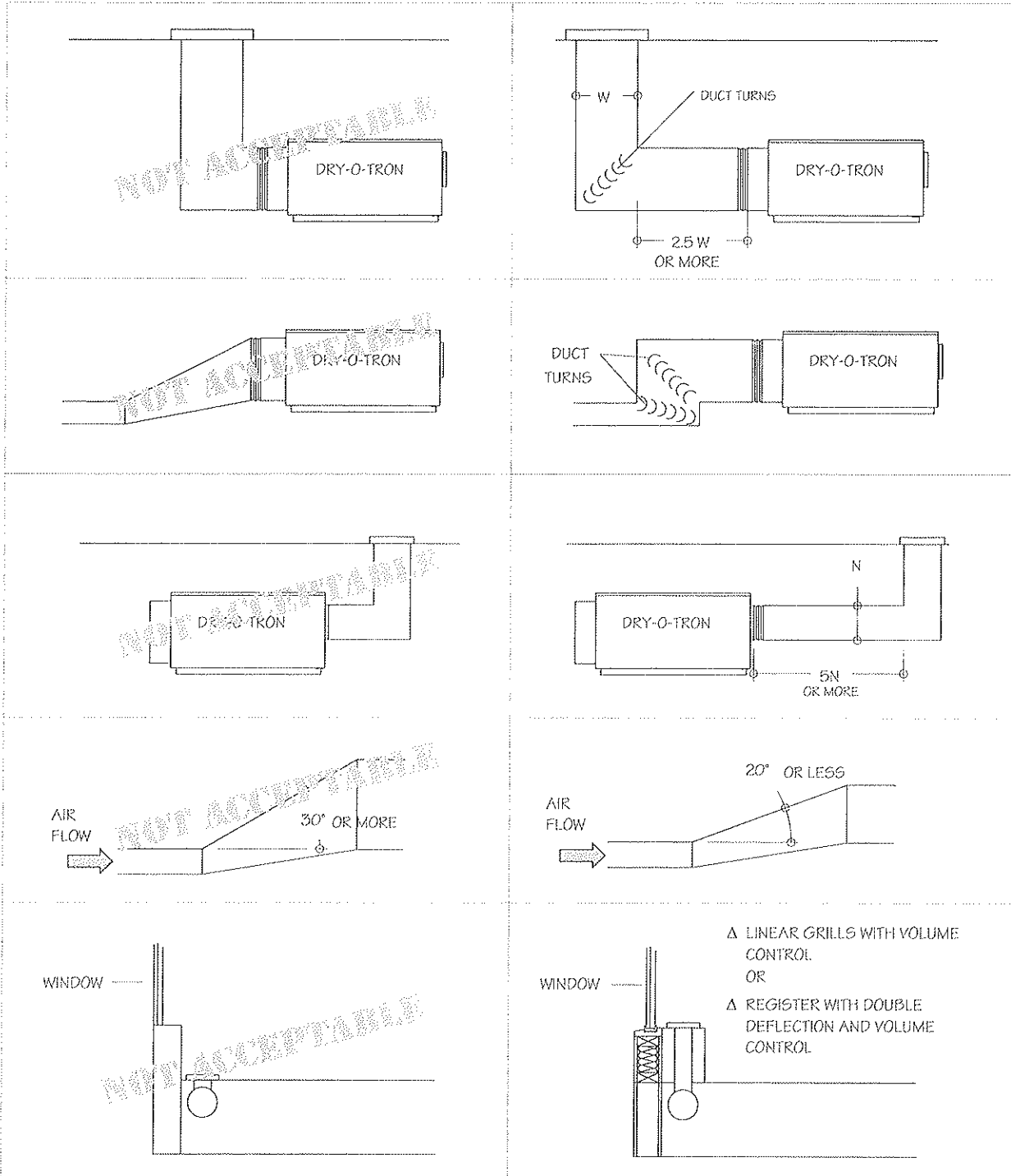
#### Δ Below Grade Ductwork

If a below grade duct system is used transite or PVC coated round metal ductwork should be used.

#### Δ Connecting Duct to DRY-O-TRON

Use flexible duct connections to attach ductwork to the DRY-O-TRON unit. There must be no air stratification on the DRY-O-TRON air inlet.

Owner's Manual **DA3/DA4 Installation**



NOT ACCEPTABLE

NOT ACCEPTABLE

NOT ACCEPTABLE

NOT ACCEPTABLE

NOT ACCEPTABLE

VIEW:	SCALE:		DUCT DESIGN
VIEW:	SCALE:	DATE: JAN. 07, 1992	
DRAWING NO: DA3/DA4-INST	US AND CANADIAN PATENTS	APPROVED: <i>P.R.</i>	

Installation is straightforward if the design guidelines have been followed. Proceed with the step-by-step instructions below.

### Step 1 Unpacking the DRY-O-TRON

All DRY-O-TRON units are fully factory tested under design conditions to ensure proper operation prior to shipment. Inspect the unit thoroughly upon arrival at the installation site.

Notify the carrier immediately if shipping damage is suspected. If concealed damage is suspected, then indicate "contingent on internal inspection" when signing for the shipment. Keep copies of all shipping damage claim documentation including photographs of the observed damage.

#### IMPORTANT!

**Claims for loss or damage must be filed against the carrier!**

### Step 2 Location of DRY-O-TRON

There are two prime considerations for locating the DRY-O-TRON unit: access for proper maintenance and space for required ductwork.

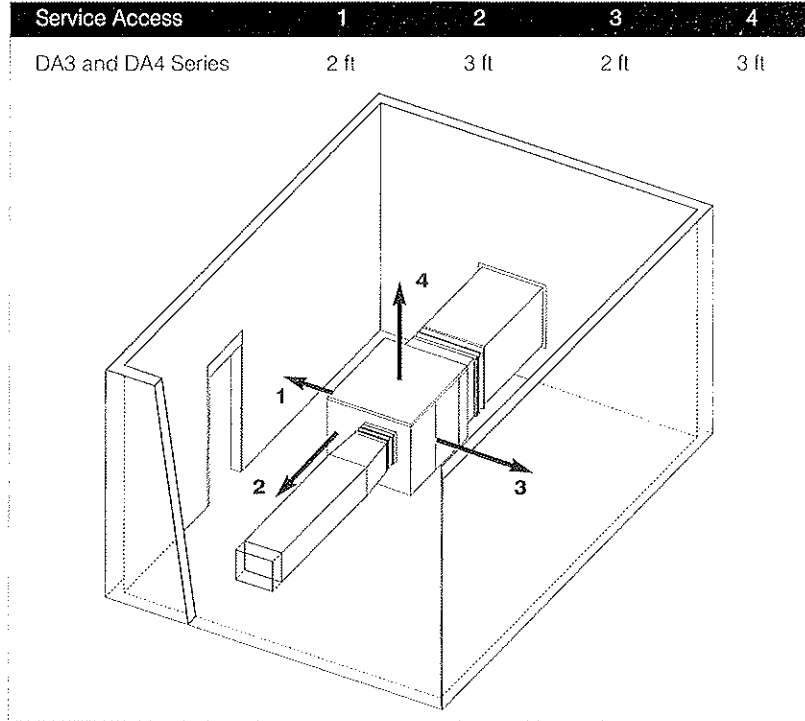
Minimum required service access is shown in the drawing (at right).

When no return air duct connection is used, units should be mounted on a hanging service platform (see drawing next page). A step-ladder is not considered a safe means of service access.

When no return air duct connection is used, ensure a minimum 4 ft. clearance between the return air inlet and the nearest obstruction.

### Step 3 Sound and Vibration Elimination

Install anti-vibration pads such as machinery cork, rubber pads or other approved isolation materials to isolate the DRY-O-TRON from the supportive structure.



#### IMPORTANT!

**Do not mount the unit on a plywood sheet or any material that will resonate.**

Install flexible duct to the outlet of the DRY-O-TRON to prevent sound and vibration transmission. Install a 90 degree elbow with acoustic insulation on the supply duct of the DRY-O-TRON to eliminate air movement noise. Use aerofoil type turning vanes on all elbows. If a return air duct is used, install flexible duct and a 90 degree elbow with acoustic insulation on the return air side to further reduce air movement noise.

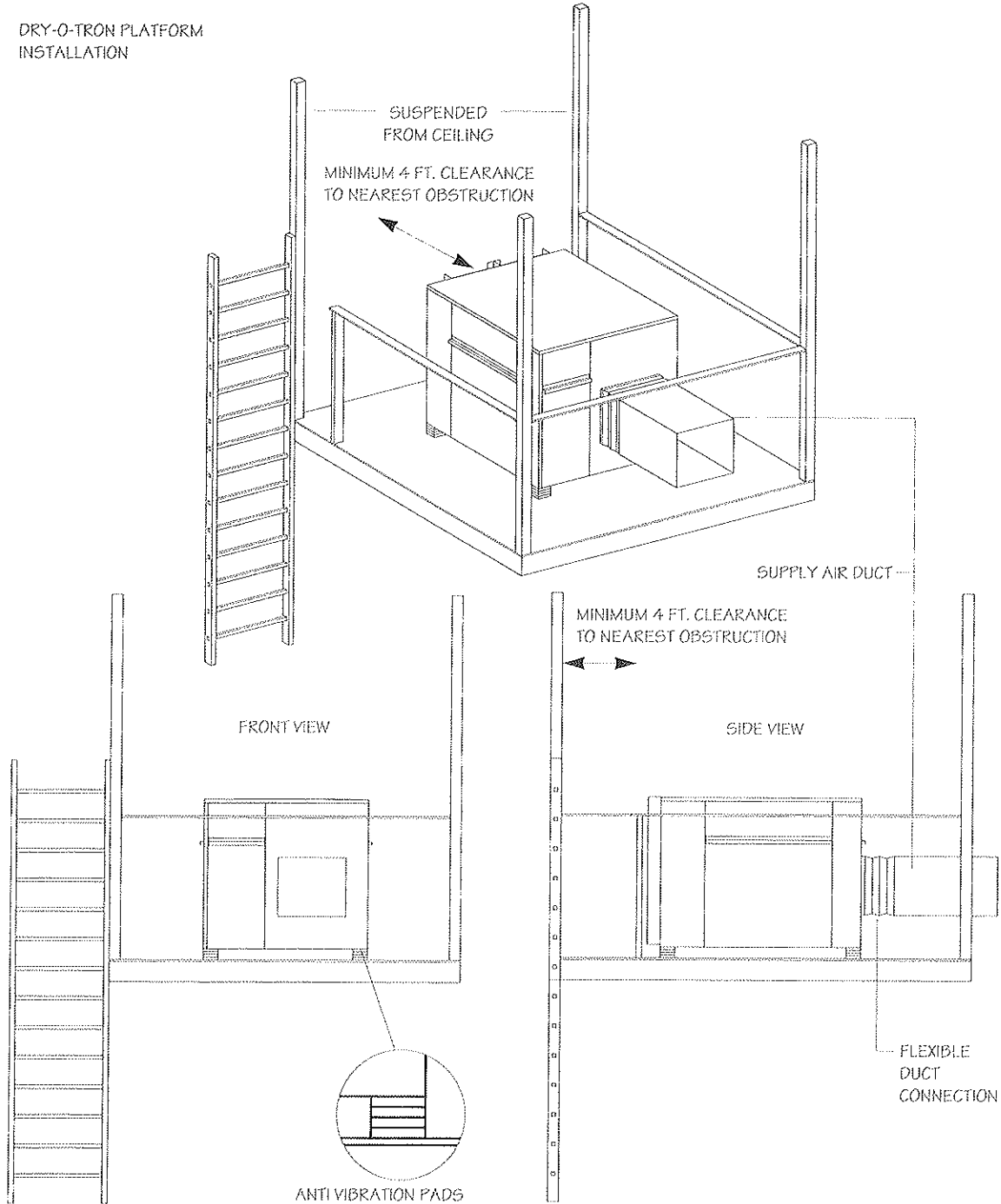
### Step 4 Condensate Drain Connection

The unit has a 3/4 in. I.D. rubber hose drain connection. The rubber hose forms a trap inside the unit and an external P-trap is not required. In DA4 units the condensate drip pan and internal trap are heated during operation to help prevent ice build-up. In an unheated environment Dectron's rubber connections are virtually maintenance free.



# DA3/DA4 Installation

DRY-O-TRON PLATFORM  
INSTALLATION



VIEW: TRIMETRIC  
VIEW: ORTHOGRAPHIC  
DRAWING NO: DA3/DA4-HNG

SCALE: NOT TO SCALE  
SCALE: NOT TO SCALE  
US AND CANADIAN PATENTS

NET WEIGHT:  
DATE: AUG. 28, 1992  
APPROVED: *P.R.*

MODEL:  
DA3/DA4

### Step 5 Power and Control Wiring

The DRY-O-TRON is factory pre-wired. Field wiring is limited to power wiring and the installation of wiring for the 24V controls.

Provide and install a main disconnect switch within the vicinity of the DRY-O-TRON. Refer to the unit nameplate or electrical information (pages 3.9 - 3.11) for proper voltage, ampacity and maximum main fuse protection. All wiring and main disconnect switch should be provided in accordance with local electrical codes. Use copper conductors only. The power leads are brought into the unit through the top or bottom of the main control panel. Supply voltage must not vary more than 10% of the nameplate voltage when the unit is operating. Unbalanced phase voltage must not exceed 2% between phases. Make sure that the DRY-O-TRON is properly grounded via the ground lug terminal located in the control panel. All DA3 and DA4 units must have one power source only.

The control wiring should be done according to the wiring diagram provided with the unit. The DRY-O-TRON operates with 24V controls.

### Step 6 Refrigerant Piping for Air-Cooled Air Conditioning (DA3 Only)

Installation of the outdoor air-cooled condenser should only be done by a qualified refrigeration mechanic familiar with this type of work.

#### IMPORTANT!

**The outdoor condenser should be installed above or at the same level as the DRY-O-TRON. In order to accommodate condenser installation below the DRY-O-TRON, the DRY-O-TRON must be ordered for this configuration. Check with your Dectron representative.**

For condensers with more than one circuit, the piping should be arranged so that lengths of run and number of fittings to and from each condenser are equal (see drawing opposite) to assure balanced flow. Branch-off tee must be

the same size as the main pipe.

#### IMPORTANT!

**Hot gas and liquid line sizes that are stated on the unit MUST be employed. The maximum length of refrigerant piping is also stated. DO NOT exceed these dimensions as the refrigerant receiver is sized accordingly.**

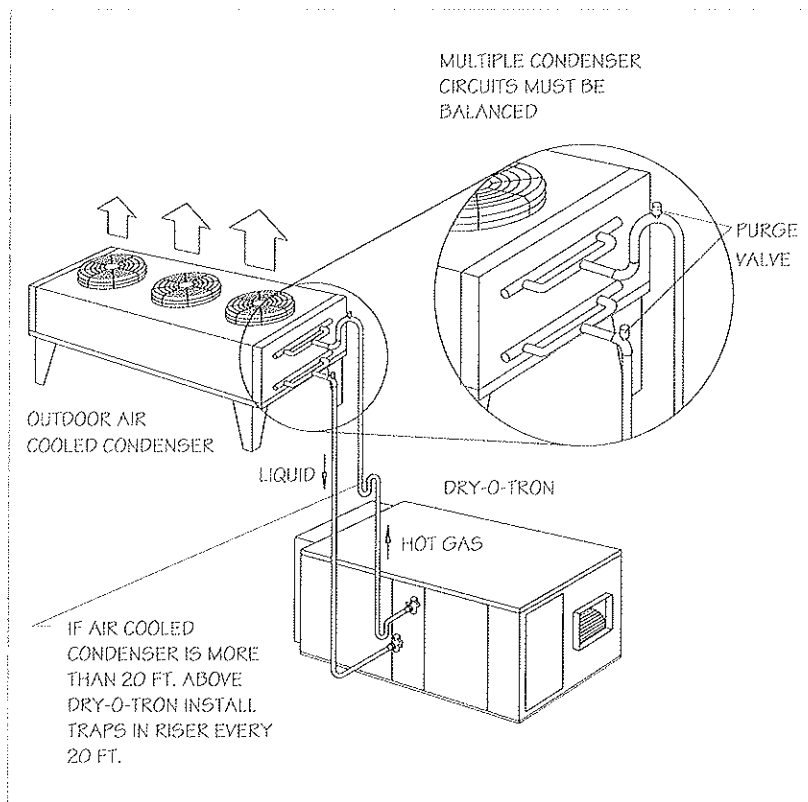
The unit nameplate includes the amount of R-22 refrigerant shipped in the DRY-O-TRON as well as the total system charge required after the installation of the air-cooled condenser. The amount of refrigerant to be added upon start-up is the difference between these two figures.

All brazing shall be done under nitrogen purge. Do not open ball valves

inside the DRY-O-TRON unit until all exterior piping is leak checked and triple evacuated. The last vacuum shall be broken with liquid refrigerant R-22, taking care to weigh in the amount drawn into the condenser piping. The remaining charge should be weighed in the gas state to the suction access valve provided for that purpose on the exterior of the DRY-O-TRON with the compressor in operation.

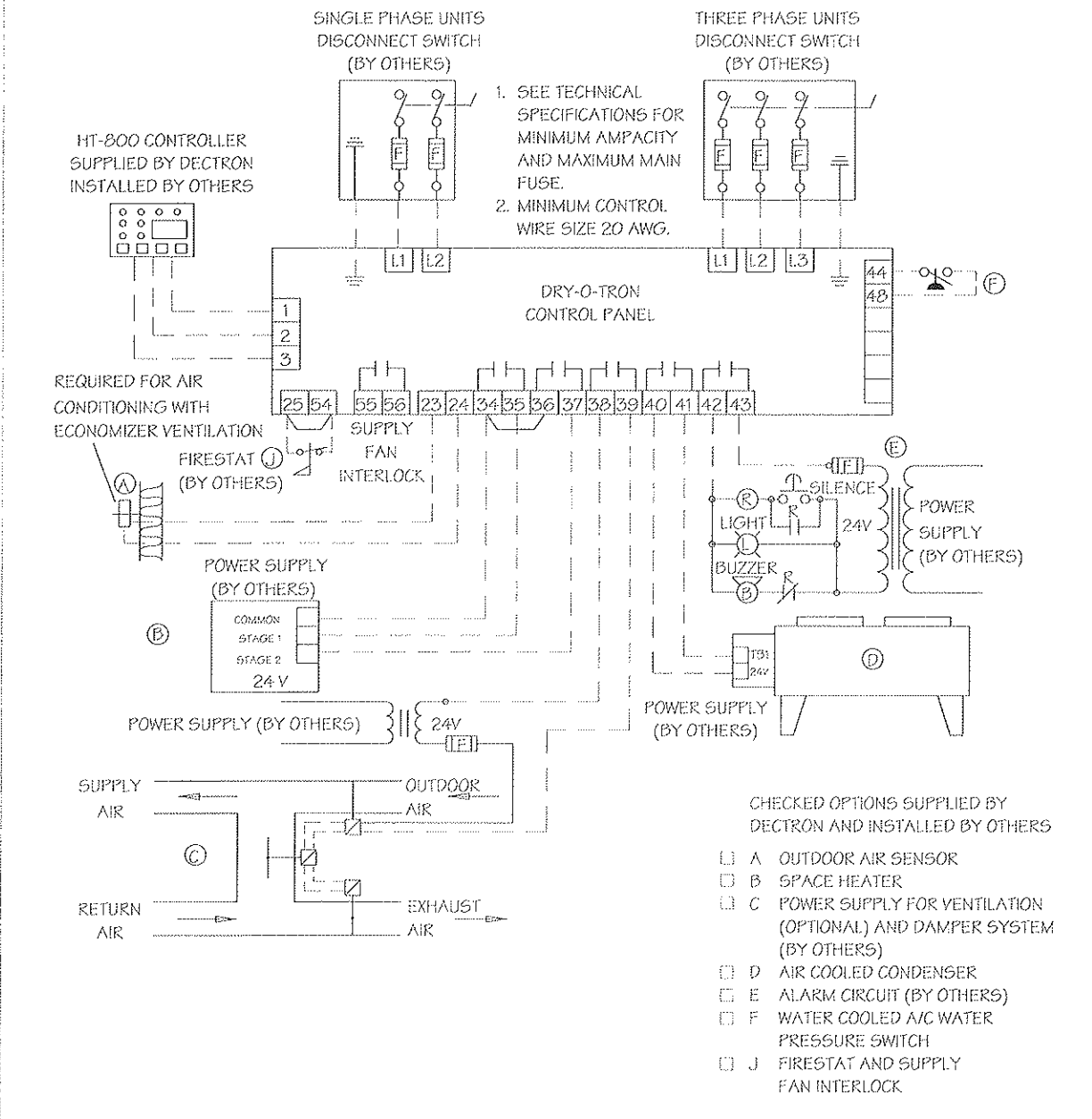
The hot gas line should be insulated if within reach of a person of normal height, and the liquid line need not be insulated unless it passes through the room environment. Keep hot gas line and liquid line at least 2 inches apart to prevent heat transfer.

If the hot gas riser exceeds 20 feet, riser traps should be installed every 20 feet.



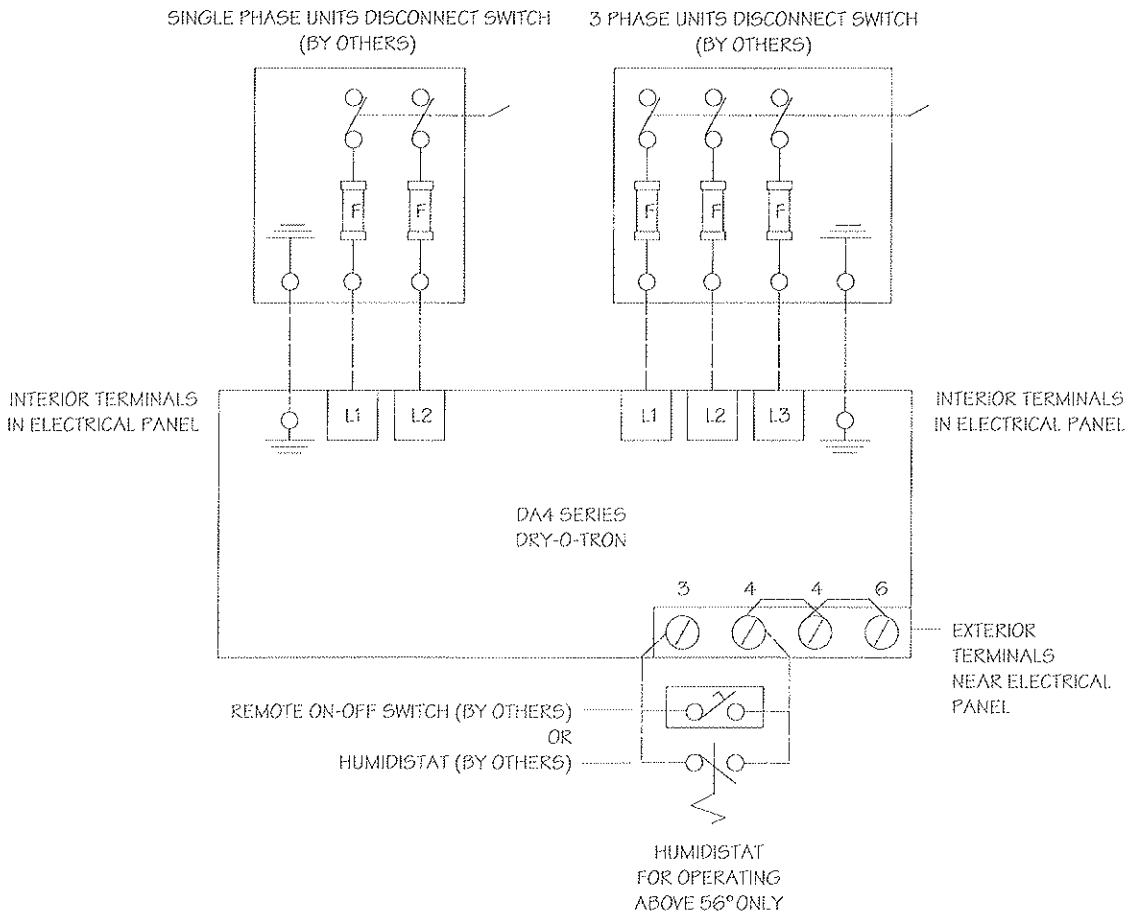
# Owner's Manual DA3/DA4 Installation

FIELD WIRING DIAGRAM (DA3 ONLY)



	VIEW:	SCALE:	NET WEIGHT:	MODEL:
	VIEW:	SCALE:	DATE: JULY 04, 1992	DA3
	DRAWING NO: DA3-FW-FE	US AND CANADIAN PATENTS	APPROVED: <i>FJR</i>	

FIELD WIRING (DA4 ONLY)



NOTE:

1. SEE TECHNICAL SPECIFICATIONS FOR MINIMUM AMPACITY AND MAXIMUM MAIN FUSE.
2. MINIMUM CONTROL WIRE SIZE 20 AWG.



VIEW: DIAGRAM

VIEW:

DRAWING NO: DA4 -FWD

SCALE: NOT TO SCALE

SCALE: NOT TO SCALE

US AND CANADIAN PATENTS

NET WEIGHT:

DATE: FEB. 09, 1992

APPROVED: *P.R.*

MODEL:

DA4

## Electrical Power Specifications (DA3)

Minimum Ampacity (A)		DA3-007	DA3-016	DA3-024	DA3-035	DA3-045
208/230 V	1 Phase	24	41	55	-	-
208/230 V	3 Phase	13	26	33	47	62
460 V	3 Phase	7	13	16	25	31
575 V	3 Phase	-	-	13	20	25
Maximum Main Fuse (A)		DA3-007	DA3-016	DA3-024	DA3-035	DA3-045
208/230 V	1 Phase	35	60	80	-	-
208/230 V	3 Phase	20	40	50	70	100
460 V	3 Phase	10	20	20	40	50
575 V	3 Phase	-	-	20	30	40

## Electrical Power Specifications (DA4)

Minimum Ampacity (A)		DA4-007	DA4-016	DA4-024	DA4-035
208/230 V	1 Phase	24	41	55	-
208/230 V	3 Phase	13	26	33	47
460 V	3 Phase	7	13	16	25
575 V	3 Phase	-	-	13	20
Maximum Main Fuse (A)		DA4-007	DA4-016	DA4-024	DA4-035
208/230 V	1 Phase	35	60	80	-
208/230 V	3 Phase	20	40	50	70
460 V	3 Phase	10	20	20	40
575 V	3 Phase	-	-	20	30

## Step 7 HT800 Controller (DA3 Only)

### Step 7.1 Operator Panel

#### IMPORTANT !!!

- Δ HT800 baseplate, blank cover and outdoor sensor shipped separately.
- Δ Install HT800 baseplate in the room.
- Δ HT800 operator panel can be located on the DRY-O-TRON. This is the **service location only**. For normal operation remove the HT800 controller and install it on the baseplate in the room. Use the blank cover on the DRY-O-TRON unit.

Choose a location for the operator panel in the room:

- Δ Do not install controller on an exterior wall.
- Δ Do not install close to any direct heat source.
- Δ Do not install in direct sunlight.
- Δ Do not obstruct vertical air circulation.
- Δ The wall surface must be flat, clean and free of vibration.
- Δ Protect against air drafts that do not represent room condition.

### Step 7.2

Pull the three wire cable from the DRY-O-TRON through a small hole in the wall where the HT800 will be mounted. Allow three inches of cable to extend beyond the wall opening.

Insert the cable through the hole in the center of the HT800 baseplate (see drawing on page 3.13). Seal hole to prevent drafts which may cause false readings.

### Step 7.3

Align the base on the wall and mark the position of the mounting holes.

Remove the base from the wall and drill two 3/16 inch holes.

Gently tap anchors into the wall until they are flush.

Install the base using no. 8 screws. Do not overtighten.

### Step 7.4

Remove about one inch of insulation from the end of the cable.

Strip each wire about 1/4 inch.

Attach each wire to the matching terminal according to color:

BLACK = 1  
WHITE = 2  
RED = 3

### Step 7.5

Gently remove the HT800 controller from the baseplate on the DRY-O-TRON unit. Install the HT800 controller gently onto the baseplate in the room. Use the blank cover to protect the baseplate on the DRY-O-TRON unit.

NOTE: There are small openings on the top and right side of the HT800 base that allow wall surface wiring.

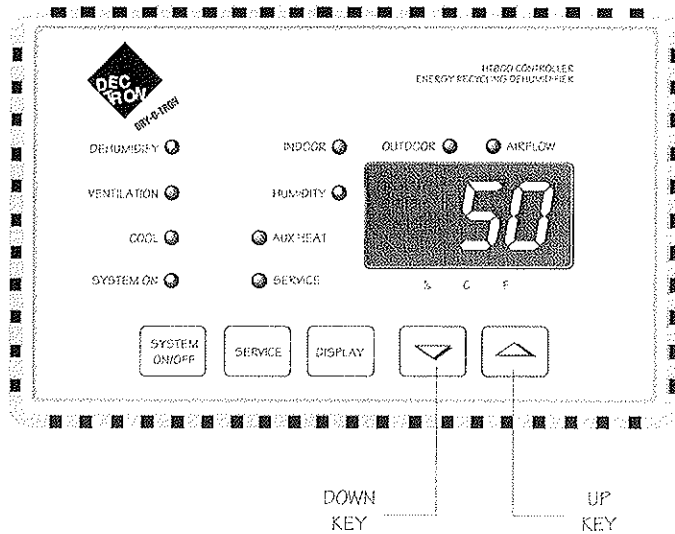
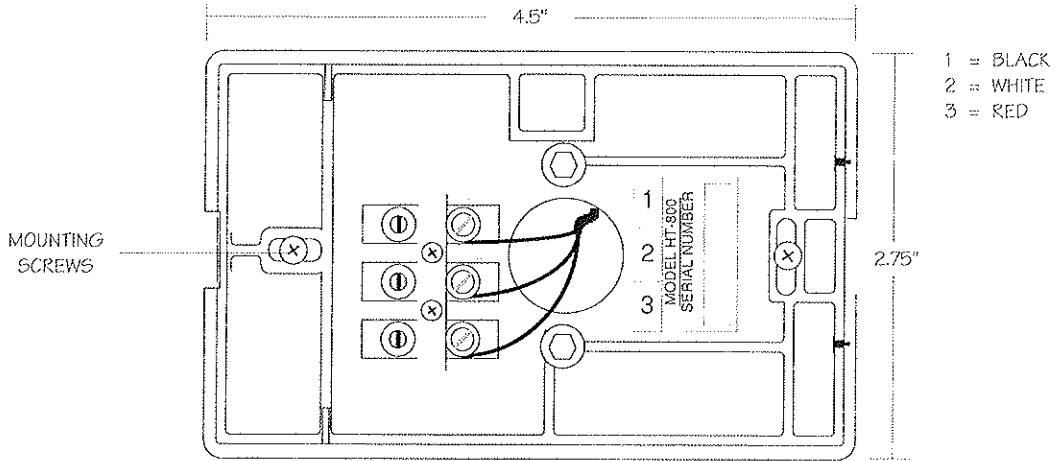
## Step 7.6 OS 800 Outdoor sensor

The outdoor sensor is optional for the DA3 Series. Choose a location for the sensor:

- Δ Install outside on exterior wall surface.
- Δ Install out of reach (minimum 8 feet high).
- Δ Do not install close to any direct heat source.
- Δ Do not install in direct sunlight.
- Δ Protect against physical damage.

Drill a 1/2 inch hole through the wall. Insert sensor wiring through the hole. Seal the hole with appropriate sealant product. Install the sensor housing with two metal screws (no. 8). Connect the two wires to terminals 23 and 24 in the DRY-O-TRON electrical panel. Use twisted pair wiring or shielded cable only.

HT800 CONTROLLER MOUNTING DETAIL (DA3 ONLY)



**IMPORTANT!!!**

- Δ HT800 BASEPLATE, BLANK COVER AND OUTDOOR SENSOR SHIPPED SEPARATELY.
- Δ INSTALL HT800 BASEPLATE IN THE ROOM.
- Δ HT800 CONTROLLER CAN BE LOCATED ON THE DRY-O-TRON. THIS IS THE SERVICE LOCATION ONLY. FOR NORMAL OPERATION REMOVE THE HT800 CONTROLLER AND INSTALL IT ON THE BASEPLATE IN THE ROOM. USE THE BLANK COVER TO PROTECT THE BASEPLATE ON THE DRY-O-TRON UNIT.

**IMPORTANT!**

This packaged energy recycling dehumidification system has been completely tested under design conditions at the factory. Start-up must be performed by a qualified factory trained service technician.

Once start-up is completed, all portions of the "Start-Up Report & Warranty Registration" form must be filled in and a copy sent to the Dectron representative or the factory in order to register and validate the warranty.

**Check List Prior to Start-Up**

Proceed step-by-step through the following checklist to ensure that the DRY-O-TRON system is ready for start-up.

**IMPORTANT!**

Do NOT turn power on until the following checklist has been completed.

**Δ Condensate**

P-trap filled with water (pour one or two pails of water into the drain pan to fill the P-trap)?

Condensate drain line works and is leak free?

Condensate pump installed and working? (If so equipped)

**Δ Air System****IMPORTANT!**

Ductwork must be installed as explained in this manual. Failure to do so may result in the DRY-O-TRON not operating at full efficiency.

Ductwork at inlet and outlet of unit installed correctly?

Clean air filters installed?

Coils clean?

All grills and registers unobstructed?

**Δ Wiring****IMPORTANT!**

Do NOT start unit unless the power supply voltage matches that on the unit nameplate. Long service runs to the unit may necessitate larger conductors to keep the voltage drop to a maximum of 2%.

Unit properly GROUNDED?

Power supply connected and compared with unit nameplate?

Wire connections checked for tightness (may come loose during shipment)?

Only copper conductors used?

All controls and sensors installed and wired according to this manual?

Electrical panel dry and free of condensation?

**Δ Refrigeration System**

All service valves opened?

Compressor suction & discharge valves opened (if so equipped, see drawing page 3.17)?

Receiver service valves opened (if so equipped)?

Any other service valves opened (if so equipped)?

Unit entirely leak tested? (In case of solder repair use an inert gas to prevent scale formation in tubing)

Refrigerant pressure in unit acceptable (use supplied service gauge fittings to attach gauges, see drawing page 3.17)?

Oil level in compressor sufficient?

**Δ General**

All shipping braces and straps removed?

All construction debris removed?

**Air-Cooled Air Conditioning (DA3 Only)****Δ Outdoor Air-Cooled Condenser Wiring**

Outdoor air-cooled condenser properly grounded?

Power supply connected as per nameplate?

Control wiring as per diagram below?

Copper conductors only used?

Fan cycling thermostat (if so equipped) set properly as per table opposite page?

**Δ Refrigeration System**

Oil traps installed at base of hot gas risers?

Evacuation of air-cooled condenser and piping completed?

Correct amount of refrigerant weighed in (refer to DRY-O-TRON nameplate)?

Air-cooled condenser and piping leak free?

Ball valves at DRY-O-TRON opened?

**Water-Cooled Air Conditioning (DA3 Only)****Δ Water Piping**

Air vent installed and operating correctly?

Water pressure switch installed with pig tail (as high as possible to prevent pipe static pressure from interfering with switch operation)?

All piping is in copper?

Water flow matches nameplate specifications?

No water leaks internally or externally?

**Δ Wiring**

Water pressure switch wired to DRY-O-TRON and adjusted properly (see Field Wiring diagram)?



**Start-Up**

Δ HT800 Controller (DA3 Only)

Gently remove the operator panel from the room location and mount it on the DRY-O-TRON. Switch on power supply, compressor crankcase heater is now energized. When power is applied the operator panel display will indicate "PF" (power failure) for 25 seconds before returning to normal operation. Press "SYSTEM ON/OFF" key and hold for five seconds to disable compressor operation. "SYSTEM ON" light should be off. Crankcase heater must be energized for at least one hour before first compressor start-up.

power supply, compressor crankcase heater is now energized. Crankcase heater must be energized for at least one hour before first compressor start-up.

Only the blower should now be operating. Check for correct blower rotation on three phase units. If blower rotation is incorrect, change two of the power supply phases and try again. Check blower motor amperage. Reading must not exceed that indicated on nameplate.

Δ HT800 Controller (DA3 Only)

Press "SYSTEM ON/OFF" key and hold for five seconds to enable compressor operation. "SYSTEM ON" light should be on. The compressor should now start. If a service indicator flashes a problem has been detected (see troubleshooting for diagnostic codes). At this point, the HT800 controller must be informed that the operator panel is located on the DRY-O-TRON (service position). Press the "DISPLAY" and "DOWN" keys at the same time and hold for 3 seconds. When the "Lo" message appears press the "UP" key until the display shows "08". Now press the "DISPLAY" key until the "CF" message appears. Press the "UP" key once to display the current Celsius/Fahrenheit mode, then press the "UP" key repeatedly to change the setting to "06" (Celsius) or "07" (Fahrenheit). After 30 seconds, the operator panel returns to normal.

Δ DA4 Units

Disable compressor operation with the remote ON/OFF switch or set humidistat to maximum setting. Switch on

Δ DA4 Units

Start compressor with remote ON/OFF switch and set humidistat to a minimum setting. The compressor should now start.

## Fan Cycling Thermostat Settings °F

Total fans/unit	Design TD	Fan 2 or 2A/2B	Fan 3 or 3A/3B	Fans 4A/4B
2	30	60	-	-
	25	65	-	-
	15	70	-	-
4	20	70	-	-
	15	75	-	-
	10	80	-	-
3	30	47	60	-
	25	54	65	-
	15	61	70	-
6	20	61	70	-
	15	69	75	-
	10	76	80	-
8	30	35	51	60
	25	45	58	65
	20	54	64	70
	15	63	71	75
	10	72	77	80

Check voltage on compressor start. Voltage should not drop more than 10% below rated voltage. If the compressor does not start (locked rotor) or knocks during start-up, stop the compressor and leave the crankcase heater on for at least 12 hours before attempting start-up again.

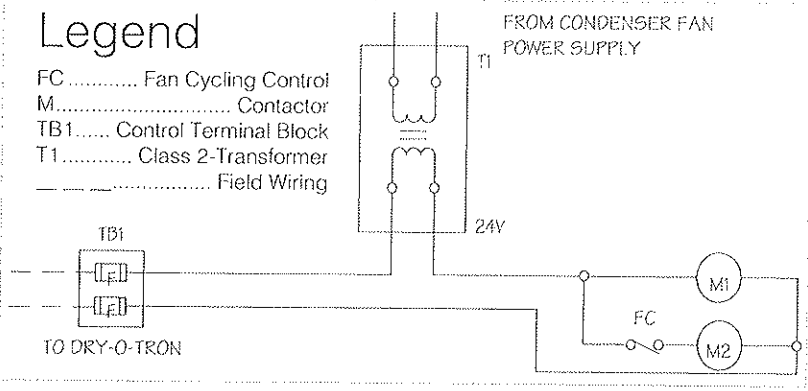
Δ Air Conditioning (DA3 Only)

Display the indoor air temperature (see Operation for instructions). Press the arrow key to view the setpoint and press the arrow key repeatedly to change the setpoint below the indoor air temperature. The "Cool" LED will come on to indicate the DRY-O-TRON is now in cooling mode.

Observe the liquid and moisture indicator - the system may require additional refrigerant. Add refrigerant until the sight glass is clear (see page 3.17). The air leaving the DRY-O-TRON should be cool.

**Legend**

- FC..... Fan Cycling Control
- M..... Contactor
- TB1..... Control Terminal Block
- T1..... Class 2-Transformer
- ..... Field Wiring



#### Δ Water Cooled Air Conditioning (DA3 Only)

The automatic water valve in the DRY-O-TRON will allow water to circulate through the water-cooled condenser and maintain condensing pressure between 210 and 220 psig. All adjustments have been factory set. The air leaving the DRY-O-TRON should be cool.

Turn water pressure switch adjustment to 0 psig, then increase slowly until compressor stops on low water flow. Turn adjustment down 5 psig and compressor should start again after anti-short cycle time delay. Check adjustment by interrupting water flow.

#### **IMPORTANT!**

**REMEMBER to return to normal operation after testing the air conditioning mode!**

Re-adjust the indoor air temperature setpoint as required.

#### Δ Air Flow Adjustment

#### **IMPORTANT!**

**Air volume adjustment should be performed only when the compressor is in operation.**

Air flow adjustment is required in order to obtain the rated moisture removal capacity. Increasing the blower speed will raise the evaporator air leaving temperature, while decreasing the blower speed will lower the evaporator air leaving temperature. The evaporator air leaving temperature should be 28 to 35 °F below the air entering temperature. Adjust blower speed with adjustable motor pulley.

On DA3 units the evaporator air leaving temperature can be read from the control panel (see page 3.24 - service functions).

On DA4 units two access ports are provided so that the coil air leaving temperatures can be verified and the blower speed is adjustable. The access ports are located on the right hand panel (as seen from the filter end of the unit, see drawing opposite page). Measure the evaporator air leaving temperature at the top port by inserting

a temperature probe or thermometer at least 6 inches deep horizontally.

(Similar temperature measurement at the bottom port will provide the condenser air leaving temperature which is verified during factory performance testing and does not require field verification).

Adjust the blower speed until the evaporator air leaving temperature is 28 to 35 °F below the air entering temperature.

Δ Compressor Discharge Temperature Adjust the expansion valve until the compressor discharge temperature is between 180 °F and 200 °F.

#### **After Start-Up**

Adjust all temperature and relative humidity setpoints to design conditions (see Operation for detailed instructions).

#### Δ HT800 Controller (DA3 Only)

When servicing is complete, the operator panel must be returned to the room. At this point, the HT800 controller must be informed that the operator panel is located in the room (normal position). Press the "DISPLAY" and "DOWN" keys at the same time and hold for 3 seconds. When the "Lo" message appears press the "UP" key until the display shows "08". Now press the "DISPLAY" key until the "CF" message appears. Press the "UP" key once to display the current Celsius/Fahrenheit mode, then press the "UP" key repeatedly to change the setting to "04" (Celsius) or "05" (Fahrenheit). After 30 seconds the operator panel returns to normal.

#### Δ Optional Air Flow Sensor (DA3 Only)

For units equipped with optional air flow sensor, the sensor must be calibrated. Press the "DISPLAY" and "DOWN" keys at the same time and hold for 3 seconds. When the "Lo" message appears press the "UP" key until the display shows "08". Now press the "DISPLAY" key until the "Fc" message appears. Press the "UP" key once to display the current airflow reading. Press the UP and DOWN keys at the same time and hold until the

display reads 100%. Release the keys and after 30 seconds the operator panel returns to normal.

#### **Condensate Pump and Tank**

Fill condensate tank with water and plug in pump. Water from the tank should now be pumped into the drain.

If water remains in the tank check the direction of the check valve. If water still remains in the tank check if pump head is sufficient.

#### **Auxiliary Space Heater (DA3 Only)**

The DRY-O-TRON is equipped with dry contacts for staged auxiliary space heating control (see electrical diagram enclosed with unit). Connect these to the space heater as required.

Display the indoor air temperature (see Operation for instructions). Press the arrow key to view the setpoint and press the arrow key repeatedly to change the setpoint above the indoor air temperature. The "Aux Heat" LED will come on to indicate the space heater is operating.

#### **IMPORTANT!**

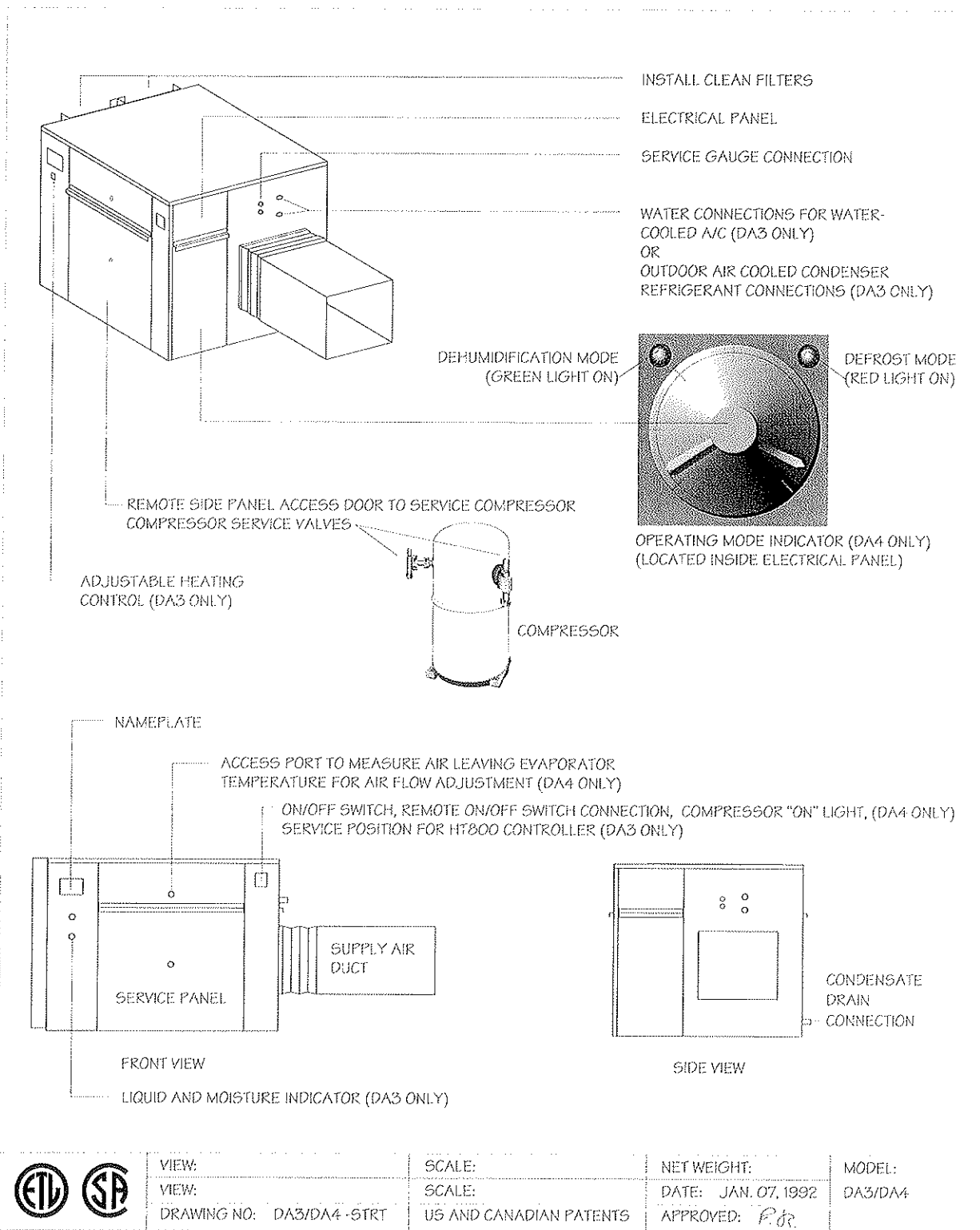
**REMEMBER to return to normal operation after testing the auxiliary air heater!**

Re-adjust the indoor air temperature setpoint as required.




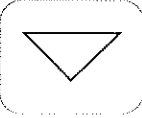

#### **IMPORTANT!**

**After final adjustments are made, ensure that the Start-up Report and Warranty Registration form is completely filled in and a copy returned to the Dectron representative or the factory to register the warranty.**

**Leave the Owner's Manual and the completed start-up form with the DRY-O-TRON.**



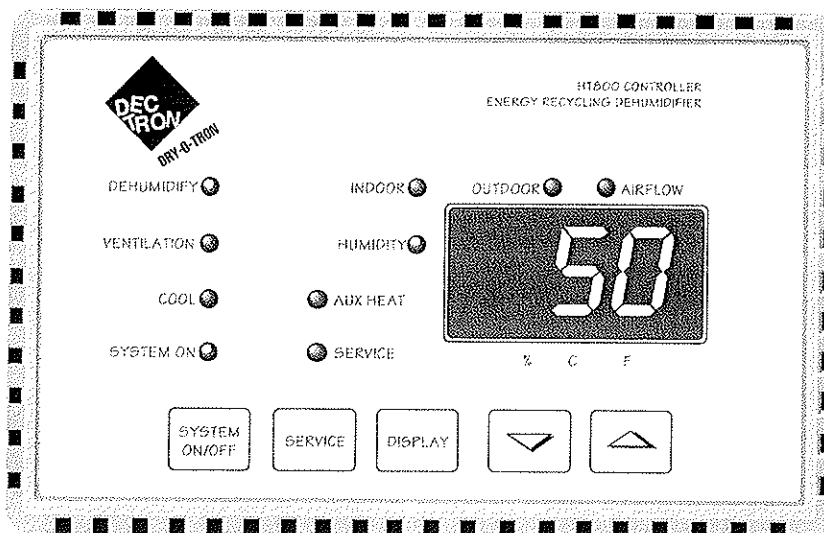
## DA3 Units (HT800 Controller)

Keys		Lights	Description
	Press and hold 5 seconds to turn on or off the DRY-O-TRON and auxiliary space heater. (Blower on/off control is optional).	SYSTEM ON	Indicates normal operation when on
	Press to display last error code or help code. (This code is displayed for 15 seconds).	SERVICE	Flashes to indicate a problem is detected (see diagnostic codes page 3.24)
	Press to view the indicated sensor on the display. (Note: 15 seconds after last touch INDOOR light goes on and indoor air temperature is displayed).	INDOOR HUMIDITY OUTDOOR AIRFLOW	Indoor air temperature Indoor air relative humidity Outdoor air temperature Filter efficiency (flashes when filter is dirty)
	Press once to view the indicated setpoint. Press again to decrease the setpoint indicated. Wait 15 seconds for the new setting to be confirmed (display will blink once). Do not remove the operator panel during this period!	INDOOR HUMIDITY OUTDOOR	Indoor air temperature set point (60 to 100 °F) Indoor humidity set point (20 to 80%) Ventilation set point (outdoor air temperature 55 to 90 °F) for optional economizer cooling. When outside air temperature is below this setpoint unit will activate ventilation on a call for cooling. When outside air temperature is above this setpoint unit will block ventilation and use built-in air conditioning on a call for cooling.
	Press once to view the indicated setpoint. Press again to increase the setpoint indicated. Wait 15 seconds for the new setting to be confirmed (display will blink once). Do not remove the operator panel during this period!	INDOOR HUMIDITY OUTDOOR	Indoor temperature set point (60 to 100 °F) Indoor humidity set point (20 to 80%) Ventilation set point (outdoor air temperature 55 to 90 °F)
Status Indicators:		DEHUMIDIFY VENTILATION COOL SYSTEM ON AUX HEAT	Dehumidification on Ventilation on (using outdoor air) Cooling on Normal operation Auxiliary space heater on

## DA4 Units

Control Device	Description
Humidistat	Adjust humidistat to desired setting. Note that humidistats are not recommended below 56 °F.
Remote ON/OFF switch	Turn unit on when humidity control is required.

# DA3/DA4 Operation



HT800 CONTROLLER (DA3 ONLY)

SYSTEM ON	Indicates that the DRY-O-TRON energy recycling dehumidifier is on and the blower is running.
DEHUMIDIFY	Indicates that the DRY-O-TRON is efficiently dehumidifying the space and recycling the energy where required. The DRY-O-TRON can heat or air-condition the space (DEHUMIDIFY, and COOL indicators can be on at the same time).
VENTILATION	The DRY-O-TRON can be equipped with a dry contact or power supply to control outdoor air ventilation for space cooling when required. Option packages are available which combine ventilation and air conditioning.
COOL	Air cooled conditioning is standard for all DRY-O-TRON DA3 Series units. A must for complete comfort control in the summertime. Intelligent air control options allow the customer to interlock ventilation with air conditioning to provide "free cooling" when outdoor conditions permit. (DEHUMIDIFY, and COOL indicators can be on at the same time).
AUX HEAT	During winter conditions, high building heat losses may necessitate the use of an auxiliary space heater, controlled by the DRY-O-TRON. Optional heaters are available from Dectron.
SERVICE	Flashes to indicate that the DRY-O-TRON unit requires service. Using an alarm code which appears on the LED display the owner or factory trained serviceman can diagnose everything from a clogged air filter to a failed component. Audible alarms are also available with the DRY-O-TRON. The HT800 electronic thermostat can be easily detached from the room location and plugged directly onto the DRY-O-TRON unit to simplify initial start-up as well as service diagnosis. In the unlikely event that service is required, built-in diagnostics help locate failed components quickly and reliably.
LED DISPLAY	Provides accurate and complete information about DRY-O-TRON operation, and allows the owner to adjust set-points with the touch of a button. Displayed functions include relative humidity level and setpoint, indoor air temperature and setpoint, outdoor air temperature and ventilation adjustment (with optional outdoor air sensor), optional airflow indicator (indicates when filter replacement is needed). Temperature displays can be in Celsius or Fahrenheit.



VIEW: FRONT  
VIEW  
DRAWING NO: DSHT8 - 03 - 4F

SCALE: 1:1  
US AND CANADIAN PATENTS

NET WEIGHT:  
DATE: JULY 04, 1992  
APPROVED: *RJR*

MODEL:  
HT800  
DA3 ONLY

The DRY-O-TRON technology is so far advanced that it requires virtually no maintenance.

**Air Filters**

The air filters should be checked once per month. Dirty filters should be changed immediately and replaced with identical filters which should be available locally. Clogged and dirty filters will seriously hamper the performance of the equipment.

For DA3 units with optional air flow sensor, follow calibration procedure (page 3.16) after changing filters.

**Blower Belt**

Check the belt for signs of wear and replace if severely worn or cracked. Check blower belt tension annually.

## If You Have a Problem...

Problem	Suggested Cause and Solutions
Dehumidifying coil iced up	<p>Blower turns backwards (3 phase Only).            Incorrect ductwork (if so equipped) creates stratification on air inlet.            Loose blower belt, adjust.            Low refrigerant charge, add refrigerant.            Low air flow, adjust (see page 3.16).            Dirty filters, replace.            Wrong filter with too much air resistance, replace with disposable type.            Return air too dry, adjust humidity setpoint.</p> <p>With return air temperature below 64 °F, this is normal. Unit should defrost automatically about every two hours (DA4 Only).            Check operation of defrost timer and hot gas valve solenoid, replace if defective (DA4 Only).            Obstruction at air inlet. Allow four feet minimum clearance between air inlet and nearest obstruction.</p>
High humidity	<p>Incorrect duct work (if so equipped) creates stratification on air inlet.            Obstruction at air inlet. Allow four feet minimum clearance between air inlet and nearest obstruction.            High air flow, adjust (see page 3.16).            Check humidity setpoint.            Low room temperature (DA3 Only).</p>
High head pressure	<p>Manual shut off valves(s) not fully open (if so equipped).            Non-condensable gases in system.            Outdoor condenser dirty or fan(s) not operating (DA3 Only).            Unit's air reheat coil dirty, clean.            Return air temperature or humidity too high.            System overcharged.            Remote air cooled condenser circuit too large for receiver in DRY-O-TRON (DA3 Only).            Insufficient remote condenser capacity (DA3 Only).            Low air flow, adjust (see page 3.16).            Do not operate unit above 80 °F, stops on high pressure control. (DA4 Only).            Restricted filter driers, replace (DA4 Only).</p>
Low head pressure	<p>Low refrigerant charge, add refrigerant.            Return air temperature or humidity too low.            Incorrect head pressure control valve setting (DA3 Only).            Do not operate unit below 35 °F due to low limit thermostat adjustment (DA4 Only).</p>

## If You Have a Problem...

Problem	Suggested Cause and Solutions
High suction pressure	<p>Incorrect duct work (if so equipped) creates stratification on air inlet.</p> <p>High air flow, adjust (see page 3.16).</p> <p>High room temperature.</p> <p>Return air temperature or humidity too high.</p> <p>Compressor defective. Verify amperage.</p>
Low suction pressure	<p>Low refrigerant charge, add refrigerant.</p> <p>Low air flow, adjust (see page 3.16).</p> <p>Dirty filters, replace.</p> <p>Return air too dry, check humidity setpoint.</p> <p>Low room temperature.</p> <p>Loose belt or pulley.</p>
Space too cold	<p>Check room thermostat adjustment.</p> <p>Verify auxiliary duct heater operation.</p> <p>Too much outdoor air.</p>
Space too warm	<p>Outdoor condenser dirty or fan(s) not operating (DA3 Only).</p> <p>Check room thermostat adjustment.</p> <p>Verify auxiliary duct heater operation.</p> <p>Check outdoor air ventilation mode (DA3 Only).</p>
Air discharge temperature too cold	<p>Check if unit is in air conditioning mode.</p> <p>Check A/C solenoid.</p>
Unit noisy	<p>Superheat adjustment incorrect. NOTE: Compressor discharge to be 160 °F to 200 °F.</p> <p>If noisy on start up only. Liquid refrigerant reaches compressor during start up. This may occur during the few seconds after start up and cannot be avoided. Verify crankcase heater.</p> <p>Whistling noise - may sound like blower bearings failure - may occur if access panels do not close properly.</p> <p>Blower ball bearing failure, replace.</p> <p>Loose belt or pulley, adjust.</p>
Unit runs continuously	<p>Incorrect duct work (if so equipped) creates stratification on air inlet.</p> <p>Low room temperature.</p> <p>High air flow, adjust (see page 3.16).</p> <p>Check room temperature setpoint.</p> <p>Check humidity setpoint.</p> <p>No damage will be caused by this condition.</p>



## If You Have a Problem...

Problem	Suggested Cause and Solutions
Compressor will not start	<p>Compressor crankcase full of liquid refrigerant. Check crankcase heater.</p> <p>Loose control or power wiring, tighten and check continuity.</p> <p>Anti-short cycle timer prevents start up, 3 to 10 minutes delay.</p> <p>Single phase units only: low voltage may require installation of high starting torque kit.</p> <p>Check control settings for humidity, and air temperatures.</p> <p>Open thermal compressor protection. Allow one hour for compressor to cool.</p> <p>Defective 24V control voltage transformer, replace.</p> <p>Manual reset required for high pressure, low pressure, oil failure and thermal overheat (if so equipped).</p> <p>Defective motor wiring.</p> <p>Defective fuse, replace.</p> <p>This is normal if space below 35 °F (DA4 Only).</p> <p>Unit stopped on defrost control (DA4 Only).</p> <p>Check operation of defrost timer, replace if defective. Green light goes "on" means normal operating mode. Red light "on" means unit in defrost cycle, compressor and blower not running is normal during defrost (DA4 Only).</p> <p>Unit off or no power supplied.</p>

## HT800 Diagnostics (DS-010 to DS-080)

When a problem is detected, the service light flashes. Press the SERVICE key to view the service code.

If the problem disappears the light goes off, but the error code is kept in memory and can be seen by pushing the SERVICE key.

Press and hold the SERVICE key for 5 seconds to erase the last error code.

The service codes are:

- 1 = Communication fault
- 2\* = Filter blocked
- 3\* = High pressure fault (3rd time within 15 minutes)
- 4\* = Low pressure fault (3rd time within 15 minutes)
- 5\* = High pressure fault
- 6\* = Low pressure fault
- 9\* = High limit evaporator air temperature (over 60°F for 5 minutes)
- 10\* = Low limit evaporator air temperature (lower than 35°F for 3 minutes)
- 13 = A/C water pressure fault
- 14 = Outdoor air temperature sensor fault
- 19 = Supply air temperature sensor fault
- 20 = Evaporator air temperature sensor fault
- 21 = Return air temperature sensor fault
- 22 = Humidity sensor fault
- 23 = HT800 temperature sensor fault
- 24 = System "OFF" more than 10 minutes.
- 90 = High pressure (momentary)
- 91 = Low pressure (momentary)
- 92 = 15 minutes delay after a momentary high pressure
- 93 = 15 minutes delay after a momentary low pressure
- 94 = 3 minutes compressor anti-cycling delay
- 95 = System "OFF" less than 10 minutes.
- 96 = No demand
- 97 = Ventilation (low outdoor temperature)
- 00 = Compressor will start





\*After these faults have been repaired, reset the DRY-O-TRON by switching "OFF" then "ON" again using the SYSTEM ON/OFF key.

When servicing the DRY-O-TRON unit, the HT800 controller can be removed from the pool room and mounted on the DRY-O-TRON unit.

After servicing, return the HT800 controller to its location in the pool room and reinstall the blank cover to protect the baseplate on the DRY-O-TRON.

Whenever the HT800 controller is moved, follow the set-up instructions on page 3.15 and 3.16 (concerning location of operator panel) to ensure proper operation.

## Service Functions

Keys	Lights	Description
 <p style="text-align: center;">And</p>  <p>Press both keys and hold for three seconds.</p>		Bypass the 3 minute compressor anti-cycling delay and 15 minute high/low pressure delay.
 <p style="text-align: center;">And</p>  <p>Press both keys until the SERVICE light comes on. Press the DISPLAY key to view the indicated sensor on the display.</p>	INDOOR HUMIDITY OUTDOOR AIRFLOW	Indoor air temperature Evaporator air temperature Supply air temperature Future use

**absolute zero:** the zero point on the absolute temperature scale, 459.69 degrees below the zero of the Fahrenheit scale, 273.16 degrees below the zero of the Centigrade scale.

**absorption:** a process whereby a material extracts one or more substances present in an atmosphere or mixture of gases or liquids; accompanied by physical change, chemical change, or both, of the material.

**activated alumina** a form of aluminum oxide which absorbs moisture readily and is used as a drying agent.

**adsorption:** the action, associated with surface adherence, of a material in extracting one or more substances present in an atmosphere or mixture of gases and liquids, unaccompanied by physical or chemical change.

**air, ambient:** generally speaking, the air surrounding an object.

**air conditioning:** the process of treating air so as to control simultaneously its temperature, humidity, cleanliness, and distribution to meet the requirements of the conditioned space.

**air cooling:** reduction in air temperature due to the subtraction of heat as a result of contact with a medium held at a temperature lower than that of the air. Cooling may be accompanied by moisture addition (evaporation), by moisture extraction (dehumidification), or by no change whatever of moisture content.

**air, outdoor:** air taken from outdoors and, therefore, not previously circulated through the system.

**air, recirculated:** return air passed through the conditioner before being again supplied to the conditioned space.

**air, return:** air returned from conditioned or refrigerated space.

**air, saturated:** moist air in which the partial pressure of the water vapor is equal to the vapor pressure of water at the existing temperature. This occurs when dry air and saturated water vapor

coexist at the same dry-bulb temperature.

**air standard:** air with a density of 0.075 per cu ft and an absolute viscosity of  $0.0379 \times 10^{-5}$  lb mass per ft-sec. This is substantially equivalent to dry air at 70°F and 29.2 in. Hg barometric pressure.

**air, supply:** the quantity of air delivered to each or any space in the system, or the total delivered to all spaces in the system.

**alternating current (ac):** current flow which is constantly changing in amplitude and reversing its direction at regular intervals.

**ampere:** a unit of intensity of electrical current produced in a conductor by an applied voltage.

**ASHRAE:** American Society of Heating, Refrigeration, and Air Conditioning Engineers.

**barometer:** an instrument used for measuring atmospheric pressure.

**boiling point:** the temperature at which the vapor pressure of a liquid equals the absolute external pressure at the liquid-vapor interface.

**British Thermal Unit (Btu):** the heat required to raise the temperature of 1 pound of water 1°F.

**BTUH:** British Thermal Unit per Hour.

**buck and boost:** stepdown and stepup (transformer).

**bypass:** a pipe or duct, usually controlled by valve or damper, for conveying a fluid around an element of a system.

**calibration:** the process of dividing and numbering the scale of an instrument; also of correcting or determining the error on an existing scale, or of evaluating one quantity in terms of the readings of another.

**calorie:** the heat required to raise the temperature of 1 gram of water 1°C

from 4°C to 5°. Mean calorie = 1/100 part of the heat required to raise 1 gram of water from 0° to 100°C.

**calorimeter:** a device for measuring heat quantities, such as machine capacity, heat of combustion, specific heat, heat leakage, etc. Also a device for measuring quality (or moisture content) of steam or other vapors.

**capacity:** the usable output of a system or system component in which only losses occurring in the system or component are charged against it.

**capacity, heat:** the amount of heat necessary to raise the temperature of a given mass one degree. Numerically, the mass multiplied by the specific heat.

**capillary tube:** in refrigeration, a tube of small internal diameter used as a liquid refrigerant flow control or expansion device between high and low sides; also used to transmit pressure from the sensitive bulb of some temperature controls to the operating element.

**Celsius (C):** a thermometric scale in which the freezing point of water is called 0 degrees and its boiling point 100 degrees at normal atmospheric pressure (14.696 psia).

**change of state:** change from one phase, either solid, liquid, or gas, to another.

**charge:** amount of refrigerant in a system; to put in the refrigerant charge.

**coil:** a cooling or heating element made of pipe or tubing.

**comfort chart:** a chart showing effective temperatures with dry-bulb temperatures and humidities (and sometimes air motion) by which the effects of various air conditions on human comfort may be compared.

**compression:** in a compression refrigeration system, a process by which the pressure of the refrigerant is increased.

**compressor, centrifugal:** a non-

positive displacement compressor which depends for pressure rise, at least in part, on centrifugal effect.

**compressor, reciprocating:** a positive displacement compressor with a piston or pistons moving in a straight line but alternately in opposite directions.

**compressor, rotary:** one in which compression is attained in a cylinder by rotation of a positive displacement member.

**condensation:** the process of changing a vapor into liquid by the extraction of heat. Condensation of steam or water vapor effected in either steam condensers or in dehumidifying coils and the resulting water is called condensate.

**condenser:** a vessel or arrangement of pipe or tubing in which a vapor is liquefied by removal of heat.

**conductor:** a material which gives up free electrons easily and offers little opposition to current flow.

**control:** any device for regulation of a system or component in normal operation, manual or automatic. If automatic, the implication is that it is responsive to changes of pressure, temperature, or some other property whose magnitude is to be regulated.

**convection:** transfer of heat by movement of a fluid.

**critical point:** the point at which the liquid and vapor of a substance have identical properties; critical temperature, critical pressure and critical volume are the terms given to the temperature, pressure and volume at the critical point.

**current:** the flow of electrons through a circuit.

**current, induced:** the electric current produced by moving a conductor in a magnetic field.

**cycle:** one complete movement of an ac wave from 0 to 360°; on and off operation of an air conditioner (e.g.,

cycling on and off due to a malfunction).

**cycle, refrigeration:** the complete course of operation of refrigerant back to a starting point, as evidenced by: a repeated series of thermodynamic processes, or flow through a series of apparatus, or a repeated series of mechanical operations.

**dehumidification:** the condensation of water vapor from air by cooling below the dewpoint, or the removal of water vapor from air by chemical or physical methods.

**density:** the ratio of the mass of a specimen of a substance to the volume of the specimen. The mass of a unit volume of a substance. When weight can be used without confusion, as synonymous with mass, density is the weight per unit volume.

**desiccant:** any absorbent or adsorbent, liquid or solid, that will remove water or water vapor from a material. In a refrigeration circuit the desiccant should be insoluble in the refrigerant.

**dewpoint:** see temperature, dewpoint.

**differential (of a control):** the difference between cut-in and cut-out temperatures or pressures.

**direct current (dc):** current that always flows in the same direction through a circuit.

**drier:** a device containing a desiccant, placed in the refrigerant circuit; its primary purpose being to collect and hold within the desiccant all water in the system in excess of the amount which can be tolerated in the circulating refrigerant.

**duct:** a passageway made of sheet metal or other suitable material, not necessarily leak-tight, used for conveying air or other gas at low pressures.

**evaporation:** change of state from liquid to vapor.

**evaporative cooling:** the exchange of heat between air and a water spray

or wetted surface. The water approaches the wet-bulb temperature of the air, which remains constant.

**evaporator:** that part of a refrigerating system in which the refrigerant is vaporized to produce refrigeration.

**expansion, dry:** a process of heat removal by a refrigerant in an evaporator fed by a flow control, responsive to temperature or pressure or both at some point in the evaporator, or to the difference between high and low side pressures, and not to the liquid level in the evaporator.

**Fahrenheit (F):** a thermometric scale in which 32° denotes freezing point and 212° the boiling point of water under normal pressure at sea level (14.696 psia).

**filter:** a device to remove solid material from a liquid.

**Flammability:** a material's ability to burn.

**flash gas:** the gas resulting from the instantaneous evaporation of refrigerant in a pressure-reducing device designed to cool the refrigerant.

**flash point:** the temperature of combustible material, as oil, at which there is a sufficient vaporization to ignite the vapor, but not sufficient vaporization to support combustion of the material.

**fluid:** gas or liquid.

**freezing point:** the temperature at which a given fluid will solidify or freeze upon removal of heat. The freezing point for water is 32°F, or 0°C.

**frequency:** the number of cycles per second, given in the unit hertz (Hz).

**gas:** usually a highly superheated vapor which, within acceptable limits of accuracy, satisfies the perfect gas laws.

**halide torch:** a flame tester generally using alcohol and burning with a blue flame; when the sampling tube draws in halocarbon refrigerant vapor, the color of the flame changes to bright

green.

**halogen:** a non-oxygenated chemical that forms salts by direct union with metals.

**heat:** the form of energy that is transferred by virtue of a temperature difference.

**heat, latent:** change of heat content during a change of state. With pure substance, latent heat is absorbed or rejected at constant pressure.

**heat, sensible:** heat which is associated with a change in temperature, in contrast to a heat interchange in which a change of state (latent heat) occurs.

**heat, specific:** the ratio of the quantity of heat required to raise the temperature of a given mass of any substance one degree to the quantity required to raise the temperature of an equal mass of a standard substance (usually water at 59°F) one degree.

**heat exchanger:** a device specifically designed to transfer heat between two physically separated fluids.

**heat of fusion:** latent heat involved in the change between solid and liquid states.

**heat of vaporization:** latent heat involved in the change between liquid and vapor states.

**high side:** parts of a refrigerating system subjected to condenser pressure or higher.

**horsepower (hp):** unit of energy; equivalent to 76 watts, 2,545 Btuh.

**humidifier:** a device to add moisture to air.

**humidify:** to add water vapor to the atmosphere; to add water vapor or moisture to any material.

**humidity:** water vapor within a given space.

**humidity, relative:** approximately, the ratio of the partial pressure or den-

sity of the water vapor in the air, to the saturation pressure or density of water vapor at the same temperature.

**humidity, specific:** weight of water vapor (steam) associated with one pound of dry air; also called the humidity ratio.

**insulation, thermal:** a material having a relatively high resistance to heat flow, and used principally to retard the flow of heat.

**insulator:** a material which does not give up free electrons easily and offers great opposition to current flow.

**liquid line:** the tube or pipe carrying the refrigerant liquid from the condenser or receiver of a refrigerating system to a pressure reducing device.

**load, estimated design:** in a heating or cooling system, the sum of the useful heat transfer, plus heat transfer from or to the connected piping, plus heat transfer occurring in any auxiliary apparatus connected to the system.

**low side:** parts of a refrigerating system at or below evaporator pressure.

**mass:** the quantity of matter in a body as measured by the ratio of the force required to produce given acceleration to the acceleration.

**Ohm:** basic unit of resistance measure equal to that resistance which allows 1 ampere of current flow when an emf (potential) of 1 volt is applied across the resistance.

**oil separator:** a device for separating oil and oil vapor from the refrigerant, usually installed in the compressor discharge line.

**power:** the rate of performing work. Common units are horsepower, Btuh, and watts.

**power factor:** the figure which indicates what portion of the current delivered to the motor is used to do work.

**preheating:** in air conditioning, to heat the air in advance of other

processes.

**pressure:** the normal force exerted by a homogeneous, liquid or gas, per unit of area, on the wall of its container.

**pressure, absolute:** pressure referred to that of a perfect vacuum. It is the sum of gauge pressure and atmospheric pressure.

**pressure, atmospheric:** the pressure due to the weight of the atmosphere. It is the pressure indicated by a barometer. Standard atmospheric pressure or standard atmosphere is the pressure of 76 cm of mercury having a density of 13.5951 grams per cu cm, under standard gravity of 980.665 cm per sec<sup>2</sup>. It is equivalent to 14.696 psi or 29.921 in. of mercury at 32°F.

**pressure, static:** the normal force per unit area that would be exerted by a moving fluid on a small body immersed in it if the body were carried along with the fluid. Practically, it is the normal force per unit area at a small hole in a wall of the duct through which the fluid flows or on the surface of a stationary Tube at a point where the disturbances, created by inserting the tube, cancel out.

**pressure, vapor:** the pressure exerted by a vapor. If a vapor is kept in confinement over its liquid so that the vapor can accumulate above the liquid, the temperature being held constant, the vapor pressure approaches a fixed limit called the maximum, or saturated, vapor pressure, dependent only on the temperature and the liquid. The term vapor pressure is sometimes used as synonymous with saturated vapor pressure.

**psychrometry:** the branch of physics relating to the measurement or determination of atmospheric conditions, particularly regarding moisture mixed with the air.

**purging:** the act of blowing out gas from a refrigerant-containing vessel, usually for the purpose of removing noncondensables.

**receiver:** a vessel permanently connected to a system by inlet and outlet pipes for the storage of condensed refrigerant.

**refrigerant:** a substance which produces a refrigerating effect by its absorption of heat while expanding or vaporizing.

**refrigerating system, mechanical:** a refrigerating system employing a mechanical compression device to remove the low-pressure refrigerant enclosed in the low-pressure side and deliver it to the high-pressure side of the system.

**resistance:** opposition offered by a material to the flow of current.

**rotor:** the rotating section of a motor.

**saturation:** the condition for coexistence in stable equilibrium of a vapor and liquid or a vapor and solid phase of the same substance. Example: steam over the water from which it is being generated.

**serpentine:** doubling the tube in an evaporator back upon itself several times to increase length in a short space.

**sight glass:** glass tube used to indicate the liquid level in pipes, tanks, bearings and similar equipment.

**silica gel:** a form of silicon dioxide which adsorbs moisture readily and is used as a drying agent.

**sine wave:** a curve of theoretically pure ac.

**solenoid:** an electromagnet with an energizing coil around a plunger. The plunger moves when current is applied to the coil.

**stator:** the stationary section (field coil) of a motor.

**sub-base:** separate plate in a thermostat that holds all the components.

**subcooling:** the process of cooling refrigerant below condensing temperature, for a given pressure; also, cooling

a liquid below its freezing point, where it can exist only in a state of unstable equilibrium.

**temperature:** the thermal state of matter with reference to its tendency to communicate heat to matter in contact with it. If no heat flows upon contact, there is no difference in temperature.

**temperature, critical:** the saturation temperature corresponding to the critical state of the substance at which the properties of the liquid and vapor are identical.

**temperature, dewpoint:** the temperature at which the condensation of water vapor in a space begins for a given state of humidity and pressure as the temperature of the vapor is reduced. The temperature corresponding to saturation (100 percent relative humidity) for a given absolute humidity at constant pressure.

**temperature, dry-bulb:** the temperature of a gas or mixture of gases indicated by an accurate thermometer after correction for radiation.

**temperature, ejective:** an arbitrary index which combines into a single value the effect of temperature, humidity, and air movement on the sensation of warmth or cold felt by the human body. The numerical value is that of the temperature of still, saturated air which would induce an identical sensation.

**temperature, wet-bulb:** thermodynamic wet bulb temperature is the temperature at which liquid or solid water, by evaporating into the air, can bring the air to saturation adiabatically at the same temperature. Wet-bulb temperature (without qualification) is the temperature indicated by a wet-bulb psychrometer constructed and used according to specification.

**thermostat:** automatic heating-cooling control.

**ton of refrigeration:** a useful refrigerating effect equal to 12,000 Btu per hour; 200 Btu per min.

**vapor, superheated:** vapor at a temperature which is higher than the

saturation temperature (i.e. boiling point) at the existing pressure.

**triple point:** the temperature at which three phases of given substance (solid, liquid, and gas) exist in equilibrium at atmospheric pressure.

**vapor:** a gas, particularly one near to equilibrium with the liquid phase of the substance, which does not follow the gas laws. Usually used for a refrigerant, and in general for any gas below the critical temperature.

**voltage:** electromotive force (emf). It is a force which, if applied to a closed circuit, will produce a current in the circuit.

**zone, comfort:** average - the range of effective temperatures over which the majority (50% or more) of adults feel comfortable. Extreme - the range over which one or more feel comfortable.

# DRY-O-TRON DA3 and DA4 Series Start-up Report & Warranty Registration

**Warranty void unless completed and a copy returned to Dectron immediately after start-up!**

Installation Name .....

Installation Address .....

Dectron Representative .....

Model # ..... Serial # .....

Compressor Serial # ..... Belt Size .....

Electrical power	L1 - L2	L2 - L3	L1 - L3	Nameplate
Blower amperage				
Blower voltage				
Compressor amperage				
Compressor voltage				

Proper duct design provided? <input type="checkbox"/>	Condensate pump installed properly? <input type="checkbox"/>	Wire connections checked for tightness? <input type="checkbox"/>
Minimum 4 ft. clearance on return side of unit (when no return duct used)? <input type="checkbox"/>	Main disconnect switch installed? <input type="checkbox"/>	Start-up check lists complete? <input type="checkbox"/>
Vapor retardant installed properly? <input type="checkbox"/>	Compressor service valves opened? <input type="checkbox"/>	Crankcase heater working? <input type="checkbox"/>
Adequate service access provided? <input type="checkbox"/>	Clean air filters installed? <input type="checkbox"/>	Blower rotation on 3-phase units correct? <input type="checkbox"/>
Units level and vibration isolated? <input type="checkbox"/>	Coils are clean? <input type="checkbox"/>	Air flow and blower speed adjusted? <input type="checkbox"/>
Flexible duct installed at inlet and outlet of DRY-O-TRON? <input type="checkbox"/>	Outdoor air-cooled condenser installed properly? <input type="checkbox"/>	Refrigerant charge OK? <input type="checkbox"/>
Condensate drain connected and P-trap filled? <input type="checkbox"/>	Operator controls installed properly? <input type="checkbox"/>	No fault codes are displayed on operator panel (DA3 Only)? <input type="checkbox"/>
Condensate drain tested? <input type="checkbox"/>	Outdoor temperature sensor installed (DA3 Only)? <input type="checkbox"/>	Setpoints are at design conditions? <input type="checkbox"/>
		Air flow ..... cfm

Outdoor air cooled condenser location      Above D.O.T.       Below D.O.T.       Same level as D.O.T.

Refrigerant connection.....Hot gas .....Liquid      Pipe length from D.O.T. to condenser .....

# DRY-O-TRON DA3 and DA4 Series Start-up Report & Warranty Registration

**Warranty void unless completed and a copy returned to Dectron immediately after start-up!**

## Operational Data

**NOTE: To Obtain Adequate Readings, a Delay of Ten (10) Minutes is Required Between Every Operation or Adjustment**

		Dehumidification	A/C
Entering Air Temperature	°F		
Leaving Air Temperature	°F		
Room Relative Humidity	%		
High Pressure	PSIG		
Suction Pressure	PSIG		
Oil Pressure	PSIG		
Sight Glass Clear (DA3 Only)	(Y/N)		
Bulb Temperature TX Valve (DA3 Only)	°F		
Compressor Discharge Temp	°F		
Air Leaving Evaporator Temp	°F		

Comments: .....

.....

.....

Form completed by.....Signature.....

Company Name.....

Date.....Telephone ( ).....



## Terms of Limited Warranty

### DRY-O-TRON Energy Recycling Dehumidifiers (packaged units) and Factory Supplied Accessories

#### General

Dectron Inc. warrants as set forth and for the time periods shown below that it will furnish to the original owner, through a Dectron Inc. authorized installing contractor or service organization, a new or rebuilt part for a part which has failed because of a defect in workmanship or material. Dectron Inc. reserves the right to apply handling and inspection charges in the case of parts or equipment improperly returned as defective whether under warranty or not.

#### Registration and Start-Up Report

Warranty void unless upon start-up of the unit the "Start-up Report and Warranty Registration" is completed and sent to the factory within one week of initial start-up. This will also register the compressor warranty with the compressor manufacturer.

#### Initial 30 Days Warranty

During the first 30 days from initial start-up and subject to prior approval from the factory Dectron Inc. will provide and/or reimburse the required labor, materials, and shipping costs incurred in the replacement of a defective part.

#### Remainder of One-Year Warranty

Upon expiry of the initial 30 days warranty, and until completion of the twelfth month from date of unit start-up, or 15 months from date of shipment from Dectron Inc., whichever is earlier, if any part supplied by Dectron Inc. fails because of a defect in workmanship or material Dectron Inc. will furnish a new or rebuilt part F.O.B. factory. No reimbursement will be made for expenses incurred in making field adjustments or replacements unless specifically approved by Dectron Inc. in writing beforehand.

#### Applicability

This warranty is applicable only to products that are purchased and retained in the United States and Canada. This warranty is not applicable to:

- Δ Products that have become defective or damaged as a result of the use of a contaminated water circuit or operation at abnormal water temperatures and/or flow rates.
- Δ Parts that wear out due to normal usage, such as air filters, belts, fuses and refrigerant.
- Δ Products that have been moved from the location where they were first installed.
- Δ Any portion of the system not supplied by Dectron Inc.
- Δ Products on which the model and/or serial number plates have been removed or defaced.
- Δ Products on which payment is in default.
- Δ Products which have become defective or damaged as a result of unauthorized opening of refrigerant circuit, improper wiring, electrical supply characteristics, poor maintenance, accidents, transportation, misuse, abuse, fire, flood, alteration and/or misapplication of the product.
- Δ Products operated without clean, properly installed air filters.
- Δ Products not installed, operated and maintained as per the applicable Dectron Inc. Owner's Manual.

#### Transportation Costs

After the initial 30-day warranty period has expired, charges covering transportation of the defective part(s) to

Dectron Inc. from the customer site and replacement part(s) from Dectron Inc. to the customer site are not covered by this warranty.

#### Limitations

This warranty is given in lieu of all other warranties. Anything in the warranty notwithstanding, any implied warranties of fitness for particular purpose and merchantability shall be limited to the duration of this express warranty. Manufacturer expressly disclaims and excludes any liability for consequential or incidental damage for breach of any express or implied warranty.

Where a jurisdiction does not allow limitations or exclusions in a warranty, the foregoing limitations and exclusions shall not apply to the extent of legislation, however, in such case the balance of the above warranty shall remain in full force and effect.

This warranty gives specific legal rights. Other rights may vary according to local legislation.

#### Obtaining Warranty Service

Normally, the DECTRON INC. AUTHORIZED CONTRACTOR who installed the products will provide warranty service to the owner. Should the installing contractor be unavailable, contact your local Dectron Inc. representative or the factory.

#### Force Majeure

Dectron Inc. will not be liable for delay or failure to provide warranty service due to government restrictions or restraints, war, strikes, material shortages, acts of God or other causes beyond Dectron Inc. control.

#### Optional Second to Fifth Year Compressor Warranty

Under this warranty a replacement compressor will be supplied at Dectron Inc.'s expense, provided the failed

## Terms of Limited Warranty

### DRY-O-TRON Energy Recycling Dehumidifiers (packaged units) and Factory Supplied Accessories

compressor is returned to the factory with transportation prepaid. This extended compressor warranty is subject to all the terms of the standard DRY-O-TRON warranty but applied to the compressor only. This extended warranty must be purchased before shipment of the unit.

#### Optional Delayed Start-up Warranty

Under this warranty upon expiry of the initial 30 days warranty, and until completion of the twelfth month from date of unit start-up, or 24 months from date of shipment from Dectron Inc., whichever is earlier if any part supplied by Dectron Inc. fails because of a defect in workmanship or material Dectron Inc. will furnish a new or rebuilt part F.O.B. factory. No reimbursement will be made for expenses incurred in making field adjustments or replacements unless specifically approved by Dectron Inc. in writing beforehand.

The optional delayed start-up warranty is only valid if all of the following conditions are met:

- Δ Water or condensation are not allowed to enter the electrical panel.
- Δ Indoor units are stored in a dry and protected area.
- Δ Electrical power must not be connected.
- Δ Unit not tampered with or vandalized in any fashion.
- Δ Start-up Report and Warranty Registration is completed and sent to the factory within one week of initial start-up.

This optional delayed start-up warranty is subject to all the terms of the standard DRY-O-TRON warranty. This extended warranty must be purchased before shipment of the unit.

U.S.A.

#### **DECTRON INC.**

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