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### **RENOVATION OF BUILDING M-231** CONTRACT NO. N62470-88-C-3764

Transmittal No.	105
Item No.	

#### **OPERATION & MAINTENANCE MANUAL DIVISION 15 - MECHANICAL**

General Contractor:

Mechanical Subcontractor:

C.B.C. Enterprises, Inc. 1312 E. Little Creek Road Norfolk, Virginia 23518 (804) 588-6100

G. R. Michaels & Co. 331 32nd Street Newports News, Virginia 23607 (804) 245-9173

## C. B. C. ENTERPRISES, INC.

It is hereby certified that the (equipment) (meterial) shows and marked in this submitter is that proposed to be incorporated into Contract No. 88-1-37VA-( ) is in compliance with the Contract drawings

and specifications and is submitted for Government approval

( ) is a deviation from the Contract drawings and specif stions and is submitted for Government opproval and can be institle the alloger Certified by

Date 11 15



OPERATION AND MAINTENANCE

Renovation of Building M-231 Marine Corps Base Camp Lejeune, North Carolina Contract: N62470-88-C-3764

> G.R. Michaels & Co. 331 32nd Street Newport News, Virginia





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Renovation of Building M231 Marine Corps Base Camp Lejeune, NC Contract: N62470-88-C-3764

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- Operating and Maintenance Instruction Hot Water Storage Heaters
- Operation and Installation Fans
- 5. Installation, Operation and Maintenance Air Cooled Chiller
- 6. Temperature Control System Operation & Maiteneance
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#### Electric Water Coolers

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CBC Enterprises, Inc. 1312 E. Little Creek Road Norfolk, Virginia Phone: (804) 588-6100

Mechanical Contractor:

G.R. Michaels & Co. 331 32nd Street Newport News, Virginia Phone: (804) 622-3099 Mr. Terry Gregston

Wholesaler and Supplier:

Ferguson Enterprises, Inc. 600 Rotary Street Hampton, Virginia (804) 826-5300 Steve Saunders



# **INSTALLATION & SERVICE INSTRUCTIONS**





## • WATER COOLERS

## • BOTTLE WATER COOLERS

# PACKAGED WATER CHILLERS

















## INTRODUCTION

This manual is prepared as a guide to the periodic inspection and general servicing of water coolers. It is intended for use in routine maintenance and minor servicing, but not for the repair of the refrigeration system. A cooler in warranty which has a refrigeration befect must be repaired by an authorized service center, or by the factory, whichever is determined by your local sales representative. If you are not familiar with the name and phone number of service personnel in your area, we will be happy to supply this information upon request.

## START-UP PROCEDURE

#### INSTALLATION

- Insure proper ventilation by maintaining 4" clearance from cabinet louvers to wall on each side of cooler.
- Water inlet 3/8" IPS. Waste 1-1/4" O.D. tailpiece for slip trap. Contractor to supply waste trap in accordance with local codes.
- Connecting lines to be of copper or brass, thoroughly flushed to remove all foreign matter before connected to cooler. If flushing does not remove all particles, a water strainer should be installed in supply lines.
- 4. Connect cooler to building supply line with a shut-off valve and install a union connection between the valve and cooler.
- 5. Electrical: Insure power supply is identical to that specified on cooler serial plate.

NOTE: As a preventive measure, a water line strainer should be installed ahead of the inlet water

connection whether the installation is made on new or old plumbing. The strainer will prevent clogging water lines and bubbler valves.

#### START-UP

- 1. Release air from tank by holding button down. Steady stream flow assures all air removed.
- Stream height is factory set at 35 PSI. If supply pressure varies greatly, stream height will need adjustment. (See service procedure page 3.)

These products are designed to operate on 20 psig to 105 psig supply line pressure. If inlet pressure is above 105 psig, a pressure regulator must be installed in the supply line. Any damages caused by reason of connecting this product to supply line pressures lower than 20 psig or higher than 105 psig is not covered by warranty.

- On H models (hot tank), depress lever and assure full stream flow. DO NOT connect electrical power until full water flow is assured.
- 4. Rotate condenser fan blade to insure proper clearance and free fan action. (Not required on all models.)

## PRINCIPLE OF OPERATION

#### **REFRIGERATION CYCLE**

The cycle of operation of the refrigeration system for the water coolers is as follows: Hot, high pressure refrigerant vapor is pumped by the compressor through the discharge tube of the compressor. In passing through the condenser, the vapor gives up some of its heat to the room air and condenses to liquid. The liquid refrigerant passes out the bottom of the condenser, through a drier and capillary tube into a larger tube which is coiled and bonded to the water storage tank. In removing heat from e water, the liquid refrigerant is boiled off into two pressure vapor which flows through the suction tube, to the compressor. The temperature control bulb is located in a control well which extends outside the water tank. In this position, the control is made responsive to the temperature of both the water and refrigerant.

#### WATER COOLING CYCLE

The water cooling cycle is as follows:

The building water supply enters the cooler through the inlet water connection of the cooler. When in the cooling tank, the water is cooled by contact with the refrigerated walls of the tank.





#### CLEANING STAINLESS STEEL AND BRONZETONE BASINS

Clean stainless steel and bronzetone surfaces with only a mild detergent or vinegar and water. Rinse well with clean water and wipe dry with a soft cloth. Any misuse or abrasion can eventually damage the finish. (Never use steel wool or other types of abrasive pads.)

Note: Cleaning abrasives, strong solutions and chemicals will damage the basin. The manufacturer is not liable for the finish beyond the date of installation.

#### CLOGGED WATER LINES AND STREAM HEIGHT ADJUSTMENT

NOTE: The following procedure requires that you make provisions for catching water that might damage customer's premises.

Insufficient bubbler stream or no stream may be caused by a clogged water line. It may also be caused by an in-operative bubbler cartridge assembly or one that requires cleaning or adjustment.



CUTAWAY VIEW BUBBLER CARTRIDGE ASSEMBLY

- 1. Remove hex nut, and button.
- Attempt to adjust stream height by inserting screw driver blade into bubbler cartridge adjusting screw and turn right to raise. Push down on cartridge spring housing and observe stream.
- If the stream height has not increased, shut off water inlet valve and unscrew the bubbler cartridge retainer nut. Lift out the bubbler cartridge. Open water inlet valve, making provision to catch water at cartridge body housing. If full flow of

water is obtained from the valve body, shut off water inlet valve, disassemble and clean bubbler cartridge assembly or install replacement.

If still little or no water flow, disconnect building supply line to cooler, remove stainer located inside 3/8" female fitting - clean or replate strainer. Reinstall supply line, check and adjust stream height.

#### **CLEANING CONDENSER**

Accumulations of lint and dust on condenser reduces cooling capacity and affects economy of operation. Cooler should be kept free of such accumulations by use of vacuum cleaner, stiff bristle brush, or supply of compressed air. To clean:

- 1. Remove front panel and unplug service cord from electrical outlet
- Insert vacuum cleaner nozzle or brush between blades of fan, turning blades as necessary and taking care not to bend blades or damage fin surface. (Condenser fan not used on all models.)
- 3. Clean cabinet side louvers at outlet side of condenser.

#### PREPARING COOLER FOR SHIPMENT OR STORAGE

All water in the cooler, connecting tubing and fittings should be drained from cooler before it is shipped or stored. If this is not done, serious damage from freezing may result.

#### DRAINING WATER FROM COOLING TANK

- 1. Disconnect power supply and plumbing connections. If necessary, move cooler to location where water spill will not cause damage.
- 2. Remove plug from tank drain.
- Depress push-button to open bubbler valve, allowing air into tank to assist in draining water.

#### DRAINING WATER FROM HOT WATER TANK

- 1. Remove plug from tank drain.
- 2. Depress valve to assist in draining water.



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Before assuming a refrigeration system is defective, evaluate the cooling load of the unit. The load may be exceeding the capacity of the unit. Examine the installation and determine if adequate ventilation is being provided. Obstacles in the air stream or a dirty condenser will reduce cooling capacity. Check the electrical service. The supply voltage must be equal to the voltage specified on the data plate. After making the above checks and the proglem still exists, proceed as follows:





#### FAILURE ANALYSIS

The refrigeration system operates on demand of the cold control. If the cold control contacts remain closed and the refrigeration system continues to operate, any of the following conditions may exist:

- A. Cold control is defective.
- B. Refrigerant charge has partially or completely leaked out.
- C. Refrigerant circuit is restricted.
- D. Compressor is defective.
- E. Dirty condenser.

The refrigeration system starts but does not continue to operate, check the following conditions:

- A. Condenser fan motor is inoperative.
- B. Refrigerant circuit restricted or blocked.
- C. Running voltage more than 10% under rated voltage.
- D. Dirty condenser or restricted fan blade.

The refrigeration system does not start, check following conditions:

- A. Electrical power supply.
- B. Cold control is defective.
- C. Compressor electrical component(s) defective.
- D. Compressor defective.

Once the nature of the refrigeration system failure has been identified, the individual components should be checked in the order listed above. For example, if the refrigeration system does not start, first check the cold control (B) and so on until the defective part is found. The procedure for checking the various components is outlined in the reference paragraphs.

#### ELECTRICAL COMPONENTS

Cold Control-A cold control can fail in either the

open or closed contact position. Failure in the open position (compressor and condenser fan motor will not run and warm water is dispensed. Replace the control. Failure of the control in closed position (compressor and condenser fan motor run continuously and water freeze-up has occurred) indicates the contacts have fused together. Replace control.

Fan Motor (when used)-Check voltage at motor terminals. If motor is inoperable at rated voltage, replace. If motor does not come up to normal speed, disconnect electrical supply and turn fan by hand. Replace motor if motor does not turn freely after oiling.

Capacitor (when used)-While working on the electrical circuit, check the electrical system thoroughly before applying power. Improperly wired capacitors can burn out the compressor windings in one minute or less without the compressor protector tripping. Capacitor terminal with red dot or + should be connected to line side of circuit. A replacement capacitor must have an equal or higher voltage rating and a capacitance rating (M.F.D.) equal to that of the capacitor it replaces. We suggest replacement be ordered from factory.

Replacement start capacitors should be of the bleed resistor type. The bleed resistor prevents arcing across potential relay contacts. In an emergency situation when a bleed resistor capacitor is not available, purchase a two watt 15,000 ohm resistor and solder across the terminals of a properly rated capacitor for relay protection.

Compressor Relay-A compressor relay is designed to function with a specific compressor. Use only relay specified for compressor being used.

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**Compressor Protector - Overload**—Compressor protector is designed to trip on excessive temperature and/or current. Use only specified replacement overload protector.

#### REFRIGERANT SYSTEM

STEE TAPPING INTO THE REFRIGERATION STEEM WILL VOID WARRANTY UNLESS FAC-TORY AUTHORIZED

With a refrigeration system that operates electrically with little or no cooling effect, make the following observations before opening the system. Feel the compressor discharge line. A warm discharge line indicates the compressor is pumping. Inspect the capillary tube at the inlet and outlet connections. A frosted line indicates a partial loss of refrigerant or a restriction. Apply heat sparingly to the cold section of the capillary and allow the system to operate. Return to a normal operating condition



would indicate the restriction is caused by moisture in the system. A system restricted by moisture will eventually fail because of excessive acid buildup; therefore the system should be opened, flushed, evacuated, and recharged. If additional information about the refrigeration system is required, it will be necessary to tap into the refrigeration circuit. 2. E

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A low pressure reading would indicate a loss of the refrigerant charge or a restriction in the refrigerant circuit. To establish the difference, add a small amount of refrigerant (same type as specified on the data plate) in a gaseous form to the refrigerated circuit and compare gauge reading with refrigerant pressure-temperature chart. An increase in the pressure indicates an initial low charge or a leak in the system which will require repair. A continuing low pressure indicates a restriction which can be found in the manner previously described.

Leak Testing—With the system pressurized with refrigerant, check all joints and components with a leak detector capable of sensing a leak of .5 oz. per year. Once the leak is found, bleed the refrigerant from the system and repair using silver solder.

**Component Replacement**—to obtain maximum performance of refrigeration system after a repair, it is essential that all replacement components be identical to the factory supplied parts. Replacement parts lists are available for each model so that the correct parts can be obtained. In most units a parts list is attached to rear side of front panel.

## HOT WATER SYSTEMS



PRESSURE HOT WATER SYSTEM PRIOR TO 1980 PRESSURE HOT WATER SYSTEM AFTER 1980

Since all supply water has air and gases in solution, h are released when heated, the hot water system must be vented to relieve these gases. This is accomplished through the use of a double seating hot water valve. When the valve is closed to line pressure, the area above the seat and the hot water supply line is open to the atmosphere, therefore

#### 1. DESCRIPTION OF THE HOT WATER CIRCUIT

**Pressure Type**—A tee in the "Water In" connection supplies water to the hot water valve. As hot water is dispensed, the vent tube is closed, water flows to the bottom of the heater tank. The pressure of the water forces heated water from the top of the tank and through the dispensing valve.

**Bottle Type**—Water runs directly from the reservoir of the cooling unit to the bottom of the heater tank. Hot water is drawn from the top of the tank when dispensing valve is open.

CAUTION—Avoid overfilling water reservoir. After changing water bottles, depress cold water faucet until bubbler appears in bottle. This will insure correct water level. Over-filling the reservoir may cause boiling, over-heating, and possible damage to the water cooler.



#### 2. ELECTRICAL HEATING SYSTEM

An electrical heater element immersed in the heater rank is used as the source of heat. The temperature of the water is controlled by a thermostat to control a maximum temperature of 180°F. When provided, a thermal cut off is located on the heater tank for thermoection.

#### 3. SERVICING THE HOT WATER SYSTEM

#### Problem-No Hot Water

Solution A—Check the electrical supply to the heating system. When this is not the source of trouble, disconnect electrical supply and test each electrical component individually with an

ohm-meter for continuity. Replace part proved defective.

#### Problem-Water Too Hot

Solution A—The thermostat located in the machinery compartment is adjustable. Adjust to lower setting.

Solution B—The hot water tank may be cycling on the hot thermostat due to the thermostat setting to high or burnt contacts in the thermostat. With failure in adjustment of thermostat, replace thermostat. Models equipped with thermal cut off, may also require replacement.

## FOOT PEDAL MODELS

Foot pedal and valve linkages are normally trouble free, as they are made for easy operation and of the simplest design. Each model cooler has its own foot pedal and linkage design, but however, the maintenance and repair are similar.

When trouble is encountered with a reduced or restricted water flow, see page 2 — Stream Height

Adjustment before any changes are made in the linkage. This is normally the source of trouble.

All linkages are provided with a return spring which is adjustable. When linkage gives evidence of binding or noise in operation, lubricate the trouble spot with a light odorless, tasteless grease.

## AUTHORIZED REPAIR CENTER

hermetic refrigeration system of a cooler in warranty must never be opened in the field. Such repair work should be done at an authorized repair center.

If warranty has expired, the components of the refrigeration system can be field replaced. Extreme care has to be taken in cleanliness, dehydration, evacuation and charging of the system. Cleanliness is most important in servicing the refrigeration system, since dirt can contaminate or cause a restricted flow of refrigerant through the system.

Maximum care is maintained in the production of the cooler to assure a moisture level of 10 PPM or less. Moisture cannot be tolerated in the system, since it has an oxidizing effect on the refrigeration parts or may freeze the capillary exit blocking the flow of the refrigerant.

Precautions are also taken in manufacture to exclude air and non-condensibles from the system.

The system is swept with a refrigerant vapor and evacuated to 250 microns.

Charging of the system with refrigerant is critical. An overcharge causes the suction line to frost or sweat and may cause damage to the compressor.

The service centers attempting to service the refrigeration system in the field should have a vacuum pump capable of pumping down to 100 microns, a vacuum gauge capable of reading 10 microns, a Halogen leak detector capable of sensing a refrigerant lead of .5 ounces per year, a charging system capable of charging within 0.10 ounces by weight and a thorough knowledge of the refrigeration system.

It is highly recommended therefore, to have the cooler with an internal refrigeration defect repaired only at a factory authorized repair center.





3

#### WATER COOLER FEATURES

- Flexi-Guard.<sup>®</sup> Exclusive safety bubbler. Keyed in location to prevent rotation. Standard on all models with separate push-button controls.
- 2. Cascade<sup>®</sup> Basin. Splash-resistant. Multi-level deck design. One-piece nickel-bearing stainless steel.
- **3.** Separate Push-Button Control. Positioned to be sanitary and easily accessible.
- In-Line Flow Regulator. Automatically maintains constant stream height at line pressures of 20 to 105 P.S.I.
- 5. Glass-Filler. Optional. (Requires factory preparation.

NOTE: Models equipped for glass filler require pressurized cooling tank.

- Hot Water Dispenser. Optional. Insulated storage tank heats and serves up to 40 cups (6 oz.) of 180° water per hour.
- 7. Condenser Coil. Fin and tube type.
- 8. Fan Motor and Blade. Heavy duty. Permanently sealed and lubricated.
- **9.** Drain Outlet. 1¼-inch diameter by up to 4-inches long for hook-up to 1¼-inch slip joint fitting. Positioned for easy accessibility.
- **10.** Water Inlet Connection. %-inch female pipe thread for hook-up to incoming water line. Unobstructed for easy installation.
- **11.** Compressor and Motor. Hermetically sealed. Permanently lubricated. Factory tested.
- **12.** Non-Pressurized Cooling Tank. Combination tube-type. Tube portion is continuous coil of copper tubing. Tank is copper. Fully insulated with polyurethane foam which meets Underwriters' Laboratories requirements for self-extinguishing plastic. (U.L.-94HB)

Storage tank is subject to line pressure only when regulator button is pressed. In the unlikely event of a burst tank, only stored water would be released <u>not</u> the full line of flow

- 13. Pre-Set Cooler Control. Requires altitude adjustment only.
- Drier. Prevents internal moisture from contaminating refrigeration system.
- 15. Tank for hot water dispenser.
- 16. On-off switch for hot water dispenser.







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#### OPERATION & MAINTENANCE MANUAL

#### TACO EQUIPMENT

PROJECT: Building M231

LOCATION: Camp LeJeune, NC CONTRACTOR: G.R. Michaels - Newport News, VA WHOLESALER: Ferguson Enterprises, Inc. - Newport News, VA

> REPRESENTED BY: N.H. Yates & Co., Inc. 3923 Deep Rock Rd. Richmond, VA 23233




TACO BASE MOUNTED PUMPS

#### (SLEEVE AND BALL BEARING)

#### Plant ID No. 001-922

#### A-INSTALLATION

A3-PIPING

#### A1-LOCATION

Locate pump in an easily accessible place with sufficient space around it for maintenance and servicing. On larger pumps allow head room for the use of hoists or overhead cranes. Locate pump on a dry and clean place so that motor will be protected from moisture and dust.

On closed heating systems place compression tank at the suction side of the pump. When pump head is less than 20 feet, it is permissible to connect compression tank to discharge side of pump.

On open systems, install pump close to liquid supply and make suction piping as short and as straight as possible.

#### **A2-FOUNDATION**

The foundation serves to carry the pump weight and to absorb vibration. Normally, the foundation is made of concrete block, preferably tied in with the floor or ground. Make the foundation block about 4" longer and 4" wider than the base of the frame. Height of the block may vary from 2/3 to 1 times the *width* of the foundation (Fig. 1). When foundation is poured, provide a hole near each of the four (4) corners. To simplify installation and maintenance use lead Anchors. Place the front Anchor about 2" from the edge of the foundation to clear overhanging casings (Fig. 2).



Fig. 1-Foundation Block



Correct piping is of prime importance for the proper operation and long life of the pump. Stresses induced by piping will cause excessive wear of seals, bearings, and couplings that could ultimately destroy these elements.

Both suction and discharge piping should be suspended close to the pump connections, so that <u>no</u> pipe weight rests on the pump. Pipe flanges and pump flanges should align <u>perfectly</u> before connections are made, piping should never be drawn by force into place.

Thermal expansion of piping requires special attention on heating installations. If no room is provided for pipe expansion, stresses are induced in the piping that will exert a load on the pump. Forces created by pipe stresses can exceed by far the load exerted through pipe and water weight. Stress forces can distort pump, bend shafts, wear out seals, and impeller wear rings, and ultimately burn out bearings. To protect pump from thermal pipe stresses, provide spring hangers and flexible connectors that are suitable to compensate for pipe expansion. (See Fig. 3).

Install gate valves on both suction and discharge side of the pump to allow servicing without draining the system. Also provide a flanged nipple (spool) between gate valve and suction end of the pump to enable you to take the pump apart without disturbing piping (Fig. 3). In order to have them easily accessible, the pump and flange

On open pumping systems drawing water from a level below the pump (suction lift) install a foot valve with strainer. On open systems where the pump is located below the suction water level (suction head) install a check valve in the discharge line close to the pump.

nipples should not be covered with insulation.



Fig. 3-Typical Installation-Vertical Piping



#### A-INSTALLATION-Continued PRESSURE GAGE CHECK VALVE CHECK VALVE GATE VALVE PRESSURE GAGE PR

#### Fig. 3-Typical Installation-Horizontal Piping

#### A4-PUMP SETTING

When pump is set on its foundation, make sure to have it properly levelled. Place baseplate over foundation bolts provided for it, place shims at corners of baseplate when required and level with a spirit gauge. Tighten baseplate firmly to its foundations. Check also level of suction and discharge flanges.

#### A5-COUPLING ALIGNMENT

Proper alignment of pump and driver will assure trouble-free operation and long life of the pump. Misalignment will cause rapid wear of seals, couplings, and bearings. All pumps are carefully aligned before leaving the factory. However, experience indicates that alignment invariably changes in shipping and handling. Therefore, it is of utmost importance that alignment be checked at various steps of the installation process. i. e., after leveling, after piping, and after first few weeks of operation.

Check alignment by placing a slotted straight edge across the coupling halves at top, bottom, and at the sides. If any light is seen between the straight edge and one of the coupling flanges, it means the unit is out of alignment. (Fig. 4)

If light is seen at top and bottom position of the straight edge, alignment is out of height. Usually shims are placed under the motor feet. Loosen the four motor bolts, remove or add shims as required to correct proper height. Tighten the motor bolts and check to make sure alignment was corrected properly. If alignment is out on the sides of the coupling, loosen the four motor bolts and lightly tap the motor in the direction required. Tighten the four motor bolts and check to make sure alignment was corrected properly.

As alignment in one direction may alter the alignment in another, be sure to check all alignments made.



Fig. 4-Coupling Alignment

#### A6-CONNECTING PIPING

Piping may now be connected to pump. Make sure that pump and pipe flanges are strictly parallel and properly spaced for the gasket that will be used. Also check that pipes are supported properly and <u>do not</u> rest on pump flanges. <u>Never</u> draw pipes by force to pump flanges. Recheck alignment after piping connections are made. If misalignment was caused by piping, it is a sign that pipe stresses distorted the pump. Correct piping to relieve stresses.

#### B-PUMP START-UP & OPERATION

Before starting up pump for the first time several items are to be checked to avoid damaging pump.

#### **B1-LUBRICATION**

Sleeve Bearing pumps are filled with oil at the factory but some oil night be lost during shipment. As a matter of precaution, check oil level before starting up pump. Proper level is at the center of the sight glass. If oil level is too low, remove top cover (Fig. 5) and refill.

Drain and refill oil well once a year. Initial filling is Socony Mobil DTE Heavy Medium Oil, but any premi-

**Ball Bearing** pumps are greased at the factory. Grease with not flow out during shipment, so no checking will be required at startup.

Regrease ball bearings every two years or 3,000 hours of operation. Initial filling is LUBRIKO-grease, Density M31, manufactured by Master Lubricants Company, Philadelphia.

Any general purpose ball bearing grease No. 3 NLGI (National Lubricating Grease Institute) hardness may be used.

To grease bearings open side covers (Fig. 5), slide

um SAE Grade 20 Non-Detergent Motor Oil can be used.

Motor bearings also might loose oil during shipment. Check oil level as indicated on motor instruction. Electric motors have either an oil cup or a pipe plug for filling. An overflow is located at the side of the bearing area. Before starting unit, fill motor bearing with an oil can until oil flows out of overflow.

them about 1/2" to the side and introduce grease thru the opening with a putty knife. Fill grease chamber 2/3 high. Excessive grease causes unnecessary friction and will overheat bearing. If bearings run hot after regreasing, stop pump, open side cover, and wipe out excessive grease. Overheating will then cease.

Motor ball bearings also are greased at the factory. Grease should be replaced as indicated by motor manufacturer's instruction. Normally greasing is required every two years. On electric motors grease is usually introduced through a grease fitting with a grease gun.



#### **B-PUMP START-UP & OPERATION-Continued**



#### Fig. 5-Lubrication Points

#### **B2-MOTOR WIRING & SENSE OF ROTATION**

Check wiring of motor before starting to make sure that connections are wired properly for the voltage in use. Overvoltage can burn out motor windings. Check heater element in magnetic starter to see that it is rated the same as the motor.

#### AMP RATING

		IUN		
3 PH	ASE SQUIRR	EL CAGE IN	DUCTION	MOTORS
Motor	220	Volt	440	Volt
HP	1750 RPM	3450 RPM	1750 RPM	3450 RPM
1/4	1.0		.5	- <u>-</u>
1/3	1.4	1995 <u>-</u> 2996 - 19	.7	
1/2	1.8		.9	- 1987 -
3/4	2.4	2.2	1.2	. 1.1
1	3.6	3.4	1.8	1.7
11/2	4.8	4.6	2.4	2.3
2	6.2	5.6	3.1	2.8
3	9.0	8.0	4.5	4.0
5	14.4	13.4	7.2	6.7
71/2	20.0	19.2	10.0	9.6
10	26.4	25.6	13.2	12.8
15	39.0	38.0	19.5	19.0
20	51.0	50.0	25.5	25.0
25	62.0	60.0	31.0	30.0
30	74.0	72.0	37.0	36.0
40	96.0		48.0	
50	120.0		60.0	11. <del>-</del> 317.

Before attempting to check out sense of rotation of pump, fill pump with water to provide lubrication of the seal. Do not operate pump dry for motor checkout.

Next throw the switch and see if direction of rotation corresponds with arrows on frame of pump. The direction of rotation is counterclockwise facing the suction end of pump. Direction of rotation of three phase motors can be easily reversed by interchanging two of the three wires at the terminal board of the motor. Reversing of single phase motors is done by interchanging some internal wires or clamps. Instructions for reversing are found either on the motor nameplate or inside the motor terminal cover.

#### **B3-PUMP START-UP**

After you have checked lubrication and wiring you are ready to start the pump.



Open the gate valve in the suction side and close the valve on the discharge side. Start motor, wait until unit has come to full speed and then open discharge valve slowly. Do not run pump for more than a few minutes with completely shut valves. If system conditions call for part-time operation against shut valves, install a bypass line from discharge to suction.

#### B4-MECHANICAL SEAL AND STUFFING BOX CARE

#### Mechanical Seal (See caution below)\*

Mechanical seals are the most delice te component of the pump. Special care has to be given to them to assure trouble-free operation.

The sealing element of a mechanical seal consists of a carbon washer rotating against a stationary ceramic ring.

Surfaces of both are highly lapped to assure sealing.

Any dirt that penetrates between the two mating parts will cause a rapid wear of the seal faces and will ultimately result in seal leakage.

New heating systems are usually contaminated by various materials such as construction debris, welding slugs, pipe joint compound, mill scale, etc. It is of utmost importance that such systems be cleaned out thoroughly before putting pump into continuous operation.

Cleaning of a heating system is simple and easy. First flush out system with cold water at city pressure to remove all loose foreign matter that penetrated into the system. Afterwards boil out system with chemicals to remove dirt adhering to pipes.

Chemicals most commonly used for this procedure are sodium triphosphate, sodium carbonate, or caustic soda, but any nonfoaming detergents as used in dishwashers can be applied.

Fill system with clean water, add cleaning chemicals (1) lb. for every 40 to 50 gallons of water, (or Mfrs. Instruction) start pump and heat up system. Let system run for a few hours, then drain and refill with fresh water. Your pumps are now ready for continuous duty. (See caution below).<sup> $\circ$ </sup>

Stuffing boxes are less delicate in operation than mechanical seals. No chemical cleaning is necessary as on mechanical seal pumps, but flushing out with cold water is beneficial on this type of pump too.

After pump is started up adjust gland of stuffing box evenly so that it drips from one to three drops of water per minute. This drip is absolutely essential to prevent damage to packing and shaft sleeve. It also prevents overloading of motor. Excessive dripping may cause air to enter pump under certain conditions.

Sump of pump should be piped to any convenient sewer or drain. A pipe tapping is provided for this purpose at the side of the sump. Never plug this drain tapping.

\*CAUTION: The addition of certain chemical additives to systems utilizing TACO Equipment, voids the warranty.





#### INSTALLATION OF EXTERNAL CIRCULATION TUBE



Before filling system with water, assemble external circulation tube to pump casing as follows:

- 1. Screw nut into body until hand tight.
- 2. With a wrench continue tightening for about one and onehalf full additional turns. (It is not necessary to tighten nut all the way down)



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# TACO Instruction Sheet

# Horizontal Circulators Nos. 110 thru 120

#### Plant I.D. No. 001-318

#### **APPLICATION:**

- 1. Maximum recommended working pressure is 125 psi (862 K Pa).
- 2. Maximum water temperature must not exceed 240°F.
- 3. Cast Iron Circulators should be used for closed systems only.
- 4. Bronze circulators must be used in open or fresh water systems and potable water systems.

#### INSTALLATION:

- 1. Mounting position Circulators must be mounted with motor in a horizontal position.
- 2. Rotating casing Casing has an arrow on front which indicates direction of flow. To rotate casing remove the casing bolts, rotate casing and replace bolts. Make sure gasket is properly located before tightening bolts.
- 3. Electrical connections Observe all applicable codes when connecting to power supply. The motors do not require overload protection.
- 4. Fill system It is good practice to flush a new system of foreign matter before starting circulator.

#### TO REPLACE MOTORS:

- 1. Disconnect wiring.
- 2. Loosen the two set screws at pump end of spring coupling, remove bolts between bracket and motor and separate.
- 3. Loosen other set screw of coupling and remove coupling from old motor.
- 4. Slide coupler with single set screw over new motor shaft and tighten against flat surface of shaft.
- 5. Place new motor assembly into bracket and replace bolts.
- 6. Extend pump end of spring coupling over impeller shaft 3/16" and tighten both set screws. If impeller and shaft move into body during this operation, water will flow from weep hole in bracket. If this does occur, extend spring coupler a little more or until water stops flowing. CAUTION: UNDER NO CIRCUMSTANCES SHOULD THE WEEP HOLE BE PLUGGED.
- 7. Rewire motor.

#### TO REPLACE SPRING COUPLING

Follow same procedure outline above.

#### LUBRICATING INSTRUCTIONS

Re-oil pump and motor annually with SAE No. 30 oil.

\*CAUTION: The addition of certain chemical additives to systems utilizing TACO Equipment, voids the warranty.

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#### REPLACING SEALS

Waterflowing from weep hole in bracket normally indicates dirt on the seat or seal needs replacement. Before taking pump apart extend spring coupling and impeller shaft into body as far as it will go. This will separate the seal halves and permit a greater flow thru the weeping hole and wash any foreign matter off the seats. Release and if flow stops, it indicates that the seals do not require replacement. If the flow does not stop, loosen the two set screws on the coupling and extend as far as it will go. If leak stops it means there was insufficient tension on the coupling. If leak continues, indications are that the seal needs replacement. Proceed as follows: -

- 1. Disconnect wiring.
- 2. Valve off or drain system.
- 3. Remove body bolts and pull entire assembly out of body.
- 4. Loosen the two set screws at pump end of spring coupler, file off any burrs on shaft and pull impeller and shaft from bracket.
- 5. Pry out old seal seat from bracket with a screwdriver and old part from impeller shaft with a pair of pliers.
- 6. Clean shaft and seal bearing surfaces thoroughly with clean cloth.
- 7. Dip CARBON part of seal in water to lubricate, place on top of impeller shaft with carbon facing up. Push down on shaft with palm of hand as far as it will go. Then with both thumbs push all the way down making certain that prongs engage the two holes in the impeller. If there are no holes in the impeller, break off the prongs with a pair of pliers and smooth burrs with a file.
- 8. Separate rubber from ceramic part, wet it and set into recess in bracket. Set ceramic seal into rubber with seat facing out by starting at a slight angle first, then pushing away and down simultaneously. The rubber rings should not be folded over during the operation. Make certain that both the rubber and ceramic are "bottomed" squarely.
- 9. Clean both seal surfaces with a clean lintless cloth.
- 10. Place a few drops of oil along the impeller shaft and push slowly with a twisting motion through ceramic part into bracket and spring coupling.
- 11. While holding impeller and shaft with seal faces mating, insert an Allen wrench into one of the set screws in the coupling, extend spring - 3/16".
- 12. Remove old body gasket, clean surfaces and replace with new gasket.
- 13. Place entire assembly into body, replace and tighten bolts gradually and evenly all around.
- 14. Refill system. If water leaks from weep hole in bracket increase tension on spring coupling slightly more or until leak stops.
- 15. Rewire motor.







# Heat Exchangers

#### INSTALLATION

- 1. Allow sufficient clearance for removal of tube bundle.
- 2. After initial start and run at operating temperatures and pressures, shut down and tighten head bolts
- Make certain that tubing is full of water before introducing steam or hot water into shell, otherwise flashing or noise may occur.

#### CLEANING

Shell and tube bundle should be flushed out periodically. If cleaning is necessary, remove head and bundle to clean inside of shell and outside of tubes. Replace gaskets if necessary.

If unit is installed in a hard water area, inside of tubing can be cleaned as follows: -

- 1. Break water connections and plug bottom opening.
- 2. Fill the tubes with a solution of 1 part muriatic acid to 10 parts of water and allow to stand for 2 hours:
- CAUTION: A longer period may cause damage to the copper tubing.
- 3. Drain off and flush thoroughly with clean water.
- 4. Re-assemble unit.

#### NOTE

Commercially available cleaners may also be used.

#### **REPLACEMENT PARTS**

When ordering replacement parts specify

- 1) Complete Model Number
- 2) Date of Manufacture
- 3) Special Materials if Required

Normally, the only replacement parts required would be:

- 1 Tube Bundle
- 1 Set of Gaskets

NOTE: When ordering replacement tube bundles care must be take to insure correct construction and proper materials. Units manufactured prior to 1974 should have the prefix RUX.

Example: A replacement bundle for a B10212-L built in 1970 would be a RUX10212-L.

Replacement heads are also available if required.

### Quality Through Design — COMPARE.

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Form No. F202-001 Effective 5/1/81

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Instruction Sheet

102-006

UPERSEDES: IS 102-006 dated 3/1/85

PLANT I.D. #001-924

**Boiler Feed Valves** (Reducing Valves)

Models 329-3, 329-T3 and 335-3

## **Dual Controls**

Models 334-3 and 334-T3

#### RATINGS

Boiler Feed Valve (Reducing Valve) Supply pressure at inlet Factory setting of system side Setting Range Relief Valve in Dual Control Set to relieve at 29 psi-30 psi

Temperature—212°F max.

100 psi max. 12 psi 5 psi to 25 psi

#### DESCRIPTION

The Boiler Feed Valves are adjustable pressure reducing valves that automatically maintain system pressure. They are equipped with a "fast fill" lever that can be used to override automatic closing during purging.

- 329-3: 1/2" union connection with a sweat tailpiece at inlet end and a threaded connection at the outlet end.
- 329-T3: same as 329-3 except the inlet union connection is threaded.
- 335-3: <sup>3</sup>/<sub>4</sub>" cast brass body with threaded connections at body ends.

The Dual Control consists of a 329 Boiler Feed Valve with an in-line pressure relief valve connected at its outlet end.

334-3:  $\frac{1}{2}''$  union connection at inlet with sweat tailpiece and a threaded connection at the outlet end. 334-T3: same as the 334-3 except the union end tailpiece is threaded.

#### INSTALLATION

- 1. Install the Boiler Feed Valve or the Dual Control in a horizontal position in the cold water supply pipe to the boiler.
- Install a shut-off valve on the upstream side of the Boiler Feed Valve. This valve, provided for isolation purposes during maintenance, must be open at all times during operation so that the Boiler Feed Valve can maintain pressure automatically.
- 3. Flush out the supply pipe to clear it of chips, scale, dirt, etc. before connecting it to the inlet of the Boiler Feed Valve.
- 4. Connect a pipe from the bottom "DRAIN" connection of the Relief Valve in the Dual Control. Direct it to some convenient open drain, such as a floor drain or set tubs. Always obey local regulations. DO NOT install a valve of any kind in the drain pipe. The pipe must always pitch down from the valve, with no part of it above the valve, and be no smaller in size than the valve drain connection size.



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#### OPERATION

- 1. To fill the system, open the shut-off valve upstream of the Boiler Feed Valve. This valve must always be kept open when the system is in operation.
- 2. The FAST FILL lever must be pushed all the way over to the side of the cover slot, over the "A" on the cover flange for AUTOMATIC operation. The supply water will flow into the system until it is full and under pressure.
- 3. The Taco Boiler Feed Valves have such a high flow capacity that the FAST FILL feature is not usually needed during filling. It is supplied for use during purging of the system. By moving the lever down and to the side over the "O" on the flange of the cover (OVERRIDE position), the valve will be held open, overcoming the closing action of pressure increases against its diaphragm.
- 4. After filling and purging, the FAST FILL lever must be placed at the AUTOMATIC ("A" side) position. Under system pressure the lever will move up and be secured in the notch. The lever should not be moved during system operation. This position allows the valve to maintain normal pressure in the system automatically.



- 5. The Boiler Feed Valve is factory set to deliver water to the boiler at 12-14 psi. This pressure is sufficient for a 3-story building. To determine the required pressure if the factory setting is not sufficient to lift the water to the highest radiation, calculate the number of feet from the regulator to the top of the highest radiation. Multiply this by .43 and add 3 psi. This is the pressure needed to raise the water to the highest radiation and keep it under sufficient pressure. To increase the valve setting, loosen the locking nut on the adjusting screw at the top of the valve. Now turn the adjusting screw in (clockwise) slowly until the gauge indicates the pressure calculated. Then lock the adjusting screw with its locking nut.
- 6. The pressure relief valve of the Dual Control is non-adjustable and is set to relieve at 30 psi.

CAUTION: The addition of certain additives to systems utilizing Taco equipment voids the warranty. Avoid oil. Oil-free antifreezes, ethylene glycol and propylene glycol are acceptable.





Taco

NUMBER

#### INSTRUCTION SHEET

Effective: March 1, 1981 Supersedes: IS400-2-1 dated 7/30/76

# CONTROL

AIR

I — Select proper size based on flow (GPM) thru System

Taco Air Control	Maximum Flow	Taco Air Control
Less Strainer	GPM	With Strainer
AC2	80	AC2F
AC25	130	AC25F
AC3	190	AC3F
AC4	330	AC4F
AC5	550	AC5F
AC6	900	AC6F
AC8	1500	AC8F
AC10	2600	AC10F
AC12	3400	AC12F
AC14	4700	AC14F
AC16	6000	AC16F
AC18	8000	AC18F
AC20	10000	AC20F

- 2 Install Air Control in Supply Line between boiler and pump(s) as indicated in Diagram on reverse side.
- 3 Install Expansion Tank (s) as close to Air Control as possible with horizontal pipe (if any) pitching up to tank.
- 4 If a shutoff valve is installed in Expansion Tank line, use a Gate Valve and make certain it is fully open when system is in operation.

5 — A connection for a Vent is provided at the top of the Air Control.

When the system is first filled, all you have to do is Vent heating units and high points if necessary for quick filling. Thereafter, any entrained air is separated continuously as water is pumped thru the Air Control.

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Item	No.			PART N	O. PER PUR	AP SIZE			REMARKS
No.	Reqd.	DESCRIPTION	2008	2012	2508	2510	3008	4006	
1	1	Suction Cover	920-003C	884-003C	928-003C	922-003C	934-003C	938-003C	Iron Only
2	8	Suction Cover Bolts	10-216	10-211	10-216	10-211	10-216	10-230	
3	1	Suction Cover 'O' Ring	912-005RP	868-004RP	912-005RP	862-005RP	912-005RP	918-005RP	
4	1	Impeller Bolt (SS)	10-257	10-259	10-257	10-257	10-257	10-257	State of the second
5	1	Impeller Washer	926-004RP	926-004RP	926-004RP	926-004RP	926-004RP	926-004RP	e per su former département
6	1	Impeller	920-002B	884-002B	928-002B	922-002B	934-005B	938-002B	Brz. Only
7	1	Impeller Key (SS)	13-104	13-105	13-104	13-104	13-104	13-104	Constant Section of the
8	1	Casing (Mech. Seal)	920-030RP	884-007RP	928-021RP	922-024RP	934-021RP	938-021RP	w/Thrott. Bush
8	1	Casing (Packed)	920-032RP	884-009RP	928-023RP	922-026RP	934-023RP	938-023RP	w/Thrott. Bush
16	4	Casing Bolt	10-201	10-201	10-201	10-201	10-201	10-201	3/8-16x1-1/8
17	1	Drain Plug	16-102	16-104	16-102	16-102	16-102	16-102	3/8 NPT
34	1	Slinger Ring	900-044RP	900-044RP	900-044RP	900-044RP	900-044RP	900-044RP	in philipping and
66	1	Belleville Washer	900-053RP	900-053RP	900-053RP	900-053RP	900-053RP	900-053RP	an a she casa saga as
275	2	Fitting	900-798RP	900-798RP	900-798RP	900-798RP	900-798RP	900-798RP	1
276	1	Tube	900-728	900-728	900-728	900-728	900-728	900-728	and a standard standa

0

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B1	BALL BEARING DESIGN:	Update pump with 840-124RP Complete Frame Assembly. Please furnish all name plate data to insure proper updated nameplate.
B2	SLEEVE BEARING DESIGN:	Update pump with 840-124RP Complete Frame Assembly. Please furnish all name plate data to insure proper updated nameplate.
<b>B</b> 3	SLEEVE BEARING DESIGN:	Update pump with 840-124RP Complete Frame Assembly. Please furnish all name plate data to insure proper updated nameplate.
<b>B6</b>	SLEEVE BEARING DESIGN:	Update pump with 840-124 RP Complete Frame Assembly. Please furnish all name plate data to insure proper updated nameplate.

FRAME SIZE & STYLE - 0000-00-XX00

**B4** 

#### CLOSE COUPLED (CC)



NEMA FRAME Size "T"	NEMA FRAME Size "U"	ITEM 13 FR. BOLT Part No.	ITEM 15 PUMP FR. 1750 "T"	ITEM 15 PUMP FR. 3450 "T"	ITEM 15 PUMP FR. 1750 "U"	ITEM 15 PUMP FR. 3450 "U"
a share a salah	48	10-201			920-004C	920-004C
in Quanting	56	10-201	Call Control		920-004C	920-004C
143	182	10-201			920-004C	920-004C
145	184	10-201	920-004C	and a second	920-004C	920-004C
182	213	10-223	920-004C	Section 1	928-004C	928-004C
184	215	10-223	920-004C	and the second	928-004C	928-004C
213	254	10-223	928-004C	928-004C	928-004C	928-004C
215	256	10-223	928-004C	928-004C	928-004C	928-004C
254	285	10-223		928-004C	Sec. a perto	900-126C
256	286	10-223	Net the state	928-004C	Sec. A. S. A.	900-126C
284	A Mandat V	10-223	Sec. 1	900-126C		

#### B5 BALL BEARING DESIGN:





Item No.	No. Req.	DESCRIPTION	PART NO.	REMARKS REMARKS
74	1	Frame Assembly (complete)	840-124RP	
15	1	Frame	840-111	
42	1	Shaft	840-113RP	Add S for Stainless Steel
50	1	Bearing Plate Gasket	840-123RP	and a second
52	4	Bearing Plate Bolt	10-230	3/8 - 16 x 1
59	2	Drain Plug	16-111	1/8 NPT Brass
63	1	Ball Bearing	840-114RP	and the second sec
82	1	Ball Bearing	840-071RP	the second s
191	1	Retainer Ring	15-105	
289	1	Bearing Cover Plate Assembly	840-120RP	A DESCRIPTION OF THE PROPERTY OF THE PARTY O
290	2	Lubrication Fitting	15-200	
297	1	End Cap	820-368RP	





PACKING



#### TYPE B STANDARD. TYPE D HI-TEMP. TYPE P PACKED. TYPE E CERAMIC.

Item	No.		SI	AL OR PAC	KING DESIG	IN	a second second second
No.	Reqd	DESCRIPTION	Type 'B'	Type 'D'	Type 'P'	Type 'E'	REMARKS
3	1	'O' Ring	the states of	See Page 1			and the second
9	1	Impeller Spacer	920-026RP	900-026RP	NA	900-026RP	
10	1	Throttle Bushing	920-016RP	920-016RP	920-008RP	920-016RP	
20	1	Packing Set	N/A	N/A	900-241RP	NA	
21	2	Studs	N/A	N/A	900-029RP	NA	The second s
22	1	Filler Ring (Not shown)	N/A	N/A	900-030RP	NA	The second s
23	1	Gland	N/A	N/A	920-015BRP	NA	Bronze Only
24	2	Hex Nuts	N/A	N/A	12-129	NA	3/8 – 16
28	11	Retainer Cap Gasket	920-014RP	920-014RP	N/A	920-014RP	
29	1	Water Seal	900-024RP	900-087RP	N/A	900-215RP	
91	1	WATER SEAL KIT	840-128BRP	840-128DRP	N/A	840-128ERP	Incl. Items No. 28, 29, 35 & 67
30	4	Retainer Cap Bolts	10-208	10-208	N/A	10-208	3/8 - 16 x 7/8
32	1	Seal Retainer Cap	920-020RP	920-020RP	N/A	920-020RP	
35	1	Sleeve	900-027BRP	900-027BRP	920-006RP	900-027BRP	
67	1	Sleeve Gasket	920-007RP	920-007RP	920-007RP	920-007RP	



#### MOTOR PARTS – NOT PART OF SERIAL NUMBER –Motor Frame Sizes Must be Specified When Ordering Parts Shown Below –



No	NO I				MOTOR FR	CAME SIZE (INEIN	14 310.) 1		OC AT	- REMARKS
VO.	Reqd.	DESCRIPTION	143-145T	182T	1841	T 2	2131	2151	2541	
5	1	Base Plate	820-957	820-957	820-9	57 84	0-418	840-418	840-418	
7	2	Spacer	840-098C	840-0030	840-00	14C 840	0-005C	840-006C	840-041C	
'8	2	Frame Spacer	NA .	NA	NA	1. S.	NA	NA	NA	
56	1	Coupler	900-193	900-206	900-2	06 90	0-195	900-195	900-197	5/4/
38	4	Mtr. Lck. Wshr.	14-104	NA	NA		NA	NA	NA	5/10
38	4	Mtr. Lck. Wshr.	NA	14-101	14-10	01 14	4-101	14-101	NA	3/8
38	4	Mtr. Lck. Wshr.	NA	NA	NA		NA	NA	14-100	//10
52	4	Frm. Lck. Wshr.	14-102	14-102	14-10	02 14	4-102	14-102	14-102	1/2
13	4	Mtr. Hx. Hd. Blt.	10-214	NA	NA	1997 No. 1	NA	NA	NA	5/10-18x11/4
13	4	Mtr. Hx. Hd. Blt.	NA	10-221	10-22	21 10	0-221	10-221		3/8-10x1 1/4
13	4	Mtr. Hx. Hd. Blt.	NA	NA	NA		NA	NA	10-209	7/10-14x1/2
13	4	Mtr. Hx. Hd. Blt.	NA	NA	NA		NA	NA	NA	7/16-14x11/4
61	4	Fr. Hex. Hd. Blt.	10-238	10-238	10-23	38 10	0-238	10-238	10-238	1/2-13x1%
61	4	Fr. Hex. hd. Blt.	NA	NA	NA		NA	NA	NA	1/2-13×21/2
79	4	Spr. Hx. Hd. Blt.	10-230	10-230	10-23	30 10	0-230	10-230	NA	3/8-16x1
55	1	Coupler Key	13-100	13-100	13-10	00 1:	3-100	13-100	13-100	1/4x1/4x1%
47	1	Coupler Guard	820-796	820-796	, 820-7	96 82	20-796	820-796	840-125	
48	4	CG. Rd.Hd. Scw.	10-408	10-408	10-40	08 10	0-408	10-408	10-408	1/4-20x3/8
111		Coup. Insert	900-512	900-512	900-5	90	0-513	900-513	900-514	
om	I NO				MOTOR FRAME S	SIZE (NEMA STD.	) 'Г			REMARKS
No.	Pegd	DESCRIPTION	2561	2841	28415	286T	286TS	324TS	326TS	1
	Regg.									
65	1 1	Base Plate	840-418	840-419	840-419	840-419	840-419	840-419	840-419	A
65	1	Base Plate	840-418 840-040	840-419 NA	840-419 NA	840-419 NA	840-419 NA	840-419 NA	840-419 NA	
65 77 78	1 2	Base Plate Spacer Frame Spacer	840-418 840-040 NA	840-419 NA 840-106	840-419 NA 840-106	840-419 NA 840-106	840-419 NA 840-106	840-419 NA 840-107	840-419 NA 840-107	
65 77 78	1 2 2	Base Plate Spacer Frame Spacer Coupler	840-418 840-040 NA 900-197	840-419 NA 840-106 900-538	840-419 NA 840-106 900-197	840-419 NA 840-106 900-538	840-419 NA 840-106 900-199	840-419 NA 840-107 900-538	840-419 NA 840-107 900-538	
65 77 78 56 38	1 2 2 1 4	Base Plate Spacer Frame Spacer Coupler Mtr. Lck. Wshr.	840-418 840-040 NA 900-197 NA	840-419 NA 840-106 900-538 NA	840-419 NA 840-106 900-197 NA	840-419 NA 840-106 900-538 NA	840-419 NA 840-106 900-199 NA	840-419 NA 840-107 900-538 NA	840-419 NA 840-107 900-538 NA	5/16
65 77 78 56 38 38	1 2 2 1 4 4	Base Plate Spacer Frame Spacer Coupler Mtr. Lck. Wshr. Mtr. Lck. Wshr.	840-418 840-040 NA 900-197 NA NA	840-419 NA 840-106 900-538 NA NA	840-419 NA 840-106 900-197 NA NA	840-419 NA 840-106 900-538 NA NA	840-419 NA 840-106 900-199 NA NA	840-419 NA 840-107 900-538 NA NA	840-419 NA 840-107 900-538 NA NA	5/16 3/8
65 77 78 56 38 38 38	1 2 2 1 4 4	Base Plate Spacer Frame Spacer Coupler Mtr. Lck. Wshr. Mtr. Lck. Wshr. Mtr. Lck. Wshr.	840-418 840-040 NA 900-197 NA NA 14-100	840-419 NA 840-106 900-538 NA NA 14-100	840-419 NA 840-106 900-197 NA NA 14-100	840-419 NA 840-106 900-538 NA NA 14-100	840-419 NA 840-106 900-199 NA NA 14-100	840-419 NA 840-107 900-538 NA NA 14-108	840-419 NA 840-107 900-538 NA NA NA 14-108	5/16 3/8 7/16
65 77 78 56 38 38 38 38	1 2 2 1 4 4 4 4	Base Plate Spacer Frame Spacer Coupler Mtr. Lck. Wshr. Mtr. Lck. Wshr. Frm. Lck. Wshr.	840-418 840-040 NA 900-197 NA NA 14-100 14-102	840-419 NA 840-106 900-538 NA NA 14-100 14-102	840-419 NA 840-106 900-197 NA NA 14-100 14-102	840-419 NA 840-106 900-538 NA NA 14-100 14-102	840-419 NA 840-106 900-199 NA NA 14-100 14-102	840-419 NA 840-107 900-538 NA NA 14-108 14-102	840-419 NA 840-107 900-538 NA NA 14-108 14-102	5/16 3/8 7/16 1/2
65 77 78 56 38 38 38 38 62 13	1 2 2 1 4 4 4 4 4	Base Plate Spacer Frame Spacer Coupler Mtr. Lck. Wshr. Mtr. Lck. Wshr. Frm. Lck. Wshr. Mtr. Hx. Hd. Blt.	840-418 840-040 NA 900-197 NA NA 14-100 14-102 NA	840-419 NA 840-106 900-538 NA NA 14-100 14-102 NA	840-419 NA 840-106 900-197 NA NA 14-100 14-102 NA	840-419 NA 840-106 900-538 NA NA 14-100 14-102 NA	840-419 NA 840-106 900-199 NA NA 14-100 14-102 NA	840-419 NA 840-107 900-538 NA NA 14-108 14-102 NA	840-419 NA 840-107 900-538 NA NA 14-108 14-102 NA	5/16 3/8 7/16 1/2 5/16-18x1¼
65 77 78 56 38 38 38 62 13	1 2 2 1 4 4 4 4 4 4 4 4	Base Plate Spacer Frame Spacer Coupler Mtr. Lck. Wshr. Mtr. Lck. Wshr. Mtr. Lck. Wshr. Frm. Lck. Wshr. Frm. Lck. Wshr. Mtr. Hx. Hd. Blt.	840-418 840-040 NA 900-197 NA NA 14-100 14-102 NA NA	840-419 NA 840-106 900-538 NA NA 14-100 14-102 NA NA	840-419 NA 840-106 900-197 NA NA 14-100 14-102 NA NA	840-419 NA 840-106 900-538 NA NA 14-100 14-102 NA NA	840-419 NA 840-106 900-199 NA NA 14-100 14-102 NA NA	840-419 NA 840-107 900-538 NA NA 14-108 14-102 NA NA	840-419 NA 840-107 900-538 NA NA 14-108 14-102 NA NA	5/16 3/8 7/16 1/2 5/16-18x1¼ 8/8-16x1¼
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65 77 78 56 38 38 38 62 13 13 13	1 2 2 1 4 4 4 4 4 4 4 4 4 4 4 4	Base Plate Spacer Frame Spacer Coupler Mtr. Lck. Wshr. Mtr. Lck. Wshr. Mtr. Lck. Wshr. Frm. Lck. Wshr. Frm. Lck. Wshr. Mtr. Hx. Hd. Blt. Mtr. Hx. Hd. Blt. Mtr. Hx. Hd. Blt. Mtr. Hx. Hd. Blt.	840-418 840-040 NA 900-197 NA 14-100 14-102 NA NA 10-209 NA	840-419 NA 840-106 900-538 NA NA 14-100 14-102 NA NA NA NA 10-202	840-419 NA 840-106 900-197 NA NA 14-100 14-102 NA NA NA NA 10-202	840-419 NA 840-106 900-538 NA NA 14-100 14-102 NA NA NA NA 10-202	840-419 NA 840-106 900-199 NA NA 14-100 14-102 NA NA NA NA 10-202	840-419 NA 840-107 900-538 NA NA 14-108 14-102 NA NA NA NA 10-248	840-419 NA 840-107 900-538 NA NA 14-108 14-102 NA NA NA NA NA 10-248	5/16 3/8 7/16 1/2 5/16-18x1¼ 8/8-16x1¼ 7/16-14x1½ 7/16-14x1½
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65         77         78         56         38         38         62         13         13         13         61         61         79	$ \begin{array}{c} 1 \\ 2 \\ 2 \\ 1 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4$	Base Plate Spacer Frame Spacer Coupler Mtr. Lck. Wshr. Mtr. Lck. Wshr. Mtr. Lck. Wshr. Frm. Lck. Wshr. Frm. Lck. Wshr. Mtr. Hx. Hd. Blt. Mtr. Hx. Hd. Blt. Mtr. Hx. Hd. Blt. Mtr. Hx. Hd. Blt. Fr. Hex. Hd. Blt. Fr. Hex. Hd. Blt. Sor. Hx. Hd. Blt.	840-418 840-040 NA 900-197 NA NA 14-100 14-102 NA NA 10-209 NA 10-238 NA NA	840-419 NA 840-106 900-538 NA NA 14-100 14-102 NA NA NA NA 10-202 NA 10-217 NA	840-419 NA 840-106 900-197 NA NA 14-100 14-102 NA NA NA 10-202 NA 10-217 NA	840-419 NA 840-106 900-538 NA NA 14-100 14-102 NA NA NA 10-202 NA 10-217 NA	840-419 NA 840-106 900-199 NA NA 14-100 14-102 NA NA NA NA 10-202 NA 10-217 NA	840-419 NA 840-107 900-538 NA NA 14-108 14-102 NA NA NA 10-248 NA 10-231 NA	840-419           NA           840-107           900-538           NA           14-108           14-102           NA           14-102           NA           14-202           NA           14-102           NA           14-102           NA           14-102           NA           NA           NA           NA           NA           10-248           NA           10-231           NA	5/16 3/8 7/16 1/2 5/16-18x1¼ 8/8-16x1¼ 7/16-14x1½ 7/16-14x1½ 1/2-13x1‰ 1/2-13x2⅓ 3/8-16x1
65 77 78 56 38 38 38 62 13 13 13 13 61 61 79 55	$ \begin{array}{c} 1 \\ 2 \\ 2 \\ 1 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4$	Base Plate Spacer Frame Spacer Coupler Mtr. Lck. Wshr. Mtr. Lck. Wshr. Mtr. Lck. Wshr. Frm. Lck. Wshr. Frm. Lck. Wshr. Mtr. Hx. Hd. Blt. Mtr. Hx. Hd. Blt. Mtr. Hx. Hd. Blt. Mtr. Hx. Hd. Blt. Fr. Hex. Hd. Blt. Spr. Hx. Hd. Blt. Spr. Hx. Hd. Blt.	840-418 840-040 NA 900-197 NA NA 14-100 14-102 NA 10-209 NA 10-209 NA 10-238 NA NA 13-100	840-419 NA 840-106 900-538 NA NA 14-100 14-102 NA NA NA NA 10-202 NA 10-217 NA 13-100	840-419 NA 840-106 900-197 NA NA 14-100 14-102 NA NA NA 10-202 NA 10-217 NA 13-100	840-419 NA 840-106 900-538 NA NA 14-100 14-102 NA NA NA 10-202 NA 10-217 NA 13-100	840-419 NA 840-106 900-199 NA NA 14-100 14-102 NA NA NA NA 10-202 NA 10-202 NA 10-217 NA 13-100	840-419 NA 840-107 900-538 NA NA 14-108 14-102 NA NA NA 10-248 NA 10-248 NA 10-231 NA 13-100	840-419           NA           840-107           900-538           NA           14-108           14-102           NA           14-102           NA           14-202           NA           14-102           NA           14-202           NA           10-248           NA           10-231           NA           13-100	5/16 3/8 7/16 1/2 5/16-18x1¼ 8/8-16x1¼ 7/16-14x1½ 7/16-14x1½ 1/2-13x1‰ 1/2-13x2⅓ 3/8-16x1 1/4x1/4x1½
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ITEM #3 BOD	Y GASKET
MODEL NUMBER	PART NUMBER
HC, 110, 112 & 117	110-364RP
HDH, 111, 113 & 120	120-009RP

ITEM #29	9 SEAL
MODEL NO.	PART NO.
All 110 to 120-12	110-275RP

	ITEM #8 BODY	
MODEL NO.	CAST IRON	BRONZE
HC, 110 & 112	110-226RP	110-226BRP
HDH & 111	111-004RP	111-004BRP
113	113-001RP	113-001BRP
120-1 to 120-5	NA	NA
120-6 to 120-12	120-083RP	120-083BRP

ITEM #31 MOTOR ASSEMBLY					
PART NO.					
110-223RP					
110-185RP					
112-074RP					
120-105RP					

ITEM #56 COUPLER	
MODEL NO.	PART NO.
All 110 to 120-12	110-009RP

ITEM #74 BRACKET ASSEMBLY			
MODEL NO.	CAST IRON	BRZ. FITTED	BRONZE
HC, 110 & 117	110-361RP	110-361RP	110-362BRP
HDH & 111	111-058RP	111-058RP	111-059BRP
112	112-120RP	112-103BRP	112-103BRP
113	113-013RP	113-013RP	113-012BRP
120-1 to 120-5	120-076RP	120-078RP	120-077BRP
120-6 to 120-12	120-067RP	120-069RP	120-068BRP

ITEM #	25 IMPELLER & SH	IAFT
MODEL NO.	CAST IRON	BRONZE
HC, 110, 110 & 110B	110-207RP	110-207RP
HDH, 111 & 111B	111-053RP	111-053RP
112, 112C & 112B	112-043RP	112-055RP
113, 113C & 113B	113-009RP	113-009RP
120-1 to 120-5	120-056RP	120-060RP
120-6 to 120-12	120-038RP	120-054RP





	ITEM #113 FLANG	E GASKET SET
	MODEL NUMBER	PART NUMBER
	Flat Red Rubber	110-023RP
	Round Cork (Thick)	110-227RP
1	110 to 113	110-339RP
	120-1 to 120-5	120-008RP
1	120-6 to 120-12	1600-169RP

ITEM #36 FLANGE SET		
MODEL NO.	CAST IRON	BRONZE
120-1 to 120-5	120-044RP	120-044BRP
120-6 to 120-12	1600-032RP	1600-032BRP

MOTOR ASSEMBLY L/MOTOR	
MODEL NO. & HP	PART NO.
110 (1/12 HP)	110-082RP
111 & 113 (1/8 HP)	110-008RP
112 (1/3 HP)	110-042RP
120 (1/6 HP)	110-008RP

ITEM #161 GASKET KIT			
PART NO.			
110-127RP			
120-073RP			

ITEM — Flange Set ¾", 1", 1¼", & 1½" Interchangeable. Refer to Price Sheets 103-003. For 120 models with 2 holes, specify 1600-032BRP for Bronze, 1600-032RP for Cast Iron. For 120 models with 4

holes, specify 120-044RP for Cast Iron, 120-044BRP for Bronze.

> Taco, Inc. 1160 Cranston Street, Cranston, Rhode Island 02920 Telex: 92-7627 Telephone: (401) 942-8000 Lifto in U.S.A. Taco (Canada) Limited 1310 Aimco Blvd., Mississauga, Ontario L4W 1B2

Telephone: 416-625-2160 Telex: 06-961179





FORM NO. 304-027


FRAME SIZE & STYLE



#### FRAME PARTS FOR "B" SIZE PUMP

ITEM NO.	NO. REQ.	DESCRIPTION	PART NO.	REMARKS
72	1	Frame Assembly	37652-108-122-Z	All Above Assembled As A Unit
57	1	Frame	37652-108-122-6	
58	8	Hex Hd. Screws	10-215	
59	2	Bearing Cover	37224-609-122-5	
60	2	Ball Bearing	862-101	
61	1	Shaft	36811-516-266-9	
62	1	Deflector	34112-193-005-4	ten
63	2	Retaining Ring	15-129	
64	1	Retaining Ring	15-126	
65	2	Grease Fitting	25731-108-000-1	Not Shown

66	1	Washer	14-102	Not included with frame
67	1	Bolt	10-234	Not included with frame

### COVER MODULE FOR "B" SIZE PUMPS

ITEM NO.	NO. REQ.	SEAL OR PACKING TYPE	DESCRIPTION	1210	1510	2010
11	1	B-D-E	Cover	37165-418-124-9	37165-418-124-9	37165-418-124-9
11	1	P-Y	Cover	37167-419-124-4	37167-419-124-4	37167-419-124-4
24	8		Stud	21712-334-950-7	21712-334-950-7	21712-334-950-7
25	8	Property and an or other states	Nut	12-110	12-110	12-110



find ind



## **TAB PLACEMENT HERE**

## **DESCRIPTION:**

None



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Service



3280 OLD MILLERS LANE LOUISVILLE, KY. 40216

QUALITY PUMPS SINCE 1939

News Views

No. Date 4-7-86 42E

#### VORTEX IMPELLER INSTALLATION

All Zoeller Company Vortex design pumps utilize a thread locking adhesive to secure the impeller to the shaft. (Note: The 54 & 56 are not Vortex design pumps.) Always use a thread locking adhesive when replacing any vortex impellers to insure the impeller will remain on the shaft. See chart below for correct adhesive for various units.

Series 54 & 56 (Not Vortex) 53, 55, 57, 59 All other series

Adhesive (None required) Loctite - # 222 Loctite - # 262

Loctite products are available through industrial suppliers.

NOTE: Please refer to Loctite Manufactures Recommendations as to the shelf life of their products.

#### Instructions

- 1. Thoroughly clean and dry threads on rotor shaft and impeller. (Oil, dirt and grease destroy the adhesive's bonding strength).
- 2. Place bead of loctite adhesive on threads of the rotor shaft (see Fig. 1).
- 3. Place impeller carefully on the shaft and tighten until the impeller touches the ceramic seal. Sight check to insure seal alignment. Tighten impeller until it bottoms out on the rotor shaft.



Keep your	News 8	Views for reference. Fill in the following	on Reco	rd Sheet#
News & Date	Views No.	Subject	To For	Super sedes No.
4-7-86	42E	Vortex Impeller Installation		42D





TOELLER [O.

News Views

3280 OLD MILLERS LANE LOUISVILLE, KY. 40216 DUALITY PUMPS SINCE 1939

Date	No.
2-23-89	14B

VISUAL INSPECTION AIDS

Bent switch arm, float - rod or guard indicates abuse or alteration.

Service

-Excessive heat or chemical can cause swollen or deteriorated Boot. Indicates abuse.

> -Cord pulled loose, frayed, cut or damaged indicates rough handling and abuse.

> > -Ground pin cut off or pulled out indicates abuse or an illegal alteration.

Spray here on 50/90 Series is not a leak but a vent. Must be open and clear of debris to prevent air lock. Note: Any pump installed with a check valve must have a vent hole here or between discharge of pump and check valve to prevent air lock.

- Pump housing, base, strainer or impeller coated with mineral deposits or clogged with mud, concrete or debris indicates abuse.

Cracked or broken castings or parts indicate rough handling, abuse or shipping damage.

Keep your News & Views for reference. Fill in the following		on Reco	ord Sheet	
News & Date	Views No.	Subject	To	Super sedes No.
2-23-89	14B	VISUAL INSPECTION AIDS		14B 7-14-8

Pump model and date code (<u>date code</u>, or revision letter, & month/year follows model number on tag).

Excessive heat and/or-/ chemicals cause discoloration, bulges, roughness or sponge appearance. Indicates abuse.







NOTICE TO INSTALLING CONTRACTOR: Instructions must remain with installation.





3280 OLD MILLERS LANE P.O. BOX 16347 • LOUISVILLE, KY. 40216 (502) 778-2731 • FAX (502) 774-3624



FM0447 0389 Súpersedes 0288



# **INSTALLATION INSTRUCTIONS**

## **RECOMMENDED MODELS**

SEWAGE	EFFLUENT*	DEWATERING
262 Series 266, 267, 268 Series 282, 284 Series 293, 294, 295 Series 292 Series	53, 55, 57, 59 Series 97 Series 137, 139 Series 161, 163, 165 Series 185, 188, 189 Series	All Models

\*Effluent systems should specify that pumps should not handle solids exceeding three fourths inch  $(\frac{3}{4}'')$  in order to prevent large solids from entering leeching fields, mound systems and etc. (50/90 Series have  $\frac{1}{2}''$ , 130 Series have  $\frac{5}{4}''$ , 160/180 Series have  $\frac{3}{4}''$ , solids capability.) Where codes permit, sewage pumps can be used for effluent systems.

## **PREINSTALLATION CHECKLIST** — ALL INSTALLATIONS

1. Inspect your pump. Occasionally, products are damaged during shipment. If the unit is damaged, contact your dealer before using.



2. Carefully read the literature provided to familiarize yourself with specific details regarding installation and use. These materials should be retained for future reference.

3. Make sure there is a properly grounded receptacle available. All pumps are furnished with provisions for proper grounding to protect you against the possibility of electrical shock.

#### (SEE WARNING BELOW)

4. Make certain that the receptacle is within the reach of the pump's power supply cord. DO NOT USE AN EXTENSION CORD. Extension cords that are too long or too light do not deliver sufficient voltage to the pump motor. But, more important, they could present a safety hazard if the insulation were to become damaged or the connection end were to fall into the sump.

5. Check to be sure your power source is capable of handling the voltage requirements of the motor, as indicated on the pump name plate.

6. Make sure the pump electrical supply circuit is equipped with fuses or circuit breakers of proper capacity. A separate branch circuit is recommended, sized according to the "National Electrical Code" for the current shown on the pump name plate.

7. Testing for Ground. As a safety measure, each electrical outlet should be checked for ground using an Underwriters Laboratory Listed circuit analyzer which will indicate if the power, neutral and ground wires are correctly connected to your outlet. If they are not, call a qualified licensed electrician.

8. For Added Safety. Pumping and other electrical equipment must be connected to a three prong grounded receptacle with integral ground-fault circuit interrupter. (GFCI)

9. WARNING: The installation of automatic pumps with mercury float switches or non-automatic pumps using auxiliary mercury float switches is the responsibility of the installing party and care should be taken that the tethered float switch will not hang up on the pump apparatus or pit peculiarities and is secured so that the pump will shut off. It is recommended to use rigid piping and fittings and the pit be 18" or larger in diameter.

10. Information - vent hole purpose. It is necessary that all submersible sump, effluent, and sewage pumps capable of handling various sizes of solid waste be of the bottom intake design to reduce clogging and seal failures. If a check valve is incorporated in the installation, a vent hole (approx. 3/16") must be drilled in the discharge pipe below the check valve and pit cover to purge the unit of trapped air. Trapped air is caused by agitation and/or a dry basin. This vent hole should be checked periodically for clogging. The 50 Series pumps have a built in vent hole.

### **CAUTIONS & WARNINGS**

#### WARNING:

FOR YOUR PROTECTION, ALWAYS DISCONNECT PUMP FROM ITS POWER SOURCE BEFORE HANDLING. Single phase pumps are supplied with a 3-prong grounded plug to help protect you against the possibility of electrical shock. DO NOT UNDER ANY CIRCUMSTANCES REMOVE THE GROUND PIN. The 3-prong plug must be inserted into a mating 3-prong grounded receptacle. If

a installation does not have such a receptacle, it must be changed to the proper type, wired and grounded in accordance with the conal Electrical Code and all applicable local codes and ordinances. Three phase pumps **must** be installed in accordance with the National Electrical Code and all applicable local codes and ordinances.

CAUTION: Installation and checking of electrical circuits and hardware should be performed by a qualified licensed electrician.

CAUTION: Repair and service should be performed by Zoeller Company Authorized Service Station only.

CAUTION: Dewatering sump pumps are not designed for use in septic tanks to handle sewage or effluent.

CAUTION: Maximum continuous operating temperature for standard model pumps must not exceed 130°F - 54°C.



All installations must comply with all applicable electrical and plumbing codes, including, but not limited to, National Electrical Code, local, regional, and/or state plumbing codes, etc.







#### TYPICAL SEWAGE INSTALLATION-RECOMMENDED INSTALLATION

(1) Electrical wiring and protection must be in accordance with National Electrical Code and any other applicable state and local electrical requirements.

(2) Install proper Zoeller unicheck (combination union and check valve), preferably just above the basin to allow easy removal of the pump for cleaning or repair. On ( sewage, effluent or dewatering, if high head installation is required, use Zoeller 3C Series PVC type check valve with compression end fittings on 1½" and 2" installation; on 3" use 30-0160. See (6) below.

(3) All installations require a basin cover to prevent debris from falling into the basin and to prevent accidental injury.

(4) Gas tight seals are required in all sewage installations to contain gases and odors.

(5) Vent gases and odors to the atmosphere through vent pipe.

(6) When a Unicheck is installed, drill a 3/16'' dia. hole in the discharge pipe even with the top of the pump. The 50 Series pumps have a built in vent hole. NOTE: The hole must also be below the basin cover.

(1) Securely tape or clamp power cord to discharge pipe clear of the float mechanism.

(8) Use full-size discharge pipe.

(9) Basin must be in accordance with applicable codes and specifications.

\* (11) Pump must be level and float mechanism clear of sides of basin before starting pump.

(1) Basin must be clean and free of debris after installation.

#### TYPICAL EFFLUENT INSTALLATION-RECOMMENDED INSTALLATION

() Electrical wiring and protection must be in accordance with National Electrical Code and any other applicable state and local electrical requirements.

(2) All installations require a basin cover to prevent debris from falling into the basin, and to minimize accidental injury.

(3) Wire pump to power through a Zoeller J-Pak; watertight junction box or watertight splice. NOTE: Watertight enclosure is a must in damp areas.

Use full-size discharge pipe.

(5) Install proper Zoeller unicheck (combination union and check valve), preferably just above the basin to allow easy removal of the pump for cleaning or repair. On sewage, effluent or dewatering, if high head installation is required, use Zoeller 30, Series PVC type check valve with compression end fittings on 1½" and 2" installation. on 3" use 30-0160. For below cover installation use Zoeller model 30-0200 on 1½" pipe, and PVC compression end check valve on 2 or 3 inch pipe. See (6) below.

(6) When a Unicheck is installed, drill a 3/16" dia. hole in the discharge pipe even with the top of the pump. The 50 Series pumps have a built in vent hole. NOTE: The hole must also be below the basin cover.

1 Securely tape or clamp power cord to discharge pipe clear of the float mechanism.

\* (8) Pump must be level and float mechanism clear of sides of basin before starting pump.

(9) Install blocks or bricks under pump to provide a settling basin.

(10) Basin must be clean and free of debris after installation.

#### TYPICAL DEWATERING INSTALLATION-RECOMMENDED INSTALLATION

 Electrical wiring and protection must be in accordance with National Electrical Code and any other applicable state and local electrical requirements.
 Install proper Zoeller unicheck (combination union and check valve), preferably just above the basin to allow easy removal of the pump for cleaning or repair. On sewage, effluent or dewatering, if high head installation is required, use Zoeller 30 Series PVC type check valve with compression end fittings on 1½" and 2" installation; on 3" use 30-0160. For below cover installation use Zoeller model 30-0200 on 1½" pipe, and PVC compression end check valve on 2 or 3 inch pipe. See (4) below.

(3) All installations require a basin cover to prevent debris from falling into the basin and to prevent accidental injury.

(4) Securely tape or clamp power cord to discharge pipe clear of the float mechanism.

5 Minimum 18" dia. x 24" deep basin.

(6) When a Unicheck is installed, drill a 3/16" dia. hole in the discharge pipe even with the top of the pump. The 50 Series pumps have a built in vent hole. NOTE: The hole must also be below the basin cover.

Use a full-size discharge pipe.

\*(8) Pump must be level and float mechanism clear of sides of basin before starting pump.

(9) Install blocks or bricks under pump to provide a settling basin.

(10) Basin must be clean and free of debris after installation.

\*Check specific control installation instruction for other type control usage.



## SERVICE CHECK LIST

WARNING: ELECTRICAL PRECAUTIONS — Before servicing a pump, always shut off the main power breaker and then unplug the pump - making sure you are not standing in water and are wearing insulated protective sole shoes. Under flooded conditions, contact your local electric company or a qualified licensed electrician for disconnecting electrical service prior to pump removal.

WARNING: Submersible pumps contain oil which becomes pressurized and hot under operating conditions- allow 2½ hours after disconnecting before attempting service.

#### CONDITION

- A. Pump will not start or run.
- B. Motor overheats and trips overload or blows fuse.
- C. Pump starts and stops too often.
- D. Pump will not shut off.
- E. Pump operates but delivers little or no water.
- F. Drop in head and/or capacity after a period of use.

#### **COMMON CAUSES**

Check fuse, low voltage, overload open, open or incorrect wiring, open switch, impeller or seal bound mechanically, defective capacitor or relay when used, motor or wiring shorted. Float assembly held down. Switch defective, damaged, or out of adjustment.

Incorrect voltage, negative head (discharge open lower than normal) impeller or seal bound mechanically, defective capacitor or relay, motor shorted.

Float tight on rod, check valve stuck or none installed in long distance line, overload open, level switch(s) defective, sump pit too small.

Debris under float assembly, float or float rod bound by pit sides or other, switch defective, damaged or out of adjustment.

Check strainer housing, discharge pipe, or if check valve is used vent hole should be open. Discharge head exceeds pump capacity. Low or incorrect voltage. Incorrect motor rotation. Capacitor defective. Incoming water containing air or causing air to enter pump.

Increased pipe friction, clogged line or check valve. Abrasive material and adverse chemicals could possibly deteriorate impeller and pump housing. Check line. Remove base and inspect.

If the above check list does not uncover the problem, consult the factory - Do not attempt to service or otherwise disassemble pump.

## LIMITED WARRANTY

Zoeller Company warrants, to the purchaser and subsequent owner during the warranty period, every new Zoeller Company product to be free from defects in material and workmanship under normal use and service, when properly installed, used, and maintained, for a period of one year from date of installation or 18 months from date of manufacture, whichever comes first. Part(s) that fail (within one year of installation or 18 months from the date of manufacture, whichever comes first) that inspection determine to be defective in material or workmanship, will be repaired, replaced, or remanufactured at Zoeller Company's option provided, however, that by so doing we shall not be obligated to replace an entire assembly, the entire mechanism or the complete unit. No allowance will be made for shipping charges, damages, labor or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to any material which has been disassembled without prior approval of Zoeller Company, subjected to misuse, misapplication, neglect, alteration, accident or act of God; that have not been installed, operated or maintained in accordance with Zoeller Company installation instructions; that has been exposed to but not limited to the following: sand, gravel, cement, mud, tar, hydro carbons or hydro carbon derivatives (oil, gasoline, solvents, etc.) or other abrasive or corrosive substances, is in lieu of all other warranties expressed or implied; and we do not authorize any representative or other person to assume for us any other liability in connection with our products.

Contact an authorized service station to obtain any needed repair or replacement parts. For additional information pertaining to our warranty or if service cannot be obtained locally, contact Zoeller Company, 3280 Old Millers Lane, Louisville, Kentucky 40216, Attn: Customer Service.

ZOELLER COMPANY EXPRESSLY DISCLAIMS LIABILITY FOR SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES OR BREACH OF EXPRESSED OR IMPLIED WARRANTY; AND ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICLUAR PURPOSE AND OF MERCHANTABILITY SHALL BE LIMITED TO THE DURATION OF THE EXPRESSED WARRANTY.

Some states do not allow limitations on the duration of an implied warranty, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.





## HEAD/CAPACITY CURVE



188

560

90 100 110 120 130 140 150 160

400

480

137

139

70 80

97

50 60

53,55,57,59

30 40

10

5

10 20

2

0

GALLONS

### **SEWAGE & DEWATERING**

189

155 587

151 572

145 549

140 530

133 503

127 481

114 431

100 379

85 322

70 265

54 204

37 140

21 79

8 30

110'

WARNING: Model 293 should not be subjected to less than 15 feet TDH.



640



## **"EXTRA PROTECTION SYSTEMS"**



### THE BASEMENT SENTRY

12 Volt back-up sump pump system model 505

#### Application

For clear water, emergency back-up usage when power is off or primary pump fails.

Extra Protection - When the primary AC pump fails due to power outages or system problems.

- Storms
- Brownouts
- Wiring or electrical problems

Extra Protection - When the primary pump fails to keep up with excessive water due to rain or overloading.

Ft. Head	Capacity	GPH	
----------	----------	-----	--

- Pump and control

5 1500 10 1000 15 450 - Fittings 18 Lock Valve

- Charger

- Battery Case

(Battery Not Included)

Includes:

For submersible or pedestal installations. See FM0844 for information.



### **TWO PUMP SYSTEM**

The "Extra Protection" Two-Pump system is an economical solution to the costly duplex alternating pump system and it's easy to install.

The "Extra Protection" Two Pump System consists of:

- a. The two automatic pumps of your choice
- b. One Alarm System
- c. Two Unicheck Valves as required

### **ADVANTAGES**

- (1) The two-pump system offers high pump performance without the high price. It is a system that fits your needs and your budget.
- (2) Delivers more dependability than a single pump system and greatly reduces the chance of costly and time consuming problems associated with wear out or damages and the resulting system failures.
- (3) Affords greater satisfaction and peace of mind to all concerned by providing state of the art protection for costly and expensive surroundings.



\* MINIMUM DISTANCE 2" BETWEEN PUMP

(4) Easy and economical to install.





YOUR ASSURANCE OF QUALITY

### EASY DO'S & DON'TS FOR INSTALLING A SUMP PUMP

- 1 DO read thoroughly all installation material provided with the pump.
- 2 **DO** inspect pump for any visible damage caused by shipping. Contact dealer if pump appears to be damaged.
- **3 DO** clean all debris from the sump. Be sure that the pump will have a hard, flat surface beneath it. **DO NOT** install on sand, gravel or dirt.
- 4 DO be sure that the sump is large enough to allow proper clearance for the level control switch(es) to operate properly.
- DO Always Disconnect Pump From Power Source Before Handling.
  DO always connect to a separately protected and properly grounded circuit.
  DO NOT ever cut, splice, or damage power cord.
  DO NOT carry or lift pump by its power cord.
  DO NOT use an extension cord with a sump pump.
- 6 DO install a check valve and a union in the discharge line. DO NOT use a discharge pipe smaller than the pump discharge.
- 7 **DO NOT** use a sump pump as a trench or excavation pump, or for pumping sewage, gasoline, or other hazardous liquids.
- 8 DO test pump immediately after installation to be sure that the system is working properly.
- 9 DO cover sump with an adequate sump cover.
- 10 DO review all applicable local and national codes and verify that the installation conforms to each of them.
- 11 DO consult manufacturer for clarification or questions.
- **12 DO** consider a Two Pump System with an alarm (Page 5) where an installation may become overloaded or primary pump failure would result in property damages.
- **13 DO** consider a D.C. Backup System (See the Basement Sentry page 5) where a sump or dewatering pump is necessary for the prevention of property damages from flooding due to A.C. Power disruptions, mechanical or electrical problems or system overloading.

Deller [O.

3280 Old Millers Lane P.O. Box 16347 Louisville, Kentucky 40216 (502) 778-2731 Manufacturers of . . .

QUALITY PUMPS SINCE 1939

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Confidential Records Management, Inc. New Bern, NC 1-888-622-4425 9/08





Renovation of Building M231 Marine Corps BAse Camp Lejeune, NC Contract: N62370-88-C-3764

General Contractor:

HOT WATER STORAGE GENERATOR

CBC Enterprises, Inc. 1312 E. Little Creek Road Norfolk, Virginia Phone: (804) 588-6100

Mechanical Contractor:

G.R. Michaels & Co. 331 32nd Street Newport News, Virginia Phone: (804) 622-3099 Mr. Terry Gregston

Wholesaler and Supplier:

Ferguson Enterprise P.O. Box 2778 Newport News, Virginia 23609 Phone: (804) 874-7400 Mr. Steve Saunders

> Adamson Company, Inc. 13200 Ramblewood Drive Chester, Va. 23831 (804) 748-6453





#### OPERATING AND MAINTENANCE INSTRUCTIONS FOR HOT WATER STORAGE HEATERS, TANKS, CONVERTORS AND INSTANTANEOUS HEATERS

#### OPERATION: INITIAL START-UP

Prior to initial start-up all steam and condensate lines or boller water circulation lines should be blown down or flushed out to prevent any dirt, weld slag, solder balls, etc., from entering the heating coil, temperature control valves or other apparatus connected to the heater.

Upon initial start-up the main steam globe or gate valve should be cracked slightly to allow the heating surface to come up to operating temperature. If cracking noises occur in the heating element on start-up do not be alarmed. This cracking noise should stop when the heating surface gets warm.

Do not fully open a steam hand valve on initial start-up, as this may cause internal damage to the heating element.

Once the heater is in operation and all valves are adjusted, water temperature control should be done by means of the automatic temperature control valve.

The following controls and accessories are recommended for safe and efficient operation:

- 1. Steam line strainer
- 2. Steam temperature control valve. (self-contained, pilot operated, air operated or electric motor operated are all in use today.)
- 3. Condensate line strainer.
- 4. Condensate trap (stzed to handle 3 times the condensing rate is accepted practice:)
- 5. Relief valve (ASME approved and set at a pressure not in excess of the design pressure of the shell section.)
- 6. Thermometer.
- 7. Pressure gauge.
- Nacuum breaker (this should be installed on the steam inlet side of the heating coll.)
- 9. Air Vent. (This should be installed on the steam outlet side of the heating coll.)
- 10. By-pass piping around the steam control valve and trap assembly are optional and not always used.)

A dirt leg should also be provided ahead of the trap to collect any foreign matter from entering the trap assembly.



### OPERATING AND MAINTENANCE INSTRUCTION FOR HOT WATER STORAGE HEATERS, TANKS, CONVERTORS AND INSTANTANEOUS HEATERS

### MAINTENANCE:

In any water system, the storage water heater acts as a settling basin for any foreign matter in the water which will deposit itself on the bottom of the storage section. For this reason it is recommended to drain the shell section down once a year, refill it and drain it again. The heating element should be inspected and cleaned of any scale or mineral deposits that may attach themselves to the heating surface. The heating surface may be cleaned by means of wire brushing and hosing or chemically cleaned when possible. (Contact your local chemical supply house for their recommendations and proper cleaning procedures).

The internal shell should be inspected for any rusting or pitting and corrected if possible. Maintenance of this nature will provide cleaner water and more efficient operation.

#### **RELIEF VALVE:**

The relief value should be inspected at least once a month. This is done by merely tripping the arm of the value to make sure it is in operating condition. Should the value be inoperable it should be replaced immediately. Any corrosion collecting on this value may cause it to malfunction and can create a hazardous piece of equipment. Maintenance of this value is extremely important.

SOME POSSIBLE CAUSES AND CURES TO PROBLEMS OCCURING WITH WATER.

	STORAGE HEATERS
PROBLEM	: Slow or inadequate heat recovery.
States - States	
Cause:	Dirty or fouled heating surface.
Cure:	Clean the heating surface.
Cause:	Improperly sized steam control valve.
Cure:	Check size of control valve & piping.
Cause:	Coll rated at higher than its actual operating processing
Cure	Increase pressure to design condition
Cause:	Condensate may be held in coll.
Cure:	Check trap, air vent & vacuum breaker on heating coll
Cause:	Water draw in excess of design canacity
Cure:	Increase steam pressure if possible, at the same time check piping and valves, traps, etc., to make sure additional load can be handled safely. Contact manufacturer for his recommendations on increasing coil heating surface.



### OPERATING AND MAINTENANCE INSTRUCTIONS FOR HOT WATER STORAGE HEATERS, TANKS, CONVERTORS AND INSTANTANEIOUS HEATERS

PROBLEM: Water hammer in tube bundle.

Cause: Flooded tube bundle. (Improper condensate drainage. This will reduce coil capacity and service life.)

Cure: Check trap size and capacity, also the condensate piping to make sure it is not operating at a pressure greater than that in the heater.

#### PROBLEM: Overheating of water in storage.

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Cause:	Oversized steam control valve or cut-of-calibration.
Cure:	Check valve sizing and adjustment.
Cause:	Valve may not be seating itself completely.
Cure:	Check valve.
Cause:	Valve may not close all the way due to loss of charge In thermostatic bulb. (Ruptured bulb)
Cure:	Check valve and contact manufacturer of same.
Cause:	A vacuum is created when the steam control valve closes. This vacuum may be strong enough to hold valve open and allow steam to bleed through and overheat stored water.
Cure:	Check vacuum breaker on heating section, to make sure it is operating.
Cause:	Thermostatic bulb or aquastat may be located too low in the vessel.
Cure:	Re-locate thermostatic bulb or aquastat if possible.
PROBLEM	: Excessive pressure causing relief valve to pop.
Cause:	Relief valve top too small or undersized.
Cure:	Check pressure rating and valve operation.
Cause:	Expansion of water from heating may cause excessive pressure. As temperature increases so does pressure.
Cure:	Check steam value for bleeding, relief value setting and make sure all outset values are open. If the cold water inlet is furnished with a check value, drill a 1/8" or so hole in its flap to allow the pressure to be relieved.
	거리는 거기에 가장 방법한 방법은 영법은 방법은 것을 받았는 것은 것은 것을 얻는 것을 다 있다. 이렇게 다 가장 않는 것을 것을 받았는 것을 하는 것을 하는 것을 했다. 것은 것은 것을 다 가장 않는 것을 하는 것을 것을 수 있는 것을 것을 수 있는 것을 것을 수 있다.

The initial start-up operation and maintenance of Convertors and Instantanelous Heaters is basically the same as those outlined above for Hot Water Storage Heaters.

All causes and cures to some of the problems outlined will be the same.

-3-



# OPERATING AND MAINTENANCE INSTRUCTIONS FOR

CONVERTORS-STEAM TO WATER, WATER TO WATER INSTANTANEOUS HEATERS-STEAM TO WATER WATER TO WATER

One major difference in maintenance is the cleaning of the heating element. This is generally always chemically cleaned due to scale or mineral content build-up inside the tubes.

It is possible to clean internally, if the scale or mineral content is soft and can be hosed out with water at a higher pressure than normally flows through the tubes.

For chemical cleaning, we again recommend contacting a local chemical supply house for their recommendations on the type of solvent, preparation and procedures to follow in the cleaning process.

Adamson Company, Inc. will be happly to assist with any of these or other problems occurring in relation to Adamson equipment.

ADAMSON COMPANY INC.


AI. WIT.	*	Q.C. WIT. HOLD PTS.	Q.C. INSPECTION		AI. INSPECTION	
PIS.	**		BY	DATE	BY	DATE
	MATERIAL CHECK		1			1
	PIECE PART FABRICATION					
	BURN/SHEAR SHELL					
	ROLL & TACK SHELL					
	WELD STR. SEAM				Section 1	
	SPOT X-RAY LONG SEAM					
	N.D.E. OFFSET INSPECTION					
	L/O & INSTALL FITTING HD. WELD				1.	
	F&T HEAD TO SHELL					
	GIRTH SEAM F/U				1.11	
	WELD GIRTH SEAM		1.1	28.2		1
	X - RAY GIRTH SEAM					
	LAYOUT SHELL			1		Les al
a and the	INSTALL FITTINGS SHELL WELD					T
	INSTALL ATTACHMENTS					
	CLEAN					- Calles
**	FINAL INSPECTION	**		1.20.60		
**	HYDRO S/S	**				
**	HYDRO T/S	**			- Sector	
**	VERIFICATION OF NAMEPLATE	**			100	1
	YARD					
	SHIPMENT					1

EFF. 70%	X-RAY NONZ
SHELL 7/32"	HEADS . 226" MIL
R.D. 2:1	K.R
TEMP: 2200F.	NO. COURSES
SHELL HT. NO.	
MIC. THICKNESS	
HEAD HEAT NO.	
MIC. THICKNESS	and the second
HEAD CIRCUM.	
HEAD DEPTH	
SCH. SHOP COMPL.	
SCH. SHIP DATE	

USE WELDING PROCEDURE										
NOS.	1-A	13	15	17-A	21					
REV.	1	2	1	1	1					

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Confidential Records Management, Inc. New Bern, NC 1-888-622-4425 9/08







Renovation of Building M231 Marine Corps BAse Camp Lejeune, NC Contract: N62370-88-C-3764

General Contractor:

Fans

CBC Enterprises, Inc. 1312 E. Little Creek Road Norfolk, Virginia Phone: (804) 588-6100

Mechanical Contractor:

G.R. Michaels & Co. 331 32nd Street Newport News, Virginia Phone: (804) 622-3099 Mr. Terry Gregston

Wholesaler and Supplier:

Air Distribution Sales of Virginia 742 East 25th Street Norfolk, Virginia 23508 (804)623-7345 Mr. Greg Cherry.



PART NO. 452441

### **READ AND SAVE THESE INSTRUCTIONS**



C. For All SP/CSP Sizes - Re-install power assembly in housing so that scroll discharge matches vertical discharge duct connec-

or, Refer to photo's C or D. Replace and hten bracket fasteners. Plug power cord nto internal receptacle.

HORIZONTAL DISCHARGE

SP/CSP 108-127





SP/CSP 150-158





STEP 6. Installing SP Grille and CSP Bottom Panel Position the grille (SP) or bottom panel (CSP) over the housing opening. Secure fasteners. (2 for SP; 4 for CSP)



### Hanging Vibration Isolators

Vibration isolator kits are available for suspended installations. Kits include all hardware necessary to mount one unit, with the exception of 10-32 threaded rod supplied by others. Fan mounting brackets include prepunched holes for ease of installation.



UNIT SIZE	A	в
108	41/2	115%
115, 117	51/2	145%
125, 127	63/4	151/2
150, 152, 155, 158	91⁄4	195%
160, 162, 165	91⁄4	253%
170, 175	91/4	36 3/4

159 EU / 520 449



2





IF SP OR CSP UNITS ARE TO BE INSTALLED WITH STANDARD HORIZONTAL DISCHARGE, PROCEED DIRECTLY TO STEP 4 FOR INSTALLATION INSTRUCTIONS. STEPS 1 THRU 3 APPLY ONLY TO DISCHARGE CONVERSIONS FROM HORIZONTAL TO VERTICAL.

#### STEP 1. Converting Duct Connector to Vertical Discharge

Remove duct connector and cover plate. Exchange their positions and secure with fasteners. (See versatile mounting arrangements on page 4.)





#### STEP 2. Converting Power Assembly to Vertical Discharge

A. Remove grille (SP) or bottom panel (CSP). To remove power assembly, unplug the power cord from the internal receptacle.

B. With unit unplugged, remove fasteners connecting power assembly bracket to housing. (1 fastener in SP/CSP 160-165 or 3 fasteners in CSP 170/175).

C. Remove power assembly from housing. Take care not to damage insulation.



SP/CSP 160-165

CSP 170/175

#### STEP 3. Converting Power Assembly (cont.) Re-install power assembly in housing so

that scroll discharge matches vertical discharge duct connector. Replace and tighten all fasteners. Plug power cord into internal receptacle. Replace and secure grille or bottom panel.





#### **STEP 4. Ceiling or Duct Installation**

For suspended mounting installations, see Fig. A. For ceiling mounted (SP) — Adjust mounting angles to allow fan housing to fit flush with finished ceiling. Be sure unit's backdraft damper operates freely after ductwork is installed.





#### **STEP 5. Electrical Connections**

'Remove external electrical outlet cover (A). Connect supply conduit thru one of the two 7/8'' dia. knockouts (B). Electrical connections are made directly to black and white leads. A separate green fastener is provided for ground wire connection. Replace outlet cover.



#### VERSATILE MOUNTING ARRANGEMENTS





#### MAINTENANCE SUGGESTIONS

Models SP and CSP ceiling exhaust fans require very little maintenance. But because a small problem, left unchecked, could lead to loss of performance or early motor failure, we do recommend that the unit be inspected periodically (Once or twice per year).

The fan motor and wheel(s) should be checked for dust and dirt accumulations. Dirt build-up on the drive frame could cause motor overheating by restricting air circulation around the motor. Build-up on the wheel would limit air movement. Cleaning can be accomplished by simply brushing off any dust that may have accumulated.

The motor should be checked for lubrication at this time. Lubricate only those motors which have an oil hole provided on the motor. A few drops of all purpose oil (SAE 20 viscosity rating) will be sufficient. Do not over-lubricate.

#### WARRANTY

Greenheck Fan Corporation warrants this equipment to be free from defects in material and workmanship for a period of one year from the purchase date. Any units or parts which prove to be defective during the warranty period will be replaced at our option when returned to our factory, transportation prepaid.

The motor is warranted by the motor manufacturer for a period of one year. Should the motor prove defective during this period, it should be returned to the nearest authorized motor service station. Greenheck Fan Corporation will not be responsible for any installation or removal costs.

> CSP models shown are UL listed E 33599 Maximum airstream temperature not to exceed 95°F.



P.O. BOX 410 SCHOFIELD, WISCONSIN 54476-0410 PH. 715-359-6171

CSP models shown are CSA certified LR-34470 Models CSP 108-175

> IOM SP/CSP FS MAY 1989





### LO-SONE VENTILATORS INSTALLATION INSTRUCTIONS

## **TYPICAL MOUNTING**

1. Provide Frame - This unit is designed to fit within joists on 16" centers. If ceiling joists are on larger centers, frame in housing location. Provide a solid frame to assure lowest sound levels. See Figure 1 for typical installation.

Brackets are factory set for  $\chi''$ ceiling thickness. Make sure that housing will be flush with finished ceiling.

Figure 1

VENTILATOR.

METHODS

located

FIED ELECTRICIAN.

Damper/Duct

Connector

bry set for ½" Make sure that o flush with

TYPICAL WIRING

SAFETY WARNING

TURN OFF PROPER 120 VOLT CIRCUIT AT THE

SERVICE ENTRANCE BEFORE WIRING THE

ALL ELECTRICAL CONNECTIONS MUST BE

MADE IN ACCORDANCE WITH LOCAL CODES,

ORDINANCES, AND NATIONAL ELECTRICAL CODE. IF YOU ARE UNFAMILIAR WITH

WIRING, SECURE THE SERVICES OF A QUALI-

4. Wire Unit - Remove wiring adapter plate, which is

YPICAL DUCTING

5. Connect Ductwork - Connect ductwork to damper/duct

connector. Tape all joints with duct tape. (Fig. 4)

OF INSTALLING ELECTRICAL

on top of housing (See Fig. 9), and attach

Figure 4

10

14%

This unit is designed to adapt to many different installation requirements. Plan your installation carefully. For various ducting, mounting, and wiring options, see pages 2 and 3. This page shows the most common installation.

NOTE DO NOT INSTALL THE 362 or 363 LO-SONE VENTILATOR OVER A COOKING SURFACE. THE 383 LO-SONE VENTILATOR MAY BE INSTALLED OVER A COOKING SURFACE. TO AVOID MOTOR BEARING DAMAGE AND/OR UNBALANCED OR NOISY IMPELLERS, KEEP DRYWALL SPRAY, CONSTRUCTION DUST, ETC. OFF POWER UNIT.

2. Trace Keyhole Slots - Hold unit against joists and trace keyhole slots in mounting brackets onto joists. Start wood screws provided in same end of all traced keyhole openings. Leave about 3/8" of screws projecting from joists. (Fig. 2)



3. Hang Unit - Tighten mounting screws as firmly as possible to assure lowest sound levels. For additional support, fasten unit to joists with nail or screw through hole in center of each mounting bracket.

electrical cable with appropriate electrical connector. Fasten incoming ground wire (bare or green wire) to adapter plate with green ground screw provided. Connect white wire to white, black wire to black. (Fig. 3) Replace wiring adapter plate so that tab on housing slides through slot on plate. (See Fig. 9)





## **GRILLE MOUNTING**

6. Install grille using screws provided. Do not over-tighten.

# INSTALLATION OPTIONS

Mounting brackets may be adjusted and/or moved for various types of installations shown below.

Reverse brackets to give approximately 1" more clearance. Remove hex nuts, flip brackets over, and replace hex nuts. Tighten nuts securely. (Fig. 7)

To adjust bracket position, loosen 7/16" hex nuts and move brackets up or down. Re-tighten hex nuts securely. (Fig. 5)



Adjustable for various ceiling thicknesses.

Figure 5

To move brackets, remove 7/16" hex nuts. Re-position brackets on different set of slots. Replace hex nuts and tighten securely. (Fig. 6)



Installation from above finished ceiling.

Figure 6A





Installation with suspended ceiling.

Figure 7A



Figure 7B

For in-line installations, remove 7/16" hex nuts. Reposition brackets so that housing opening is at the side instead of the bottom. (Fig. 8)





### **TAB PLACEMENT HERE**

### **DESCRIPTION:**

None



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Tab page contained hand written information \*Scanned as next image

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#### INSTALLATION, OPERATION AND MAINTENANCE

REFERENCE INSTRUCTIONS

PROJECT:

BLDG. M-231 MARINE CORPS BASE CAMP LEJEUNE, NC

**PURCHASER:** 

EQUIPMENT:

G. R. MICHAELS AND COMPANY 331 32nd Street Newport News, Virginia 23607 ATTN: Carl Knapp

QTY. 1 - PACKAGED AIR-COOLED CHILLER MODEL #W1LC530A25 TAG: ACC-1

MANUFACTURER:

YORK INTERNATIONAL CORPORATION 11635 BUSY STREET RICHMOND, VIRGINIA 23236

PURCHASE ORDER #	1290
YORK ORDER NO.	90-819826
YORK CONTRACT NO.	0-15258
SALES MANAGER :	LARRY J. BUNK
DATE:	APRIL 12, 1991

Enclosure: 4 sets

cc: Sales Dept (1) Service Dept. (2)

> Applied Systems York International Corporation 11635 Busy Street Richmond, Virginia 23236 Telephone (804) 379-1800 Toll Free (800) 552-YORK Fax (804) 379-1418





#### HERMETIC RECIPROCATING PACKAGED LIQUID CHILLERS

489

Supersedes: Nothing

Form 150.46-PAC-1

MODEL W1LC220 - 530

#### PACKET CONSISTS OF

DESCRIPTION	FORM NO.
	15年1月1
Installation Instruction	570.05-N2Y
Wiring Diagram	035-07413
Installation	55.70-N1
Installer's Check List	55.70-N2
Start=up Instructions	55.70-N3

To use this packet, use an SP Literature Order Form 45.05-F21.1. List Packet Form No. 150.46-PAC-T only and the quantity of packets required.





#### LIQUID CHILLER (AIR-COOLED)

INSTALLATION INSTRUCTION

Supersedes: Nothing

570.05-N2Y (1287)

035-07818

#### MODELS W1LC420 AND 530 STYLE A



#### GENERAL

YORK's W1LC Packaged Air-Cooled Liquid Chillers provide chilled liquid for all air conditioning applications. They are completely self contained chilling systems utilizing an accessible hermetic compressor, liquid cooler, air cooled condenser coils and electrical control panel all mounted on a steel base. They are factory piped, wired, dehydrated, evacuated, leak tested, pressure tested, functionally tested and fully charged with Refrigerant-22.

Most controls are located on the front of the unit and are readily accessible for maintenance, adjustment and service. All wiring, (power and control) can be made through the bottom of the compressor compartment.

#### REFERENCE

Additional information on the design, installation, operation and service of air conditioning equipment is available in the following reference material.

Form	55.70-N1
Form	55.70-N2
Form	55 70-N3

- General Installation

Pre-start & Post-start Check List
General Service Information

Renewal Parts: Refer to Parts Microfiche or Parts Manual for complete listing of replacement parts on this equipment.

The above forms and all other forms referenced in this instruction may be ordered from:

Publications Distribution Center Central Environmental Systems PO. Box 1592, York, Pa. 17405

#### INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing. Refer to Form 50.15-NM for additional information.

Installer should pay particular attention to the words: NOTE, CAUTION and WARNING. NOTES are intended to clarify or make installation easier. CAUTIONS are given to prevent equipment damage. WARNINGS are given to alert the installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

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Description

Water Side Pressure Drop.....

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#### PRODUCT NOMENCLATURE



#### INSTALLATION

#### LIMITATIONS

These units must be installed in accordance with all national and local safety codes. If no local codes apply, installation must conform with the appropriate national codes. See Table 1 for application data. Units with voltage codes 25 and 46 are certified by the Electrical Testing Laboratory (ETL) as meeting the requirements of the ANSI/UL 465 Central Cooling Air Conditioner Standard. If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or the customer's expense.

	TABLE 1	- APPLICATION	DATA
--	---------	---------------	------

UNIT	VOLTAGE VARIATION						
POWER SUPPLY	MIN. VOLTS	MAX. VOLTS					
208/230-3-60	187	253					
460-3-60	414	506					
380/415-3-50	342	440					
380-3-60	355	415					

		MODEL						
LIMITATION	13	W1LC420	W1LC530					
Cooler Liquid	Min.	55	70					
(GPM)	Max.	150	160					
Leaving Liquid	Min. <sup>1</sup>	32	32					
Temp. (°F)	Max.	50	50					
Air Entering	Min. <sup>2</sup>	20	20					
Condenser (°F)	Max.	115	115					

<sup>1</sup> For applications below 40°F leaving liquid temperature, a mixture of ethylene glycol and water must be used.

Water in the cooler is protected from freeze-up to 0°F ambient by a heater under the insulation.



BASE RAILS

FIG. 1 - UNIT HANDLING

Central Environmental Systems

#### HANDLING

These chillers are shipped as completely assembled units with a full operating charge. Care should be taken to avoid damage due to rough handling.

#### CAUTION: Units are not designed for stacking.

A unit should be lifted by inserting hooks through the holes in the base rails.

CAUTION: Spreader bars of greater width than the unit must be used to avoid crushing the unit frame or panels with lifting chains or cables.

When preparing to move the unit, always determine the center of gravity in order to equally distribute the weight. Slings connected to the compressor end of the unit will usually have to be made shorter than those to the rear of the unit, so the unit will lift evenly. Refer to Figure 1.

#### LOCATION

These units are designed for outdoor installations on ground or rooftop. The location should be selected for minimum sun exposure and to insure an adequate supply of fresh air for the condenser. Avoid locations beneath windows or between structures where normal operating sounds may be objectionable. The condenser fans are propeller type and are not suitable nor intended for use with duct work in the condenser air stream.

On either rooftop or ground level installations, rubber padding can be applied between the base rails of the unit and its support to lessen the transmission of vibration.

#### Ground Level Locations

It is important that the units be installed on a substantial base that will not settle. See Table 2 for unit weights. Settling could cause strain on the refrigerant or water lines resulting in leaks. A one piece concrete slab with footers extended below the frost line is highly recommended.



#### 570.05-N2Y

Additionally, the slab should NOT be tied to the main building foundations as noise due to vibration may be transmitted.

For ground level installations, precautions should be taken to protect the unit from tampering or to prevent injury to unauthorized persons. Screws on access panels will prevent casual tampering. However, further safety precautions such as a fenced-in enclosure or locking devices on the panels may be advisable. Check local authorities for safety regulations.

#### Rooftop Locations

Choose a spot with adequate structural strength to safely support the entire weight of the unit and service personnel. Care must be taken so as not to damage the roof. Consult the building contractor or architect if the roof is bonded. The unit must be mounted level on a minimum of two beams. The beams should (1) be positioned perpendicular to the roof joists, (2) extend beyond the dimensions of the section to distribute the load of the roof, (3) be capable of supporting the weight of the unit and (4) be positioned parallel to the longer base rails of the unit OR parallel to the shorter base rails of the unit as shown in Figure 2.



#### FIG. 2 - SUPPORT BEAM LOCATIONS

#### **CLEARANCES**

The units must be installed with sufficient clearance for air to enter the condenser coil and not be recirculated after discharge. Sufficient clearance must also be provided for service access. Refer to the unit illustration in Figure 5 for minimum clearances. The area within the clearances and the area under the unit must be kept clear of all obstructions that would impede free air flow to the unit. In installations where low ambient operation is intended and snow accumulation is expected, additional unit height must be provided to insure full air flow.

#### **COMPRESSOR HOLD-DOWN NUTS**

For shipping, the hold-down nuts are tightened, drawing the compressor mounting feet down to the shipping stops.

CAUTION: After the unit is in its final position, remove the compressor hold-down nuts and shipping spacers. Install rubber grommets (shipped in bag tied to compressor). Replace hold-down nuts and tighten until they begin to bind the rubber grommets. Continue to tighten 1/2 turn. See Figure 3.



#### FIG. 3 - COMPRESSOR HOLD-DOWN NUTS

#### DISCHARGE LINE HOLD-DOWN BRACKET

CAUTION: Do NOT remove the discharge line support brackets located within the compressor compartment. It reduces vibration during unit operation.

#### CHILLED LIQUID PIPING

The cooler inlet and outlet liquid connections are 4 inch nominal pipe size. The connections are made with grooved ends designed to accept Victaulic<sup>®</sup> grooved pipe couplings only. Remove the shipping caps and discard.

CAUTION: The liquid piping RETURNING to the chiller MUST be attached to the cooler connection CLOSEST to the compressor end of the unit. The liquid piping LEAVING the cooler MUST be attached to the cooler connection FURTHEST from the compressor end of the unit. See Figure 5 for liquid inlet and outlet connections.

	Co	mpres	ssor <sup>1</sup>	a contra	Condenser						Operating	0	Unit					
Model	Nom	No	Stages	F	ans (F	ropelle	r)	Fan	Motors <sup>3</sup>	Coil (C	opper -	Tube-A	luminu	m Fin)	Charge	Capacity	Weight	
model	Cap.	of	of	Otv <sup>2</sup>	Dia.	Pitch	Nom.	нр	RDM	Face Area	Ro	ows	Tube	Fins	Lbs.	(%)	Lt	os.
	(Tons)	Cyl.	Cap.	Griy.	(ln.)	(Deg.)	CFM			(Ft.) <sup>2</sup>	Deep	Wide	(In.)	In.	(R-22)		Ship.	Oper.
W1LC420 System 1 System 2	20 20	4	2 2	3	24	20	16,050 16,050	2/4	1075	30.0 30.0	3	36 36	2/9	12	26 26	25,50 75,100	3380	3480
W1LC530 System 1 System 2	20 30	4	2 2	3 4	24	30	14,400 19,400	3/4	1075	25.0 35.0	4	30 42	3/0	12	26 35	20,40 60,100	3720	3820

<sup>1</sup> All compressors are semi-hermetic.

TABLE 2 - PHYSICAL DATA

<sup>2</sup> During low ambient conditions, one of the fan motors will operate at 450 RPM.

<sup>3</sup>These PSC motors are directly connected to the condenser fans and have inherent protection, ball bearings and a 48 frame. Their rotation is clockwise when viewing the shaft end of the motor.



The chilled liquid lines that are exposed to outdoor ambient should be wrapped with supplemental heater cable and insulated to protect against freeze-up during low ambient periods and to prevent formation of condensation on lines in warm humid climates. The unit provides electrical contact closure when the outdoor ambient is low and cooler water is not flowing to energize these supplemental heaters but power must be supplied from a separate power source. Refer to Field Wiring, Figure 4.

A water flow switch is installed on the leaving water connection of the cooler. For proper operation, there should be a straight horizontal run of at least 5 pipe diameters down stream of the switch.

The chilled liquid piping system must be laid out so that the circulating pump discharges into the cooler. Hand stop valves are recommended for use in all lines to facilitate servicing. Drain connections should be provided at all low points to permit complete drainage of the cooler system and piping. The cooler barrel is provided with a 3/4 inch drain connection on the bottom of the cooler and a 1/4 inch air purge connection on the top of the cooler. A strainer (40 mesh) is recommended for use on the inlet to the cooler.

NOTE: When filling the piping system with liquid, purging the system of air is essential for the unit to achieve design capacity. Be sure to slowly fill the system with liquid and to open all purge connections in the system including the 1/4 inch connection on top of the cooler. Close all connections after all air has been purged from the system.

As an aid to servicing, thermometers and pressure gauges are recommended in the inlet and outlet water lines. A 1/4 inch plugged connection is provided on each connection for the field to install these devices.



(10VA MAX)



#### **ELECTRICAL WIRING**

#### WARNING: All power and control wiring must be in accordance with national and local electrical codes.

#### **POWER WIRING**

These units are designed for single point power source. Check the available power and unit nameplate to see if the voltages are the same. Run the necessary number of properly sized wires to the unit. Provide a disconnect switch and fusing as required. Route the conduit to the large knockout located on the bottom of the electrical box. Remove the plastic plug from the knockout and discard. See Table 3 or 4 for electrical data.

The disconnect switch may be bolted to the side of the unit but not to any of the removable panels; this would interfere with access to the unit. Make sure that no refrigerant lines or coils will be punctured when mounting the disconnect switch, and note that it must be suitable for outdoor installation.

#### CONTROL WIRING

All control wiring is connected to the field wiring terminal block, 3TB, located in the bottom of the control box. A more detailed description of operating controls is given in the Operation Section.

#### WARNING: All control wiring is 120 volts single phase. Properly sized and insulated wiring should be used.

An indoor room thermostat is not required to operate these units. Each unit contains an automatic temperature control which maintains a constant return liquid temperature to the cooler. Several recommended and optional field hookups are connected to the 3TB terminal strip. They are:

- 1. Chilled Water Pump Starting Circuit terminals K and H. (Recommended, not to be used for normal start)
- 2. Day/Night Switch Contacts for Cycling Unit On and Off with Unit Pumpdown - terminals G and C. Remove jumper J1. (Recommended)
- Low Leaving Liquid Temperature Alarm terminals B 3. and 48. (Optional)
- 4. Loss of Liquid Flow Alarm/Aux Pump Start - terminals A and 48. (Optional)

#### MULTIPLE UNITS

For increased compressor protection and to reduce power inrush at start-up on multiple chiller installations, provisions must be made to prevent simultaneous start-up of two or more units. Also, some method may be employed to automatically cycle on or off one or more of the units to permit more efficient operation at part load conditions.

#### WIRING TO EXTERNAL WATER LINE HEATERS

When the outdoor ambient drops below 36°F and there is no water flow, a contact in the unit closes across terminals W and L on the 2TB terminal block located in the bottom of the control box. This contact closure may be used to energize field installed heaters located on water lines to the unit. (See Figure 4)

WARNING: The unit contact closure does NOT provide power for the heaters. Single phase 120 or 240 volt power must come from a separate, field installed fused disconnect. Heater power must not exceed 1200 watts.

Unit Model Designation		Com	Condense	ors	Unit Ampa-	Max. Fuse	Min. <sup>3</sup> Wire	Max. <sup>4</sup> Wire					
		Power Supply	Qty.	RLA	LRA	Power Supply HP Qty. FLA (each)				city, Amps	Size, Amps	Size (AWG)	Lg. (Feet)
W11 C420A	25	208/230-3-60	2	88.5 each	428 <sup>1</sup> each	208/230-1-60	3/4	4 2	4.2 4.5	225	250	0000	212@208 227@230
WILC420A	46	460-3-60	2	44.3 each	214 each	460-1-60	3/4	4	2.3 2.5	114	125	2	374
	25	208/230-3-60	1 1	88.5 135	428 <sup>1</sup> 565 <sup>2</sup>	208/230-1-60	3/4	5 2	4.2 4.5	288	300	350	226@208 237@230
W1LC530A	46	460-3-60	1 1	44.3 67.5	214 283	460-1-60	3/4	5 2	2.3 2.5	146	175	0	424

#### TABLE 3 - ELECTRICAL DATA

<sup>1</sup>250 Amps on part winding start. <sup>2</sup>340 Amps on part winding start.  $^3$  Based on three, 75°C insulated copper conductors in steel conduit.  $^4\,$  Based on a 3% voltage drop.

#### TABLE 4 - ELECTRICAL DATA (International Models)

Unit Model		Com	Condense	ors	Unit Ampa-	Max. Fuse	Min. <sup>3</sup> Wire	Max. <sup>4</sup> Wire					
Designatio	n	Power Supply	Qty.	RLA	LRA	Power Supply	HP	Qty.	FLA (each)	city, Amps	Size, Amps	Size (AWG)	Lg. (Feet)
W/11 0 400 A	50	380/415-3-50	2	38 each	165 <sup>1</sup> each	380/415-1-50	3/4	4 2	2.3 2.5	105	110	2	320@380 368@415
WILC420A	40	380-3-60	2	52.1 each	208 each	460-1-60	3/4	4 2	2.3 2.5	135	150	0	377
en di Statu (destation) La sul Statu (destation)	50	380/415-3-50	1 1	38.0 62.7	165 <sup>1</sup> 225 <sup>2</sup>	380/415-1-50	3/4	5 2	2.3 2.5	135	150	0	369@380 412@415
W1LC530A	40	380-3-60	1	52.1 77.8	208 307	460-1-60	3/4	5 2	2.3 2.5	170	200	00	357

<sup>1</sup> 100 Amps on part winding start. <sup>2</sup> 150 Amps on part winding start. <sup>3</sup>Based on three, 75°C insulated copper conductors in steel conduit.

<sup>4</sup>Based on a 3% voltage drop.

W	1LC42	20	w	1LC53	30
GPM	PSIG	FEET	GPM	PSIG	FEET
55 60 65 70 75 80 85 90 95 100 105 110 115 120 125	2.2 2.5 2.9 3.3 3.7 4.1 4.6 5.1 5.6 6.1 6.7 7.3 8.6 9.3	4.9 5.8 6.7 7.6 8.5 9.5 10.6 11.7 12.9 14.1 15.4 16.8 18.3 19.9 215	70 75 80 85 90 95 100 105 110 115 120 125 130 135 140	2.1 2.4 2.7 3.1 3.5 3.9 4.3 4.7 5.2 5.7 6.2 6.7 7.3 7.9 8.5	4.9 5.6 6.4 7.2 8.1 9.0 10.0 11.0 12.1 13.2 14.4 15.6 16.9 18.2 19.6
		opaint and server	145 150	9.1 9.7	21.0 22.5
Annual Contractor	and the second second	Annual Pression of	155	10.4	24.0

#### TABLE 5 - WATER SIDE PRESSURE DROP



FAN GUARDS (Refer to Figure 6 for orientation of condenser fans).



# 

#### FRONT VIEW

#### BASIC UNIT DIMENSIONS

MODEL	Α	В	С	D	Е	F	G
W1LC420	127-1/4	91-1/8	51-5/8	118-5/8	86-7/8	22-1/2	6-1/4
W1LC530	127-1/4	91-1/8	55-5/8	118-5/8	86-7/8	26	6-1/4

#### **COOLER DIMENSIONS & WEIGHTS**

UNIT	COOLER SIZE	WATER CONN'S.*	J	к	L	м	COOLER WEIGHT (Lbs)	
MODEL	(Dia x Lg)	(Inlet & Outlet)			10.5.2.2.4.4		Oper.	Dry
W1LC420	10" x 7'	4″	13	72-1/2	12-7/8	26	800	700
W1LC530	10" x 7'	4″	13	72-1/2	12-7/8	26	800	700

\* Nominal pipe size - victaulic type.

#### FIG. 5 - UNIT DIMENSIONS AND CLEARANCES

Central Environmental Systems

#### 

ULLANANULO								
FRONT	36″							
BACK	24"*							
LEFT SIDE	24"*							
RIGHT SIDE	24"*							
TOP	120″							

\* One side only.

NOTE: The area within the clearances shown above and area under the unit must be kept clear of all obstructions that would impede free air flow to the unit. In installations where winter operation is intended and snow accumulations are expected, additional unit height must be provided to insure full air flow.

All dimensions are in inches. They are subject to change without notice. Certified dimensions will be provided upon request.

#### 570.05-N2Y

#### **OPERATION**

### CHECKING THE SYSTEM PRIOR TO INITIAL START UP

With the system piping and electrical wiring completed, the unit is ready to have electrical power applied. Before applying power, however, the following checks should be made:

- 1. Compressor shipping brackets have been removed and rubber isolators installed.
- 2. The Return Liquid Temperature Control (TC) has been adjusted to the desired Return Liquid Temperature and Between Stage Differential.
- The Freeze Control thermostat (FC) has been set to the proper setting. (Factory setting is 36°F)
- 4. Fan blades rotate freely.
- Compressor crankcase oil level shows 1/3 to 1/2 in sight glass.
- Suction, discharge and liquid line king valves, located in the compressor section, are open. There are two systems in these units and each system employs one set of these valves.
  - CAUTION: Suction, discharge and liquid line valves are shipped closed.
- The power supply voltage is the same as the unit nameplate voltage.
- 8. Proper fuses are in main disconnect power circuits.

#### APPLYING POWER TO THE UNIT

- CAUTION: With the preceding steps completed, make sure the DAY/NIGHT switch is in the NIGHT or UNOCCUPIED position or the unit will start immediately and compressor damage may occur.
- 1. The main power disconnect switch may now be turned ON.
  - CAUTION: Check to insure that the compressor crankcase heaters are energized. Allow at least 24 hours warm-up to allow all liquid refrigerant to be driven from the compressors. After warm-up, the crankcases should be warm to the touch.
- Start the chilled water circulating pump. Assure that the flow rate is approximately correct by checking the water pressure drop across the cooler with the data shown in Table 5.
- Check that the liquid freeze prevention thermostat (FC) does not need to be reset. It may have tripped if the unit was exposed to low outdoor temperatures during shipment.
- 4. Turn the DAY/NIGHT switch to the DAY or OCCUPIED position. If the water flow switch is closed, the unit will start after the required time delays built into the control circuit, provided the return liquid temperature is warm and the temperature control (TC) is calling for cooling.
- Allow the unit to operate, but be ready to stop the unit should any unusual noise or other adverse condition develop.
  - NOTE: Opening the DAY/NIGHT switch will only shut the unit off after completion of the pumpdown cycle. Turning OFF the main power supply will stop the unit immediately.
- To determine if the unit is operating properly, the refrigerant subcooling and superheat should be checked.

#### SEQUENCE OF OPERATION

Although the operation of Models W1LC420 and W1LC530 is similar, the #2 system of the W1LC420 is 20 tons while the #2 system of the W1LC530 is 30 tons. The sequence of operation that follows is for Model W1LC530.

NOTE 1: Figures in parentheses () represent line numbers on the unit wiring diagram shown in Figure 6.

NOTE 2: The contact opening and closing times for 50 hertz units are 6/5 of those listed for 60 hertz units.

System start-up and staging is controlled by the TC (81) which is energized through the day-night switch (83), optional field installed pump aux. contact (83), FC (81) and WFS (81). The FC (81) opens below 36°F leaving water temperature and closes above 42°F with manual reset. The WFS (81) closes at water flow rates above 55 GPM. The TC (81) is a solid state thermostat which maintains the desired chilled (supply) liquid temperature by sensing and regulating the return liquid temperature (see the ELECTRICAL CONTROLS section). It employs an encapsulated thermistor located in a well in the return liquid line.

#### **COMPRESSOR NO. 1 OPERATION**

When the first stage of the TC (81) calls for cooling:

- 1. Contact TC-1 (53) closes and energizes relay 16R (53).
- Liquid line solenoid valve 1LLS (52) will be energized through 16R-2 (52), and liquid refrigerant will flow to the 20 ton expansion valve.
- Low pressure bypass/anti-short-cycle timer 1TR (38) will be energized through 1HP (38), 18R-1 (38), 16R-1 (42), 1MP (40), 1LP (40) and 1TR-1 timer contact B2-B (39 and 38). This contact will remain closed for 150 seconds.
- 4. Time circuit relay 6R (50) will be energized through 1HP (38), 18R-1 (38), 16R-1 (42), 1MP (40), and 1TR-2 timer contact A-A1 (46 and 47). These contacts will remain closed for 15 seconds. Once energized, 6R will remain energized through its own 6R-2 contact (50) until 16R-1, 1MP or 1HP opens.

Fifteen seconds after timer 1TR (38) is energized, its 1TR-2 contact A-A2 (46) will close to energize compressor contactor 1M (43), and condenser fan motor contactor 5M (44) through contact 6R-1 (46) and timer contact 2TR (40). The 1TR-2 contact A-A2 (46) will remain closed for 135 seconds to bypass low pressure control 1LP (40). If 1LP opens during this time period, timer 1TR (38) will remain energized through contact 1R-3 (40).

When the compressor and condenser fan contactors are energized, relays 1R (45) and 20R (46) will also be energized. Contact 1R-3 (40) will close to keep the No. 1 system operating after the 1TR-2 timer contact A-A2 (46) opens, providing the low pressure control 1LP (40) is satisfied. Contact 1R-1 (38) will close to keep the condensing section operating after the first stage of the TC is satisified. Contact 20R (30) opens to de-energize compressor no.1 crankcase heater 1CCH (30) while the compressor runs.

When the second stage of the TC (81) calls for cooling:

 Contacts TC-3 (55) will close to energize relay 4R (55), and condenser fan no. 2 will start up, providing the temperature of the outdoor air is above the 45°F set point of thermostat 2TH (19).



 Contact TC-4 (56) will open tc de-energize compressor solenoid valve 2SOL (56), and the 20 ton compressor will operate at full capacity.

#### PART-WINDING START (SYSTEM #1)

208/230 and 380/415 volt compressors have two contactors and include part winding start. On start-up, timer 4TR (47) prevents contactor 2M (47) from being energized until 1 second after contactor 1M (43) is energized. This 1-second delay reduces the LRA of the compressor substantially. Refer to the electrical data in Table 3 or 4.

#### PUMPDOWN (SYSTEM #1)

When the compressor is running at part load and when the liquid cooling requirement becomes satisfied, contact TC-1 (53) will open to de-energize relay 16R (53). Contact 16R-2 (52) will open to de-energize liquid line solenoid valve 1LLS (52), and no refrigerant will flow to the 20 ton side of the cooler. Contact 16R-1 (42) will open but contact 1R-2 (40) will keep the 20 ton compressor in operation until the low side of the system is pumped out and low pressure control 1LP (40) opens to shut the No. 1 system down.

#### ANTI-SHORT CYCLING (SYSTEM #1)

When low pressure control 1LP (40) opens to de-energize the 20 ton compressor and the condenser fans, relay 1R (45) will also be de-energized. Timer 1TR (38) will now be energized through contact 1R-1 (38) and its own contact B1-B (38). 1TR timer will continue to run through this path for 350 seconds before the 20 ton compressor can restart.

#### OIL FAILURE (SYSTEM #1)

If the oil to suction pressure differential drops below 14 psig  $(\pm 2)$ , 1 OPA (41) in the oil pressure control will close and energize timer 2TR (41). If this low pressure condition exists for more than 90 seconds, 2TR contact (40) will open to shut down the compressor and condenser fans.

#### HIGH PRESSURE LOCKOUT (SYSTEM #1)

If the 20 ton compressor discharge pressure exceeds 395 psig, 1HP (38) will open to shut down the compressor and condenser fans. At the same time, lockout relay 18R (42) will energize and hold itself in through its own 18R-2 (44) contact. Contact 18R-1 (38) opens and prevents the unit from restarting when 1HP (38) closes. The unit can be reset by momentarily opening the unit disconnect switch provided 1HP (38) has closed. After reset, the unit will start in 350 seconds provided there is a call for cooling.

#### **COMPRESSOR NO. 2 OPERATION**

#### When the third stage of the TC (81) calls for cooling:

- 1. Contact TC-5 (72) closes and energizes relay 17R (72).
- Liquid line solenoid valve 2LLS (71) for pumpdown will be energized through 17R-2 (71), and liquid refrigerant will flow to the 30 ton expansion valve.
- Low pressure bypass/anti-short-cycle timer 5TR (58) will be energized through 3HP (58), 19R-1 (58), 17R-1 (62), 2MP (60), 2LP (60) and 5TR-1 timer contact B2-B (59 and 58). This contact will remain closed for 150 seconds.
- 4. Time circuit relay 14R (70) will be energized through 3HP(58), 19R-1 (58), 17R-1 (62), 2MP (60), and 5TR-2 timer contact A-A1 (66 and 67). These contacts will remain closed for 15 seconds. Once energized, 14R will remain energized through its own 14R-2 contact (70) until 17R-1, 2MP or 2HP opens.

Fifteen seconds after timer 5TR (58) is energized, its 1TR-2 contact A-A2 (66) will close to energize compressor contactor 3M (63), and condenser fan motor contactor 6M (64) through contact 14R-1 (66) and timer contact 6TR (60). The 5TR-2 contact A-A2 (66) will remain closed for 135 seconds to bypass low pressure control 2LP (60). If 2LP opens during this time period, timer 5TR (58) will remain energized through contact 7R-3 (60).

When the compressor and condenser fan contactors are energized, relays 7R (65) and 21R (66) will also be energized. Contact 7R-3 (60) will close to keep the No. 2 system operating after the 5TR-2 timer contact A-A2 (66) opens, providing the low pressure control 2LP (60) is satisfied. Contact 7R-2 (60) will close to keep the condensing section operating after the third stage of the TC is satisfied.

When the forth stage of the TC (81) calls for cooling:

- 1. Contacts TC-7 (55) will close to energize relays 11R (74) and 12R (75).
- 2. When relay 11R is energized condenser fan no. 5 will start up providing the temperature of the outdoor air is above the 45°F set point of thermostat 4TH (20). When relay 12R closes, condenser fan no. 6 will start. Note, if the temperature of the O.D. air is above the 75 °F set point of 5TH (25), condenser fan no. 6 will already be in operation.
- Contact TC 8 (77) will open to de-energize compressor solenoid valves 4SOL and 5SOL and the 30 ton compressor will operate at full capacity.

#### PART-WINDING START (SYSTEM #2)

208/230 and 380/415 volt compressors have two contactors and include part winding start. On start-up, timer 8TR (67) prevents contactor 4M (67) from being energized until 1 second after contactor 3M (63) is energized. This 1-second delay reduces the LRA of the compressor substantially. Refer to the electrical data in Table 3 or 4.

#### PUMPDOWN (SYSTEM #2)

When compressor 2 is running at part load and when the third stage of the TC (81) becomes satisfied, contact TC-5 (72) will open and de-energize relay 17R (72). Contact 17R-2 (71) will open to de-energize liquid line solenoid valve 2LLS (71), and no refrigerant will flow to the 30 ton side of the cooler. Contact 17R-1 (62) will open but contact 7R-2 (60) will keep the 30 ton compressor in operation until the low side of the system is pumped out and low pressure control 2LP (60) opens to shut the unit down.

#### ANTI-SHORT CYCLING (SYSTEM #2)

When low pressure control 2LP (60) opens to de-energize the 30 ton compressor and the condenser fans, relay 7R (65) will also be de-energized. Timer 5TR (58) will now be energized through contact 7R-1 (58) and its own contact B1-B (58). 7TR timer will continue to run through this path for 350 seconds before the 30 ton compressor can restart.

#### OIL FAILURE (SYSTEM#2)

If the oil to suction pressure differential drops below 14 psig  $(\pm 2)$ , 2 OPA (61) in the oil pressure control will close and energize timer 6TR (61). If this low pressure condition exists for more than 90 seconds, 6TR contact (60) will open to shut down the compressor and condenser fans.



6 - UNIT WIRING DIAGRAM (W1LC530 ELEMENTARY)

FIG.

Central Environmental Systems

570.05-N2Y

IOP CONTROL OIL PRESSURE -COMPR. NO.2 20P CONTROL. DIL PRESSURE -COMPR. NO.2 10PA SWITCH. O.P. CLOBE B-10 PSI: 0PEN 12-16 PSI DIFFERENTIAL 20PA SWITCH. O.P. CLOBE 6-10 PSI: 0PEN 12-16 PSI DIFFERENTIAL 1-SPU FUSE. DUAL ELEMENT (SEE CHART) 4.TPU FUSE. TRANSFORMER PRI (SEE CHART)

SFU FUSE, CONTROL CIRCUIT (SEE CHART) I-7RC CAPACITOR, RUN FAN MOTORS IT TRANSFORMER, CONTROL CIRCUIT 500VA

TERMINAL BLOCK POWER SUPPLY

O 4TB & 5TB TERNINAL BLOCK OONTROL CIRCUIT 120Y A 3TB TERNINAL BLOCK (20V, FIELD WIRING FACTORY WIRING DOT INDICATES TERMINAL NEAREST GROUND

CH	OKE COIL	CHART (ICH	8, 2CH)
LEAD	208/230-60HZ	460-60HZ	380/415-50HZ
YEL	187 - 210	44 - 444	360 - 390
BUUE	210 - 240	444 - 474	390 - 420
RED	240 - 253	414 - 506	420 - 440

COM	ITR	8 5TR	TIMING SHOWN WITH UNIT
CONTACT	TERMINAL	TIMES A	SWITCH (TIME-SEC)
ITR-I	88	OPEN	
5TR-I	88		OPEN
ITR-2	00	OPEN	V/////////////////////////////////////
5TR-2	00	OPEN	OPEN
on change	(	) 14	150

- NOTES: 1. ALL FIELD WIRING PER A. NATIONAL ELEC. CODE (NEC) AND/OR B. LOCAL OR CITY CODES. 2. DRAFTING PRACTICES B. SYMBOLS PER ARI: STANDARDS. 3. ALL NO TORS INVERTENT: PROFECTED. 3. ALL NO TORS INVERTENT: PROFECTED. 4. APPLIANCE MUST BE REMOVED. IT MUST BE REPLACED WITH TYPE ANW SO'C. WINE OR ITS EQUIVALENT. 5. THREE PHASE MOTORS IN THIS UNIT ARE PROTECTED UNDER PUMARY SINGLE PHASE CONDITIONS. 6. SEE UNIT NAME PLATE FOR MAXIMUM FIELD UNIT FOMMER SUPPLY TRUE SIZE. 7. WHEN DAY/NIGHT SWITCH IS USED RENOVE JUMPER JI 6. SEE INSTILLATION INSTITUTIONS FOR ADJUSTMERT JI 6. SEE INSTILLATION INSTITUTIONS FOR ADJUSTMERT JI 6. SEE INSTILLATION INSTITUTIONS FOR ADJUSTMERT JI 7. WHEN DAY/NIGHT SWITCH IS USED RENOVE JUMPER JI 8. SEE INSTILLATION INSTITUTIONS FOR ADJUSTMERT JI 9. THEPS 4TR & BTR AND CONTACTORS 2M & 4M USED WITH 20072304-50 K2 AND SOL/139-50H2 UNITS ONLY. 10. IT TRANSFORER (SOCIAL SHOWN WHED FOR 460-3-60 FOR ROM/230-3-60 SEE DETAIL 'N ESCIAL YEATH, S 30 FOLLY ST
- I. IF LOCAL VOLTAGE IS 380 VOLTS REWIRE DETAIL "8" TO DETAIL "C" IF LOCAL VOLTAGE IS 415 VOLTS REWIRE DETAIL "8" TO DETAIL "D"



#### HIGH PRESSURE LOCKOUT (SYSTEM #2)

If the 30 ton compressor discharge pressure exceeds 395 psig, 3HP (58) will open to shut down the compressor and condenser fans. At the same time, lockout relay 19R (62) will energize and hold itself in through its own 19R-2 (64) contact. Contact 19R-1 (58) opens and prevents the unit from restarting when 3HP (58) closes. The unit can be reset by momentarily opening the unit disconnect switch provided 3HP (58) has closed. After reset, the unit will start in 350 seconds provided there is a call for cooling.

#### WATER COOLER FREEZE PREVENTION

Off-cycle cooler freeze protection is provided when liquid is not flowing to the cooler and the outdoor ambient is low. Under these conditions, water flow switch contact WFS (81) is relaxed, and the cooler heater HTR (86) and 15R (87) relay are energized through the 7TH (86) thermostat which closes below 36°F. The cooler heater is a pad type heater fixed to the cooler under the insulation. The 15R contact (3) closes to energize field installed water line heaters. The power for these heaters comes from a separate disconnect switch. See Figure 4.

#### COMPRESSOR MOTOR PROTECTION SYSTEM

The solid state motor protection system consists of a solid state overload protector module and three sensors embedded in the compressor motor windings. The sensors are connected to the solid state overload protector module 1MP and 2MP. Refer to the wiring label on the inside of the compressor terminal box cover. This system provides 2 minute off-time delay before the compressor can restart.

#### CONDENSER FAN MOTOR CONTROL

Condenser fans motors cycle with the temperature of the outdoor air to maintain sufficient head pressure for stable operation over a wide range of conditions. One condenser fan motor per compressor can operate at a reduced speed without overheating. Motor speed is reduced from 1075 to 450 RPM when the discharge pressure of a system drops below 180 psig. The motors will return to full speed when the pressure rises above 222 psig. This speed reduction is accomplished by using a choke coil to reduce the voltage to the motor. 10 second time delay relays are included in the control circuit so these motors will always start at high speed. Refer to Figure 7.

#### EXAMPLE - W1LC420

NO. 1 (20 – TON) SYSTEM – Under 65°F, the no. 1 condenser fan will shut off. Under 45°F, the no. 2 condenser fan will shut off. At 1/2 capacity, the no. 2 condenser fan will shut off. When the discharge pressure drops below 180 psig, high pressure control 2HP will close to energize relay 3R. When contact 3R - 1 opens and contact 3R - 2 closes, condenser fan no. 3 will be powered through choke coil 1CH and its speed will drop to 450 RPM. Timer 3TR will remain open 10 seconds after start-up so condenser fan no. 3 will always start at high speed.

NO. 2 (20 – TON) SYSTEM – Under  $65^{\circ}$ F, the no. 4 condenser fan will shut off. Under  $45^{\circ}$ F, the no. 5 condenser fan will shut off. At 1/2 capacity, the no. 5 condenser fan will shut off. When the discharge pressure drops below 180 psig, high pressure control 4HP will close to energize relay 10R. When contact 10R – 1 opens and contact 10R – 2 closes, condenser fan no. 6 will be powered through choke coil 2CH and its speed will drop to 450 RPM. Timer 7TR will remain open 10 seconds after start-up so condenser fan no. 6 will always start at high speed.

#### EXAMPLE - W1LC530

NO. 1 (20 – TON) SYSTEM – Under 65°F, the no. 1 condenser fan will shut off. Under 45°F, the no. 2 condenser fan will shut off. At 1/2 capacity, the no. 2 condenser fan will shut off. When the discharge pressure drops below 180 psig, high pressure control 2HP (49) will close to energize relay 3R (49). When contact 3R - 1 (26) opens and contact 3R - 2 (28) closes, condenser fan no. 3 will be powered through choke coil 1CH (28) and its speed will drop to 450 RPM. Timer 3TR (49) will remain open 10 seconds after start-up so condenser fan no. 3 will always start at high speed.

NO. 2 (30 – TON) SYSTEM – Under 65°F, the no. 4 condenser fan will shut off. Under 45°F, the no. 5 condenser fan will shut off. At 1/3 capacity, the no. 5 condenser fan will shut off and the no. 6 condenser fan will shut off if the ambient temperature is below 75°F. When the discharge pressure drops below 180 psig, high pressure control 4HP (69) will close to energize relay 10R (69). When contact 10R - 1 (26) opens and contact 10R - 2 (28) closes, condenser fan no. 7 will be powered through choke coil 2CH (28) and its speed will drop to 450 RPM. Timer 7TR (69) will remain open 10 seconds after start-up so condenser fan no. 7 will always start at high speed.




#### **ELECTRIC CONTROLS**

#### **RETURN LIQUID TEMPERATURE CONTROL (TC)**

The YORK model TC-6A return liquid temperature control is a 4 stage solid state thermostat that maintains the desired chilled liquid temperature by sensing and regulating the liquid temperature returning to the cooler. The control is mounted in the compressor compartment, to the left of the main control box in front of the system 2 compressor. The return water temperature is sensed by a thermistor (SENSOR) located in the return liquid line. Its resistance varies with changes in return liquid temperature. Changes in the thermistor resistance are interpreted by the controller and are amplified to energize output relay contacts. The circuitry is such that the controller shuts down the compressor in the event the thermistor is disconnected or accidentally cut. The return water temperature is adjustable between 4°F and 70°F. This adjustable range is much greater than applicable to this chiller. See Table 1 for limitations in leaving liquid temperatures. The Between Stage Differential is adjustable between 1°F and 3.75°F.

On both the W1LC420 and 530, the control is factory adjusted to 54°F Return Liquid Temperature with the Between Stage Differential set at 2.5°F which results in a 44°F (10° Range) leaving liquid temperature at nominal conditions. Check that these settings are still correct or change the setting as required but do not exceed the application limitations in Table 1.

If the factory temperature control settings which provide 44°F leaving liquid temperature with a 10°F liquid temperature range are not desired for the W1LC420 or 530 installation, the required leaving liquid temperature and liquid temperature range must be specified before the new temperature control settings can be determined. To determine the Between Stage Differential setpoint on the temperature control for the W1LC420/530, divide the specified range by 4. The Return Liquid Temperature setpoint on the control is calculated by adding the specified liquid temperature range to the specified leaving liquid temperature.

#### EXAMPLE:

(W1LC420/530) Specified 45°F leaving liquid temperature with an 8°F liquid temperature range.

Calculate Between Stage Differential Setpoint.  $8^{\circ}F - 4 = 2^{\circ}F$ 

Calculate Return Liquid Temperature Setpoint.  $45^{\circ}F + 8^{\circ}F = 53^{\circ}F$ 

As an example of how the TC-6A control works in application, consider the W1LC420 chiller with the control set to maintain a 54°F return water temperature with a 2.5°F Between Stage Differential. The flow rate is set to 2.4 GPM/measured TON (10°F range), and the working fluid is water. The W1LC420 is a 4 stage machine with stages at 25%, 50%, 75%, and 100% capacity. All temperatures considered are for a TC-6A control and thermistor working at design conditions. Allowable tolerances could change the actuation temperatures by  $\pm 1.25^{\circ}F$ .

With the RETURN water temperature to the cooler rising due to increasing cooling load for the application, the No. 1 compressor will start at part load when the RETURN water temperature reaches 47.75°F. The LEAVING water temperature will quickly drop to 45.25°F. If the cooling load continues to increase, the No. 1 compressor will be fully loaded by the controller when the RETURN water temperature reaches 50.25°F. With increasing load, the controller will start the No. 2 compressor at 52.75 °F RETURN water temperature and fully load it at 55.25 °F. Under increasing load, the minimum LEAVING water temperature will be 45.25 °F and the maximum 47.75 °F. As the demand for cooling load decreases, the controller will unload compressor stages in reverse order to the way they were loaded at 52.75, 50.25, 47.75 and 45.25°F RETURN water temperature. During decreasing load, the minimum LEAVING water temperature will be 42.75°F and the maximum 45.25°F.

#### FREEZE CONTROL PREVENTION THERMOSTAT (FC)

The leaving liquid freeze prevention thermostat is designed to prevent the liquid temperature in the cooler from dropping below the freezing point of the fluid while the unit is running.

# CAUTION: Freezing fluid in the cooler can cause damage which can lead to total replacement of the cooler.

If the temperature of the liquid leaving the cooler drops below its set point, the control shuts the compressor down with a pumpdown cycle. The control must be manually reset when the bulb temperature rises to 6°F above the setpoint cutout temperature. The body of the control is in the compressor compartment attached to the left hand side of the control box. The sensing bulb is the capillary type located in a well in the leaving water connection at the far end of the cooler. This is a cross ambient sensing device that is not effected by changes in ambient temperature.

The freeze control is factory set to shut down the unit at  $36^{\circ}F$  ( $\pm 2$ ) and is manually reset when the bulb temperature reaches 42°F. This setting is for a working liquid of pure water and many light brine applications. In heavy brine applications, the control may be field adjusted using the adjustment screw at the top of the control.

CAUTION: It is recommended that the adjusted cutout temperature be at least 4°F above the freezing point of the fluid. In no brine application should the setpoint be adjusted below 30°F.

If during delivery to the job site or during non-operational periods when the ambient temperature of the freeze control bulb drops below 36°F, the freeze control may have tripped and needs to be manually reset before the unit will start.

# MAINTENANCE

#### GENERAL

It is good practice to include the W1LC chiller in the routine schedule of daily or weekly operational checks. This should include but not be limited to checking compressor crankcase oil level, checking refrigerant liquid line sight glass for proper charge and signs of moisture, and checking for obstructions on the condenser coil such as leaves or paper that would reduce normal air flow.

WARNING: Prior to performing any service or maintenance, disconnect all electrical power to the unit.

#### **CLEANING CONDENSER SURFACE**

Dirt should not be allowed to accumulate on the condenser coils. The underside of the coils will collect dirt and other foreign matter first. Cleaning should be as often as necessary to keep the condenser coils clean. Use a brush, vacuum cleaner attachment, or other suitable means. Take care so as not to damage or bend the condenser fins.

#### LUBRICATING FAN MOTORS

The condenser fan motors are equipped with factory

lubricated and sealed ball bearings, requiring no maintenance.

#### COMPRESSOR REPLACEMENT

Obtain replacement compressors or parts from your local Copeland Wholesaler. See Instruction Form 55.72-RD2.2 for replacement compressor reference data.

#### SECURE OWNER'S APPROVAL

WHEN THE SYSTEM IS FUNCTIONING PROPERLY, EXPLAIN THE OPERATION OF THE UNIT TO THE OWNER OR DESIGNATED REPRESENTATIVE. EXPLAIN THE FUNCTION OF THE LOCKOUT PROTECTION FEATURES AND HOW TO RESET THEM. SHOW HIM THE LOCATION OF ALL DISCONNECT SWITCHES. INSTRUCT HIM HOW TO STOP AND START THE UNIT.

BE SURE THE WARRANTY REGISTRATION CARD HAS BEEN FILLED OUT AND RETURNED TO THE FACTORY.













THE STILL



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Code: WBY



Central Environmental Systems

Post Office Box 1592

York Pennsylvania 17405-1592



Central Environmental Systems

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Strange Strange

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	54	TC-3	10:
IOP CONTROL, OIL PRESSURE -COMPR. NO.1 20P CONTROL, OIL PRESSURE -COMPR. NO.2 10PA SWITCH, O.P. CLOSE 8-10 PSI: 0PENI2-16 PSI OITFERENTIAL 20PA SWITCH, O.P. CLOSE 8-10 PSI: 1-540 UNSE DUAL ELDEDNIT (SEE CHART) 4.750 UNSE DUAL ELDEDNIT (SEE CHART) 1-77C CAPACIDOR, UNI FAN MOTORS 1T TRANSFORMER, CONTROL CIRCUIT SOCIA 1T TRANSFORMER, CONTROL CIRCUIT SOCIA 1T TERMINAL BLOCK WATCH LINE HEATERS	56 57 58 59 60 61 62 63 63		
A 318 DE 31 EREUNTRADO     A 318 TERNINAL BLOCK (20V, FIELD WIRING	65 66 67 88 99 	178-2 2115	
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CONTACT ITERNINAL         THER SWITCH (TIME-SEC)           ITR-I         Image: Im	77 78 79 80 81 82	SEE NOTE 6 WFS @ 10 + 3 + 6 109 K	
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OF WATER FLOW SWITCH. 9. TIMERS 4TR. 8 AFR AND CONTACTORS 2M B. 4M USED WITH 200/2500-80 HZ AND 380/415Y-50HZ UNITS ONLY. 10. IT TRANSFORMER ISOOVAI SHOWN WINED FOR 480-3-60 FOR 200/415-3-30 SEC DETAIL 'A' 300/415-3-30 SEC DETAIL 'A' 30E DETAIL 'B' AND NOTE II. 1. IF LOCAL YOLTAGE 15 360 YOLTS REWRE DETAIL 'B' AT DETAIL 'C' IF LOCAL YOLTAGE 15 445 YOLTS REWRE DETAIL 'B' TO DETAIL 'C'			

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780

80

BTR 2 79

0 3 0 80 0 TTR @BI

C 12R D

FIELD FREEZE ALARM ( 10 VA MAX )

GI5R B

4 SOL

SENSOR DTCO

31

20P COPA OF REAL

61

SEE NOTE 9

-0<sup>250L</sup>

60

58,66

58,64

6,7,8

17.23

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9,10,11

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-010

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W1LC 530 LIQUID CHILLER 208/230, 460-3-60 & 380/415-3-50





# GENERAL SERVICE INFORMATION

Supersedes: Nothing

Form 55.70-N1

573

# **GENERAL INSTALLATION**







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The purpose of this publication is to give the installer a quick reference of general information he must be aware of when installing YORK Packaged Products. Information for both Residential and Commercial equipment is included. The instruction begins with dealer's responsibilities and proceeds through installation procedures, up to the start-up of the unit. It is designed to help the inexperienced installer as well as to act as a source of reference for the experienced installer. Cross references to other instructions containing basic installation skills are also found in this instruction.

The specific instructions packed with the unit are designed to give the installer a step-by-step procedure of what to do next, along with all information peculiar to the unit. This type of specific instructions will relieve the experienced installer of the burden of reading through general information which has become common knowledge to him.

### DEALER'S RESPONSIBILITIES

APPLICATION - The manufacturer supplying the pack-

aged unit must depend on the dealer to apply and install the unit so that it will provide a satisfactory air conditioning system. The total system must satisfy the customers' needs and operate within the manufacturers published application limitations.

**INSTALLATION** – Dealer should be sure that his installers are installing the units in accordance with procedures outlined in this publication as well as the unit's specific installation instruction.

**SERVICE** – If a problem arises, the dealer should see to it that the customer's difficulties are resolved by a qualified repairman.

The repairing agency should be authorized by YORK for hermetic system repair and must follow YORK recommended procedures. "General Service Information for the Repairman", in the 55 section, includes typical testing and servicing for various problems which could arise.



#### INSPECTION

Immediately upon receiving the unit it should be inspected for possible external damage incurred during transit. If damage is evident it should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing. See Instruction 50.15-NM for additional information.

Protective crating or packaging and skids should not be removed until the unit is at the point of installation. When removing packaging or crating, be careful not to scratch and dent the unit. After removal of packaging or crating, all access panels should be removed to inspect the interior compartments for damage.

#### LIMITATIONS

Air Conditioning Units must be installed in accordance with:

- 1. Regulations of the National Fire Protection Association, local utility or other authorities having jurisdiction.
- 2. Standard for the Installation of Air Conditioning and Ventilating Systems non-residential (National Fire Protection Association Publication No. 90A).
- National Warm Air Heating (NWAH) and Air Conditioning Association (ACA) manuals, whichever are applicable.
- 4. Application, Installation and Servicing of Unitary Systems (ARI Standard 260).
- 5. Application of Sound Rated Outdoor Unitary Equipment (YORK Publication 1505.30-AD1).
- 6. Wiring must conform to provisions of the National Electric Code (National Fire Protection Association Standard No. 70) and local ordinances.

#### FURNACES LIMITATIONS

Furnaces must be installed in accordance with:

- National Fire Protection Association (NFPA) Standard No. 90B – "Warm Air Heating and Air Conditioning Systems – Residence Type".
- National Fire Protection Association (NFPA) Standard No. 54 — National Fuel Gas Code.
- 3. ANSI Z223.1 1984 National Fuel Gas Code.
- National Fire Protection Association (NFPA) Standard No. 31 – "Residential Oil Piping".

#### LOCATION

Air Conditioning Systems should be located to achieve optimum performance, taking the following items into consideration.

#### LOCATE INDOOR UNITS

- 1. Within the building in the conditioned space or with the use of duct work, in an adjacent room. Units are not weatherized for outdoor installation. Units installed in unheated spaces must be protected from freezing.
- 2. Near a drain facility.
- 3. Near the proper electrical supply.
- 4. Considering availability of condenser water so that it can easily be piped to the unit. (Embassy & Triton only)
- 5. Considering that horizontal evaporator blowers may be ceiling suspended.
- 6. Applications requiring extreme quiet should be located outside the conditioned space.
- 7. Consider connection of condensate trap and piping, supply and return air ducts and outdoor air duct if required. Heating coil piping if required should also be considered.

#### LOCATE OUTDOOR UNITS (Ground level or rooftop)

- 1. Outside the building structure for the following reasons:
  - a. Since air is the condenser cooling medium, the air flow should be unrestricted. The condenser fans are not suitable for ductwork on either the air intake or discharge.
  - b. Method of venting heating sections (Sunline and Multizone Series only).
    - NOTE: Altering or adding to either gravity or power venting systems will void A.G.A. Design Certification of the unit.
- 2. Considering the availability of the correct electrical supply.
- 3. Making sure there is adequate structural strength to support the unit on roof locations.
- 4. Selecting a place with minimum sun exposure (inlet air to the condenser coil must be drawn from as cool a location as possible). If there is a choice, the East or North sides of the buildings are preferable.
- 5. Considering that in a split system the sections (condensing and evaporator) should be placed so that connecting refrigerant lines can be made with as few bends and as short as possible.

6. Avoiding locations beneath windows or between structures where normal operating sounds may be objectionable.

## LOCATING EVAPORATOR COILS

Upflow coils are located in ductwork or coil casings on top of matching upflow furnaces.

Counterflow coils are located beneath a matching counterflow furnace. The coils are supplied with a decorative casing capable of supporting the weight of a counterflow furnace.

Duct coils are located in horizontal ducts having a blower system available such as in forced hot air heating systems. Duct coils should be as centralized with the air distribution ducts as possible. See "Duct Installation" on page 8.

#### LOCATING FURNACES

Furnaces should be located:

- 1. As near to the chimney or flue as possible to reduce the horizontal run of the flue pipe.
- 2. As centralized with the air distribution ducts as possible.
- 3. Usually in the basement but may be installed in a closet or similar enclosure.
- 4. In an area where ventilation facilities provide:
  - a. Satisfactory combustion of fuel.
  - b. Proper venting.
  - c. Safe limits of ambient temperature under normal usage.
- 5. In such a manner as not to interfere with proper circulation of combustion air within the confined space. When normal infiltration does not meet combustion air requirements, outside air should be introduced.

See specific furnace service instructions for more information concerning combustion air and ventilation of confined and unconfined spaces.

#### CLEARANCE

It is important to abide by the specific clearances listed in the specific unit installation instructions. In general, the clearances listed are given to: supply an adequate flow of air to the unit, remove and replace worn parts or dirty filters, or provide enough room for servicing the unit.

The following must be considered on most units:

1. Air intake and air discharge

- 2. Condenser water piping
- 3. Power connections
- 4. Condensate drain piping
- 5. Maintenance and servicing
- 6. Heating coil piping and connections
- 7. Refrigerant connections
- 8. Filter removal

#### FOUNDATION

Before installing the unit, the dealer should give careful consideration to the foundation on which the unit is to be installed. All foundations should be level and have sufficient strength to support the weight of the unit.

#### FOUNDATIONS FOR INDOOR UNITS

- 1. FLOOR MOUNTING Units should be placed and leveled on a floor, pedestal, platform, or shelf, designed to support the weight of the unit. On most units, it is advisable to place material such as rubber isolator pads or fiber glass insulation under the unit. This will eliminate sounds due to transmission of vibration.
- CEILING SUSPENSION Evaporator blowers may be suspended from joists with isolation type hangers, hooks or suspension accessories.

#### FOUNDATIONS FOR OUTDOOR UNITS

- 1. GROUND LEVEL Installations should be on concrete slabs with footers extending below the prevailing frostline. This is required to prevent shifting or settling of the unit which will result in strain on the refrigerant lines or ductwork, causing possible refrigerant or air leaks. The slab should extend 6 inches beyond the casing dimensions. It is important that the slab IS NOT tied into the foundation of the building as noises may telegraph through. Rubber padding may be applied bebetween the legs and the slab to lessen transmission of vibration.
- ROOF-TOP Units should be placed on hardwood strips, angle iron, channel iron, or any other material capable of carrying the unit's weight and on something which will not deteriorate rapidly. Refer to Figs. 1 and
   The beams should be; (1) positioned perpendicular to the roof joists, (2) extend beyond the dimensions of the section to distribute the load on the roof, (3) be capable of supporting the concentrated loads at the corner legs. NOTE: ON BONDED ROOFS CONSULT THE BUILDING CONTRACTOR OR ARCHITECT FOR SPECIAL INSTALLATION REQUIREMENTS. The



units are placed on beams to give more efficient operation by raising the unit above the layer of hot air usually found on a dark colored sun-exposed roof.

NOTE: In all installations where snow accumulates and winter operation is expected, additional height must be provided to insure normal condenser air flow.

Supporting structures such as: steel I-beams, steel plates, piping and timbers; should be painted or treated to prevent rust, corrosion and decay. Units supported as shown in Figures 1 and 2 must be fastened to the supporting structure by tack welding or bolting.



- 1. PLATE WELDED TO PIPE, CONTINUOUS WELD.
- 2. PIPE TACK WELDED TO ROOF TRUSS. 3. I-BEAM BOLTED OR WELDED TO PLATE
- 4. I-BEAM LEVELED BEFORE TACK WELDING TO TRUSS.



FIG. 1- ROOF INSTALLATION USING STEEL I-BEAM

- 2. PIPE TACK WELDED TO ROOF TRUSS.
- TIMBER LEVELED BEFORE TACK WELDING TO TRUSS.
- 4. TIMBER BOLTED AS SHOWN.

FIG. 2- ROOF INSTALLATION USING TIMBER

Sunline and Multi-zone units may be installed on factory or field supplied roof curbs. The curb provides a convenient way of making a water-tight duct penetration thru the roof.

## UNIT HANDLING

Care must be taken when moving the unit to the place of installation. Do not remove any crating until the unit is near

the place of installation. SPREADERS SHOULD BE USED BETWEEN SLINGS TO PREVENT CRUSHING THE FRAME OR PANELS. When preparing to move the unit, always determine the center of gravity of the unit in order to equally distribute the weight. Slings connected to the compressor end of a unit will usually have to be made shorter, so the unit will lift evenly (See Fig. 3).



FIG. 3- TYPICAL RIGGING TO LIFT UNITS

Rig units by attaching chain or cable slings to the holes or lifting lugs provided on the base rail.

Spreaders, whose length exceeds the largest dimension across the unit, should be used across the top of the unit. On units which have skids attached, the slings should be placed around the bottom skid.

To move a unit with a fork lift, extreme caution must be used to avoid damage to the unit. Proceed as follows:

- 1. Give careful consideration to the unit's center of gravity.
- 2. Determine the compressor's location within the unit. This will usually be the heaviest end of the unit.
- 3. Distribute the weight equally on both forks. Use a  $2 \times 4$ TO SPAN ACROSS THE UNIT PANELS OR FRAME MEMBERS. DO NOT ALLOW EITHER FORK TO COME IN CONTACT WITH A UNIT COIL.
- 4. Test the load to see if the weight is equally distributed. Do this by lifting the unit a few inches off the floor and holding it there before lifting any further or before transporting the unit.

## UNIT PREPARATION

After moving the unit to its final position and before startup, check the following:

- 1. Remove shipping blocks and supports from the units.
- 2. Units are shipped with hold-down or tie-down nuts which hold the compressor tight to the base plate to reduce damage which may occur in transit. On the job site, check the unit's specific instruction to determine what to do with the bolts. Units vary in that some are removed, some are loosened, and others remain tightened.
- 3. Blower motors are shipped with a tie-down bracket which holds the motor rigid to the blower scroll during shipment. This bracket should be removed and discarded.

All evaporator blowers and duct coils are shipped for a specific air flow operation, but may be converted for other illustrated air discharge patterns. In order to change the air discharge pattern, refer to the procedure given in the unit specific instruction.

- 4. Blower belts are tied to the blower. Pulley settings, motor size and belt adjustment are determined by the duct system. See "Belt Installation" and "Pulley Adjustment" for more detailed information concerning blower drive installation.
- 5. Remove all wires or metal supports which hold fans and prevent rotation, and remove all bands holding shipping blocks in place.
- 6. Shipping supports come in various forms: clamps, brackets, bands, straps, wedges, spacers, bolts, ferrules, wire, and tape. A list of shipping supports, their location, and how to remove them will be given under the "Unit Preparation" section of the unit's installation instruction. Refer to the instruction and remove supports.

#### SHIPPING RESTRICTIONS

Due to shipping restriction, some units require hoods, legs, etc., to be field installed. These parts are located in various unit compartments. Remove them and refer to the specific unit instruction packed with the unit, and install them.

## **REFRIGERANT-22 PIPING**

A majority of service troubles are caused by lack of adequate precautions to provide an internally clean and dry system. It is of extreme importance that materials used conform with established standards.

For information concerning refrigerant-22 piping refer to the current publication, Form 1505.05-AD and two future publications, Forms 55.70-NS2 on Working with Copper Tubing; and 55.70-NS3 on Working with Refrigerants.

#### EXPANSION VALVE BULB LOCATION

On most units the expansion valve bulbs are factory installed. The location has been determined by the design engineer to meet certain design conditions. On this type of unit, the installer need only check to make sure the bulb is tightly secured in place.

On most large split-system evaporators the expansion valve bulb must be installed after the refrigerant piping is completed.

The location of the expansion valve bulb is extremely important for proper valve operation. Attach bulb securely to the suction line in the following manner.

- 1. As near evaporator outlet as possible.
- 2. With good thermal contact between the bulb and the line. (See Fig. 4.)
- 3. Preferably on a straight length of horizontal tubing.

CAUTION: DO NOT INSTALL BULB IN A TRAPPED SECTION OF LINE WHERE OIL AND LIQUID RE-FRIGERANT WILL AFFECT VALVE OPERATION.

- 4. If a vertical line must be used, mount the bulb so the capillary tube comes out the top of the bulb.
- 5. On top of the line with tubing smaller than 7/8 inch.
- 6. At approximately 45 degree angle with tubing 7/8 inch and larger.

The expansion valve bulb and the tubing to which it is attached should be well insulated with moisture proof material.

LOCATION FOR SMALLER THAN 7/8" OD TUBING



LOCATION FOR 7/8" AND LARGER OD TUBING



FIG. 4- EXPANSION VALVE BULB LOCATION

#### WATER CONNECTIONS

On all units utilizing water cooled condensers, it will be necessary to make water piping connections. Supply water line is connected to the inlet connection and the wastewater line is connected to the outlet connection of the unit. Units may be field altered for right side piping connections. The inlet water connection is usually the lowest connection of the condenser. Consult unit installation instruction for proper identification of connections. A field supplied water strainer should be installed in the inlet water piping.

Water regulating valves are offered as accessories for most water cooled condensing units. YORK recommends the use of a water regulating valve on applications using city water. If one is used, it should be installed in the inlet water piping preferably inside the unit. Setting should be adjusted according to unit installation instructions.

#### PRECAUTIONS AGAINST FREEZING

Warranties do not cover frozen condensers. Units installed in locations subject to freezing should be protected from freezing by one of the following two methods. One way to protect a water cooled condenser is by using strip heaters. Another way is to install a connection that will permit the condenser and water piping to be drained and blown out. Blowing out of condenser water is necessary because the condenser's shape does not permit complete drainage by gravity.

#### GAS AND OIL PIPING

Detailed information regarding gas and oil connections may be found in the future publication, Form 55.70-NS5.

## CONDENSATE DRAIN CONNECTIONS

All evaporators remove water from the air they are cooling. It is therefore necessary for the installer to provide the unit with a properly installed drain line and trap.

Drain lines must be as large or larger than the fitting to which the line is being connected. When lines are exposed to freezing temperatures or when they are subject to the formation of condensation, the drain lines should be insulated. Horizontal lengths of drain line must be pitched towards the nearest drain facility. If drain lines are to be run from an indoor unit to the outside, they must be extended beyond the walls of the building. This will eliminate the possibility of damage caused by condensate running down the exterior surface of the buildings walls. Outdoor unit's drain line may be discharged directly onto the ground or roof or connected to an open drain.

If a unit has optional side drain connections, connect the drain line to the connection nearest the drain facility. The remaining connection must be plugged. Some types of units are provided with dual drain connections to meet code requirements. In this case CONNECT BOTH DRAINS.

Installing a trap in the drain line is a "MUST" on all drawthru evaporator fan type units to insure proper drainage. Although a trap on a blow-thru type unit is not a necessity, YORK recommends installing one. A trap on this type unit would eliminate the possibility of insects, rodents or odors from entering the supply air stream through an untrapped drain line. Some units are provided with a trap as part of the unit. If unit does not include one, install a trap of proper design (See Fig. 5).



CAUTION: AVOID CREATING A DOUBLE TRAP. This condition would occur most often when a flexible drain line is being run (See Fig. 6).



# DUCT INSTALLATION

Air supply and return may be handled in one of several ways best suited to the installations. Supply and return may be:

- 1. Conventional duct system with both supply and return air.
- 2. Conventional duct system with supply air and no ductwork for return air.
- 3. Single combination ceiling supply and return grille where ceiling heights are sufficient and unobstructed.
- 4. Use of plenum with direct supply into conditioned area and return air with or without ductwork.

The following general rules should be followed:

- 1. All ducts should be made in accordance with all local and/or national codes and in line with good duct installation practices.
- 2. Ducts should be sized no smaller than the duct flanges on the casing. Increase the duct size to keep the air at recommended velocities for the type of installation. Cooling units are normally designed to handle 400 to 500 CFM per ton. Most forced warm air units are designed to produce a temperature rise between 70 and 105 degrees which results in air quantities between approximately 10 to 13 CFM per 1000 Btuh output. See Table below for recommended duct velocities, FPM.

Recommend	led Duct Veloc	ities, fpm	
	Main Duct	Branch Duct	
Residence Schools, Theaters & Public Buildings	700-900 1000-1300	600 600-900	
Industrial Buildings	1200-1800	800-1000	

- 3. When duct work will carry both heated and cooled air, the ducts should be sized for whichever requires the greater CFM.
- 4. Asbestos cloth collars or other non-flammable material should be used to connect the unit to prevent transmission of noise and vibration. (See Fig. 7.)



- 5. Ducts should be suspended with flexible hangers.
- They should not be fastened directly to the building or structure.
- 7. Clearance should be allowed around ducts for insulation and safety in handling heated air.
- 8. Ducts should be brought through the building immediately adjacent to the unit with as short a run as possible.
- 9. Ducts should be sealed with flashing and caulked where it passes through the roof or wall to prevent leakage. DO NOT FLASH THE ENTIRE UNIT.
- 10. When a matching Borg-Warner furnace is not used, properly seal any areas where the coil and furnace mate to prevent air bypassing the coil.
- 11. Return air ducts must include provisions for filters. Locate filters where they will be convenient to inspect, and change.
- 12. When outdoor or fresh air is used, the air temperature limitations on the evaporator must be observed.
- 13. Ducts passing through roof should be installed as shown in Fig. 8.



#### FIG. 8- RECOMMENDED THRU-THE-ROOF DUCTING

More detailed information may be found in instructions 1610.05-AD, Residential Air Distribution and 1660.05-AD, Commercial Air Distribution.

### FILTER INSTALLATION

#### FACTORY INSTALLED FILTERS

Most units are factory supplied with filter racks and the proper size filter. If filters were removed for any reason, make sure they are replaced with a filter of the same size and type.

#### FIELD INSTALLED FILTERS

If a unit does not have factory installed filters, then the return air duct must include provisions for filters. Locate field supplied filters where they will be convenient to inspect and easily accessible for periodical cleaning or replacement. Filters must be rigidly supported. A field constructed filter rack is recommended. The rack must be able to accommodate enough filters of a size equal to the surface area listed in the unit installation instructions. Type of filter to be used is also given in the unit installation instruction.



#### INSULATION

Interconnecting refrigerant lines on split-systems, inlet and outlet water lines for water cooled condensing units, and supply and return air ductwork require insulation as follows:

- 1. Interconnecting refrigerant lines The suction line should be insulated, especially when exposed to high ambient temperatures. Do not solder suction and liquid lines together. If it is desirable to tape or wire these lines together for support purposes, they must be completely insulated, one from the other.
- NOTE: Residential Split System air conditioners have interconnecting tubing available with insulated suction line.

When refrigerant lines pass through a wall, it is advisable to pack fiber glass insulation and a sealing material such as permagum around the lines to reduce vibration and also retain some flexibility in the lines.

- Water lines When water lines are exposed to freezing conditions, they should be insulated against freezing. Insulation is a must where moisture forming on the water lines will be objectionable or will cause damage to the area.
- 3. Ductwork (Supply & Return) Where ductwork passes through an unconditioned space during the cooling or heating season, insulation is required. Insulation should include a vapor barrier to prevent absorption of moisture. Ductwork, when exposed to outside air, should be insulated with 2 inches thick weatherproof material.

#### **FLUE PIPING**

All gas-fired and oil-fired furnaces must be vented through flue piping and a chimney. Before securing the flue piping to the chimney, be sure that the chimney flue servicing the furnace is:

- 1. At least 2 feet higher than the ridge of the house. If it is only as high as the ridge it should be 10 feet from the nearest ridge.
- 2. Cleaned of any dirt or debris and obstructions.
- 3. Not serving an open fireplace.
- 4. Large enough to properly handle the products of combustion. Table 1 lists the required chimney area for various size flue pipes.

If more than one flue is to be connected to a chimney, the opening area of the largest flue plus 50% of the opening area of any additional flue must be less than the opening area of the chimney.

NOTE: If chimney opening area is less than flue opening area, an induced draft system of venting must be used.

#### TABLE 1- REQUIRED OPENING AREA OF CHIMNEY

Flue Pipe Size (Diam. Inches)	Required Chimney Area* (Square Inches)
3	7.1
4	12.6
5	19.7
6	28.3
7	38.5
8	50.4

\*Find the area of the chimney opening – area must be equal to or greater than figure listed.

Aluminum or galvanized pipe is satisfactory for most gas applications, but local practice will generally determine material to use.

The following design conditions must be met.

- 1. The diameter of the flue piping must be the same as the collar at the furnace outlet, or the round equivalent of the oval collar, typical flue piping is shown in Fig. 9.
- 2. A barometric draft control damper and collar must be installed on the flue piping of all oil-fired furnaces. Special instructions to install the damper on the flue piping are included with the damper. NOTE: Do NOT use a damper with a gas-fired furnace.



# FIG. 9- TYPICAL FLUE PIPING

- 3. A minimum clearance of 6" must exist between the flue and any combustible surface.
- 4. When passing through a combustible wall the flue connector must be protected with a ventilated metal thimble or sleeve two inches larger in diameter than the connector pipe.

-

- 5. Install connector with an upward slope of at least 1/4" per foot of length from the furnace to the chimney.
- 6. Avoid sharp turns and sags.
- 7. Keep as short and as direct as possible.
- 8. Join pipes tightly. Check for leaks.
- 9. Support piping securely.

#### **ELECTRICAL CONNECTIONS**

All electrical wiring should be installed in accordance with National Electrical Code (NFPA Standard No. 70) and/or local regulations.

Check the available current and nameplate for like voltage. Run the necessary number of wires of proper size from a fused disconnect switch or circuit breaker to the unit. Route the wiring through the knockouts provided. See the tables in the unit's specific instructions for Electrical Data and minimum wire sizes. All outdoor wiring must be weatherproof. Flexible metallic conduit should be used where local codes permit.

The disconnect switch may be bolted to the side of the unit if it is weatherized. Avoid locations where refrigerant lines are located. It may also be remotely installed in accordance with National or local codes. For convenience of servicing, the switch should be reasonably close to the unit. NOTE: Split-systems should have separate power supply and fused disconnect switch for condensing and evaporator blower sections. Electrical heating sections on single-package units may also require separate power supplies. Check specific unit instructions or field wiring diagrams.

Low voltage wiring should be installed according to the unit's specific field wiring diagrams.

For more detailed information concerning wiring – refer to the unit's specific instructions; Electrical Application Data, Form 1505.20-AD; and future publication, Working with Electricity, Form 55.70-NS4.

#### THERMOSTAT

When connecting room thermostats, refer to the wiring diagrams.

Thermostats should be:

- 1. Located approximately 5 feet above the floor.
- 2. Exposed to normal room air circulation.
- 3. Not on outside walls.

- 4. Not exposed to effects from:
  - a. Sunlight
  - b. Glass
  - c. Drafts from outside doors
  - d. Cooling or heating ducts within the walls
  - e. Locations subject to vibrations
  - f. Supply air grilles
- 5. Enclosed in protective case and locked when exposed to tampering or damage.

Temperature settings:

- 1. Normally the temperature setting for:
  - a. Cooling is 75-80 F
  - b. Heating is 70-75 F
  - c. Automatic changeover differential between cooling or heating operation cannot be less than 4 F due to design of conventional electro-mechanical thermostats.

Cooling/Heating thermostats have an "AUTO-ON" fan switch which allows for either intermittent (AUTO) or continuous (ON) blower operation when cooling or heating.

Continuous blower operation is:

- a. Recommended for good cooling operation except where high relative humidities are common. Continuous fan operation will permit some re-evaporation off the moist coil.
- b. Desirable during heating season if cold drafts can be avoided.

Adjust the thermostat heat anticipator to the ampere rating of the automatic gas valve, given on the gas valve. For electric heat measure the ampere load in the heat control circuit.

Cooling-only thermostats have a "Cool-Off-Fan" switch. In the "Cool" position, the evaporator blower operates continuously and the compressor and condenser fans are controlled by the thermostat. In the "Fan" position, the evaporator blower operates continuously but the compressor and condenser fans are shut off at all times.

The cooling thermostat is equipped with a fixed cooling anticipator. No change or adjustment is required.



# BELT INSTALLATION

Before installing or replacing belts, check pulley sheave grooves for side-wall wear, defects, pitmarks, burrs or anything that would shorten the life of the belt. All rust, dirt and grease should also be removed.

If belt(s) are not factory installed, install them as follows:

- 1. Adjust the blower motor in its mount so that the motor pulley can be moved towards the blower pulley.
- 2. Slip belt(s) over the pulley. DO NOT FORCE BELTS OVER PULLEY BY PRYING OR ROLLING THEM ON TO THE PULLEYS. This shortens the life of belts by breaking or weakening the fibers within the belts.

#### MATCHED BELTS

The two belts needed for a two groove pulley drive must be a matched set. Belt code number and manufacturer must match. NOTE: Used belts should never be used with new belts. Save old belts for use as spares.

#### SEATING BELTS

To seat belts the blower motor pulley should be set with both movable portions of the pulley set at the same number of turns open.

Before blower motor is moved back to tension belts, the belts should be pulled on loose side firmly and uniformly. See Fig. 10. NOTE: Slack in both belts must be on same side of the drive.

Operating the drive for a few minutes will help belts to seat.



#### FIG. 10- BELT SLACK

#### ADJUSTING BELT TENSION (FIBERGLASS ONLY)

To adjust belt tension first measure the span between blower motor pulley and blower wheel pulley.

The belt should deflect 3/16'' per foot of belt span with 2-3 pounds of force.

If deflection is more than 3/16'' per foot span, move blower motor pulley away from blower wheel pulley.

If deflection is less than 3/16'' per foot span, move blower motor pulley towards the blower wheel pulley.

#### PULLEY ADJUSTMENT

A single groove motor pulley is aligned by using its fixed flange (see Fig. 11) and the corresponding flange of the blower pulley.



HUB AT 180 DEGREES AGAINST WHICH THE SET SCREWS "B' AND "C" MAY BE TIGHTENED.

#### FIG. 11- ADJUSTABLE PITCH PULLEYS

Always align twin groove pulleys using the stationary web of the motor pulley and the center web of the blower pulley. CAUTION: Improper alignment will cause excessive noise and belt wear.

Twin groove blower motor pulleys install with the shaft set screw "A" towards motor. See Fig. 11. If necessary to align pulleys, twin groove motor pulley housing may extend 25% of its length beyond the end of the motor shaft.

Align the fan and motor pulleys with a straight edge (see Fig. 12). Tighten set screw "A". If a straight edge is not available, an alternate method of alignment should be used (see "Aligning with String").



FIG. 12- PULLEY ALIGNMENT WITH STRAIGHT EDGE



#### **ALIGNING WITH STRING**

The string should be longer than the distance across the drive as shown in Fig. 13. Hold string to sheave of the blower pulley as shown. Pull string taut. Move string in direction indicated by arrow. String should touch evenly across the face of the motor pulley as the string makes contact with the opposite side of blower pulley face at point "A".



#### ADJUSTING TWIN GROOVE PULLEYS

THE 2 GROOVE BLOWER MOTOR PULLEY REQUIRES EQUAL ADJUSTMENT OF BOTH MOVABLE PORTIONS TO AVOID UNEQUAL LOAD ON THE BELTS AND IN-SURE THE SAME PITCH DIAMETER IN EACH GROOVE. Check to see if both belts drive at the same speed. Do this by making a mark across both belts and turning the drive several revolutions by hand. If the mark hasn't separated, the belts are traveling at the same speed. If the mark has separated, make the necessary adjustments.

See specific unit instruction and Form 55.70-N3 for air system adjustment.

#### ACCESSORY INSTALLATION

Be sure all accessory items provided for use with the installation are installed before starting the unit. Some accessories are very important to proper operation of the unit. Accessory items are provided with their own installation instructions.

## **CLEAN-UP**

After installation of unit and before all panels are replaced, an inspection of the units interior is recommended. Be sure to remove all foreign matter such as tools, construction and packaging materials, and instruction packets which may have been left inside the unit. Paper, plastic and cardboard could restrict air flow thru unit preventing proper operation of unit.

Besides satisfying the customer with a neat looking installation, cleaning up around the unit could prevent injury to the installer as well as others. Debris left laying on roof-tops becomes very dangerous. Installer could trip, high winds could easily lift metal bands and strips of wood and deposit them on persons below.

#### START-UP

Before initial start-up, see Form 55.70-N2 for an installer's check list. The check list is helpful in making sure all is in order before starting the unit.



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# INSTALLATION

PURPOSE This check list is published as an aid to the installer. It should be filled out at the point of installation. After making the suggested checks, put a "/" mark in each block that is applicable to the unit being installed; also record data as needed to complete checks. The second row of blocks may be used as a dou-ble check or for indicating completion of checks to single package units with more than one refrigerant system. Fill out a separate check list for both parts of a split system. For additional information concerning each check, see reference column.

# **GENERAL SERVICE INFORMATION** INSTALLER'S CHECK LIST (PRE-START & POST-START)

Supersedes: Form 55,70-N2 Coded 573

Form 55.70 N2

776

	FILING INF	ORMATION
Owner's Name		
Owner's Address		and the second
City	State	Zip
Job Name or Loca	tion	
Unit Model No.	na ka shinka ta shin Harika ta shinka ta shink	Serial No
Split System Eva	porator Model No	
Serial No	and the second second second	

REFERENCE PRE-START CHECKS FORM NO. (PAGE) 11 - GENERAL -1. On units which have crankcase heater(s), check to see if power has been 55.70-N3\* supplied to the crankcase heater(s) for at least 8 hours before at-2. Proper clearances were considered . . . . . . . . 55.70-N1 (P.2) Record clearances: Top Front Rear Side (For minimum clearances see unit installation instruction.) Sides 3. Shipping supports have been removed . . . . . . . . . . . . . . . . . 55.70-N1 (P.6) (See unit instructions for location.) 55.70-N1 (P.7) 55.70-N1 (P.12) 55.70-N1 (P.5) 7. Terminal screws are tight and no loose wiring connections . . . . . . . 55.70-NS4\* . Available current and unit 8. Record stand-by voltage 55.70-NS4\* WIRING LABEL 10. Check the settings of all controls to make sure they are the same as UNIT INSTRUCTION listed in the specific installation instructions . . . . . . . . . . . 11. Expansion valve bulb located properly and tight . . . . . . . . . . . . . . . 55.70-N1 (P.6) 12. (WATER COOLED ONLY) Water piping is hooked-up properly . . . . . . . . . . . 55.70-N1 (P.7) 13. (SPLIT-SYSTEM ONLY) Suction and liquid valves are open . . . . . . . . . . . . 55.70-N3\* . . . . . 55.70-N1 (P.6) Exhaust fan(s) Blower wheel(s) Condenser fan(s) 55.70-N1 (P.11) Proper belt tension Proper pulley alignment Tightness of all set screws and other fastening devices 16. Filters of the proper size are installed correctly . . . . . . . . . . . . . . 55.70-N1 (P.8) 17. All ductwork is in place and return and supply grills are unobstructed . . 55.70-N1 (P.8) 19. All foreign matter has been removed from the interior of the unit . . . . 55.70-N1 (P.12) (Tools, construction materials, instruction packet, etc.) 20. All panels effecting proper operation of unit have been replaced . . . . .







	GAS HEATING ONLY
	1. Type of gas being supplied agrees with nameplate gas type
55.70-NS5*	Record nameplate gas type Record gas being supplied
	2. Record manifold gas pressure "W.C. Reading agrees with
55.70-NS5*	nameplate gas pressure
EE 70 NJ (D 0)	Altitude (over/under) 2000 Ft Furnace equipped for high altitude
55.70-NT (P. 9)	3. Flue piping is installed properly and is unobstructed
UNIT INSTRUCTION	4. Gas times are teak checked and purged of air
REFERENCE	5. Flame sensor is prugged into combination gas valve
FORM NO. (PAGE)	POST-START CHECKS
	GENERAL ✓ ↓√
55.70-N3*	1. Record and check the following data against nameplate
	Running voltage at unit Evaporator Blower amps
	Condenser fan amps Compressor amps
55.70-N3*	2. Ambient conditions are recorded below
	Outdoor ambient temp
	Condenser air temp (ON) (OFF)
	(Water Cooled Condensers Only) Water temp (ON) (OFF)
	Air temp "ON" evaporator: W.B D.B
	Air temp "OFF" evaporator: W.B D.B
55.70-N3*	3. The following are recorded for indications of proper operation
	Condenser Temp Difference, Inrush voltage,
	GPM or CFM, Discharge Temp or Pressure,
	Sub-cooling, Super Heat
55.70-N3*	4. All motors start
	Exhaust fan(s) Damper Evaporator blower(s)
	Condenser fan(s) Compressor(s)
55.70-N3*	5. Fan or blower rotation is correct
55.70-N3*	6. Compressor Oil is at proper level in sight glass
UNIT INSTRUCTION	7. Dampers and linkage move freely
UNIT INSTRUCTION	8. Dampers close tightly
55.70-NS3*	9. Refrigerant piping connections are leak tested
UNIT INSTRUCTION	10. All controls function properly
	Uperational controls Safety controls
ALLESS. INSTRUCT.	12. Looperate property
and the second	12. Instructed owner and/or operator on now to operate the unit
21 S. 1. 22 - 54	
55 70-N3*	Gas connections have been checked for leaks
00.70 110	(WARNING-DO NOT USE AN OPEN FLAME OR OTHER SOURCES OF IGNITION)
55.70-N3*	2. Fan control is adjusted for proper blower operation
55.70-N3*	3. Limit control shuts off burners at proper setting
55.70-N3*	4. Flame sensor operates properly
55.70-N3*	5. Glow coil functions properly
55.70-N3*	6. Pilot flame adjusted to proper size

\* Future publication to be issued.

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55.70-N2





# **GENERAL SERVICE INFORMATION**

START-UP INSTRUCTIONS

Supersedes: Nothing

175 Form 55.70-N3

#### INTRODUCTION

The purpose of this instruction is to provide general information for the initial start-up and check-out of the applicable YORK equipment. The installer must be aware of the many local codes and must have much basic trade knowledge regarding practical matters related to actual unit installation and start-up.

All information in this instruction (Form 55.70-N3) plus (Form 55.70-N1) GENERAL SERVICE INFORMATION INSTALLER and (Form 55.70-N2) INSTALLER'S CHECK LIST is intended to supplement the basic installation instruction provided with each unit.

Installers should be aware of the previously mentioned general instructions and understand the information they contain before attempting actual installation and start-up of YORK air conditioning equipment.

# PRE-START-UP

1. Energizing Crankcase Heaters

Compressors are equipped with crankcase heaters to prevent liquid refrigerant migration to the compressor crankcase. The crankcase heater must be energized for a minimum of 8 hours before starting the unit. This will allow sufficient time for all liquid refrigerant to be driven out of the oil in the crankcase and will help prevent damage to the compressor on start-up.

- 2. Electrical Check
  - a. Voltage It is important that the voltage supplied to the unit matches the voltage shown on the unit nameplate. A voltage check must be taken to assure that the available voltage is within the minimum and maximum voltage as indicated on the unit. Also the voltage imbalance (variation) between phases of 3 phase current should not exceed 1 or 2 volts.
  - b. Conductors Conductors of adequate size and material must be used to assure full voltage at the unit. Check that all wiring complies with local and national electrical codes. Copper wiring must be run from the disconnect switch to the unit. Check that all wires are connected tightly.
  - c. Thermostat Be sure that the proper thermostat is installed and connected.

3. Piping Check

The complete installation should be piped in agreement with all applicable codes and the specific unit Installation Instruction.

4. Fan Drive Alignment

Check that all fan belts are properly aligned and tensioned. Inspect tightness of set screws on sheaves.

5. Field Selected Equipment

All field selected equipment must be properly installed and connected. Be sure power supply voltage matches the unit nameplate voltage. All interconnecting wiring between YORK equipment and field supplied equipment must be done in such a way as to prevent any possible damage to the equipment.

- 6. Gas Heating
  - a. Piping All piping <u>must</u> comply with all local and national codes. Check with the local Gas Co. for recommendations.
- CAUTION THE YORK AUTOMATIC GAS VALVE IS LIMITED TO 1/2 PSI LINE PRESSURE. IF THE CODE REQUIRES TESTING THE GAS PIPING AT PRESSURES ABOVE 1/2 PSI, THE AUTOMATIC GAS VALVE MUST BE ISOLATED DURING THE TEST TO AVOID DAMAGING THE VALVE. REDUCE THE PRESSURE IN THE LINE AFTER THE TEST BEFORE APPLYING PRESSURE AGAIN TO THE GAS VALVE.
  - b. Flame Sensor Check that the flame sensor is properly located and that all connections are tight.
  - c. Power Vents All power driven vents should be checked to see that they operate properly. Inspect operation of power vent to see that the switch works properly (centrifugal switch or air switch).
- 7. Electric Heat

Check that the nameplate voltage and supply voltage match. Also be sure that the fuses and wiring are sized according to the applicable electrical codes.

8.	Water	Heat

Check all piping to be sure it complies with local codes and that it is free of leaks. Also check the unit instruction for piping details that are unique to that unit.

- 9. After unit inspection is completed be sure to remove all foreign matter such as tools, construction and packaging materials, and instruction packets which may have been left inside the unit. Paper, plastic and cardboard could restrict air flow thru unit preventing proper operation of unit. Besides satisfying the customer with a neat looking installation, cleaning up around the unit could prevent damage to the unit and prevent injuries.
- 10. Check Valve Positions

Be sure that suction stop valve, discharge stop valve,

and liquid line stop valve are fully open.

11. Crankcase Oil Level

Check that the oil level is visible in the compressor crankcase sightglass.

## START-UP

After the above points have been checked, set the unit thermostat to the "Off" position. Close the fused disconnect switches. Set the thermostat dial to a position to secure unit operation. Turn the switch from "OFF" to "COOL" (or "HEAT").

Observe all components to see that they operate properly. Be ready to stop the unit immediately if any unusual operating condition develops.

POST-START CHECK LIST		
Is unit expected to, or is it operating beyond its application limitations?	Yes	No
In order to answer this, refer to the application limitation section (or table) included in the service instructions for the particular unit involved and check No's 2, 3, 4, & 5. Also check No's 6, 7, & 8 on split systems.		
Check unit nameplate voltage against power supply. Is voltage beyond the maximum or minimum allowable variation?	Yes	No
(Check stand-by voltage – unit not running), then inrush voltage (when unit starts), then normal running voltage.		
. Is ambient air temperature on condenser below minimum?	Yes	No
Or above maximum?	Yes	No
If below minimum, is proper low ambient kit installed?	Yes	No
If above maximum, answer the following:		
- Is condenser air being recirculated?	Yes	No
- Is there duct work being used on condenser air circuit?	Yes	No
— Is unit located approximately 12 inches above reflective surface such as roof, concrete patio, etc., to prevent reflective heat from causing high head pressure?	Yes	No
- Is condenser fan motor up to full speed? Is rotation correct?	Yes	No
. Check air on the cooling coil? WB DB Is it beyond maximum or minimum limitations?	Yes	No
. What is CFM across evaporator? Is it below minimum or above maximum	n? Yes	No

(There should be a nominal 400 CFM per ton.) To find CFM on a cooling only unit one must know the blower RPM and the external static pressure -IWG – then find the CFM from the blower performance tables in the service instruction for the particular unit involved. (On some units one only needs to check the static pressure drop across the coil.) On heating units or a unit which has a heat section use the heating unit formulas shown on page 11.

- 6. Check maximum suction lift. Does it exceed 30 ft?
- 7. Check drain line design and operation. All unit drains must be properly trapped. For the proper method of designing drain traps refer to Form 55.70-N1, page 7. All piping must comply with local and national codes and should be leak checked.
- Check the oil level in the compressor sight glass. On start-up the oil level may drop for a short time but should soon return to normal. Do not run the compressor with low oil level.
- 9. Motor Check

Make sure all motors are running and check that fan rotation is in the correct direction. If not, try changing motor leads to reverse direction of rotation on 3 phase motors. Check capacitor hookup on single phase motors if rotation is incorrect.

10. Check Expansion Valve Bulb (s) for Tightness

The thermal expansion valve bulb must be securely attached to the suction line in order to provide good heat transfer. Loose or improperly mounted bulbs may cause unstable unit operation. Refer to Form 55.70-N1, page 6 for more detailed information on bulb mounting.

11. Check Air Filters

Check that filters are installed properly in the filter sections and that there is no bypassed air around the filters.

12. Check Air Ducts for Leaks

Discharge or return air ducts must be in place. Ducts must be tight so that there is no air leakage. It is recommended that joints be taped or gasketed. Check return and discharge grills to see that they are not obstructed.

13. Roof Mounted Units

Thru-the-roof ducts must be properly flashed so that rain, snow, etc. cannot enter the building or ducts. Check with local roofing codes to be sure all work complies with these codes. Rooftop unit(s) should be mounted per local codes and the specific installation instructions provided with the unit.

- 14. Remove compressor tie-down bolts if recommended in the unit instruction.
- 15. Leak check all refrigerant piping connections.
- 16. Put unit through its paces by operating it from the room thermostat. Do all motors and any other components, such as a liquid line and compressor unloading solenoids, start and stop in sequence and by proper thermostat control?

Is thermostat mounted solidly in a good location to prevent short cycling due to slamming doors, accidential bumping, direct exposure to supply air, etc. On mercury bulb thermostat, thermostat must be mounted level to insure the proper setpoint.

17. On 24 volt control circuits, do you have 24 volts (+ or -10%) during start-up and operation?

If answer is "no" check for such things as thermostat wire too small for length of run or that 208 volt tap is used on units with 208 volt power supply.

18. All YORK equipment is furnished with certain safety controls which stop the unit if an unsafe operating condition develops. It is important that these controls operate properly and under no circumstances should they be bypassed in the field. YORK will accept no liability for equipment damage if the safety controls have been bypassed or disconnected. Safety controls should be operated to see that they operate at their proper settings. (See unit instruction for specific set points.) Controls may be reset in the field within the limits shown in the unit instruction.

Yes	No

No

Yes

Yes\_\_\_\_ No\_\_\_\_

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Yes\_\_\_\_ No\_\_\_\_

Yes	No
	- 10

Vac	No	
res	INO	-

Yes	No	
Yes	No	-

No

Yes\_\_\_\_ No\_\_\_\_

Yes	No

Yes\_\_\_\_ No\_\_\_\_

Yes\_\_\_\_ No\_\_\_\_

	check the following:	en de la constantina de la constantina Constantina de la constantina de la cons	
	– Are suction lines designed to insure oil return to the compressor under all operating conditions?	Yes	No
	— Are evaporator suction headers designed to prevent oil draining into an idle evaporator under reduced load operating conditions?	Yes	No
	— Are double suction risers used where required to insure oil return under reduced load operating conditions?	Yes	No
	— Are evaporators trapped to prevent liquid refrigerant draining out of them on the "off" cycle?	Yes	No
	– Are liquid line solenoid values installed on the first stage and second stage evaporator?	Yes	No
	If hot gas bypass is used, does the hot gas enter the low side ahead of the liquid distributor or into the suction line?	Yes	No
	Refrigerant Mains – Are recommended pipe sizes being used?	Yes	No
	Liquid Line filter drier installed?	Yes	No
	Sight Glass installed near the evaporator?	Yes	No
	Is suction line insulated?	Yes	No
	Are long runs of suction (or discharge) and liquid lines separated to prevent heat exchange?	Yes	No
20.	Are crankcase heaters installed?	Yes	No
	Do they operate when compressor is off?	Yes	No
	Do they operate when compressor is operating?	Yes	No

19. On large split systems with condensing units having some type of capacity reduction and a circuited evaporator, or two or more evaporators, or multi-zone evaporator,

After the system has been installed a qualified person who is familiar with the operation of the system should test the equipment under all modes of operation to insure that it is functioning correctly. When the system is functioning properly, the owner's approval should be secured. The owner should be shown the location of the fused disconnect switch and controlling thermostat, instructed how to start, operate and stop the unit.

# USING TEST READINGS AND POST-START CHECK LIST

Test readings give a very complete description of the way the job is working. Recorded test readings are valuable as a comparison if trouble should develop in the future.

If a serviceman is seeking advice from a more experienced person regarding a difficult trouble job, complete data is needed for an intelligent discussion that permits sound conclusions to be drawn.

After a test run is completed test readings should be recorded in spaces provided below. Study the results carefully and make an evaluation. Either decide the job is in good condition or that it has one or more conditions that need to be remedied.

Observe and log the following Test Readings:

#### **TEST READINGS**

Record and check the following data against nameplate:



A compressor amperage draw 10% above normal should allow continuous operation without tripping the overload and therefore the compressor should not be changed.

#### Voltage

Compare the voltage reading to that shown on the nameplate for the unit. If the voltage is within 10% of nameplate it should be considered satisfactory, except where the nameplate specifies a higher minimum voltage.

If the voltage is more than 10% below nameplate, the wire used in running the line to the unit should be checked to make sure it is not undersized.

If a low-voltage condition exists, the serviceman should notify the owner and shut the equipment down. He should also notify the electric company and ask for a check on the adequacy of electric service to the property. This is actually the responsibility of the owner, but the serviceman can be helpful to the owner by taking added responsibility to insure long life for the equipment.

#### **Compressor** amperage

The nameplate on the unit will show an amperage rating for the compressor called Full Load Amperes, abbreviated FLA.

Rated load conditions are  $95^{\circ}$  F air entering the condenser,  $80^{\circ}$  F air at 50% rh entering the evaporator at a flow rate of 400 cfm per ton of cooling capacity. Under these conditions the amperage measured should be close to the FLA rating, somewhat lower on some older units.

Obviously a serviceman rarely sees a test under exactly rated conditions. Therefore the amperage draw can vary widely both because of load conditions and the condition of the system.

If the amperage is running high but not high enough to cause the unit to cut out on the current overload, possible causes are as follows:

- Voltage that is high or low by 10% or more.
- In a new installation a tight compressor can make the amperage run above normal.

If the amperage is running so high as to cause the compressor to cut out on its current overload, possible causes are as follows:

 On capacitor start, capacitor run, or PSC singlephase units, an open run capacitor will cause a very substantial increase in the amperage. An incorrectly sized run capacitor can increase amperage also.

If the amperage is running low, it helps confirm a problem such as a low refrigerant charge, low air flow over the evaporator or damaged compressor valves, short circuiting of air to the evaporator, or a restricted refrigerant line.

#### **Pressure Readings**

The question of how far from normal can the readings go before action is required continually confronts the serviceman. Lacking specific information, he must make a judgment based on general information and knowledge.

#### **Discharge Pressure**

If information is not at hand for the equipment being worked on, refer to Table 1 for the discharge pressure corresponding to various condenser inlet air temperatures for R-22 refrigerant. This table is based on general design considerations and can be used as a general guide.



#### **TABLE 1** — HEAD AND SUCTION PRESSURES

CONDENSER	HEAD	SUCTION
ENTERING AIR	PRESSURE	PRESSURE
(DEGREES F)	(PSI)	(PSI)
60	170	62
65	180	63
70	195	64
75	210	65
80	225	66
85	245	67
90	260	68
95	280	69
100	300	70
105	315	71
110	330	72
115	350	74

Some adjustment has been made in the table for a lighter load on the evaporator that normally accompanies the lower outside air temperatures.

#### **High Head Pressure**

If the head pressure is running higher than table values by more than 20 psi, possible causes are:

Condenser air recirculating. Obstructions may deflect hot discharge air in such a way that it is pulled into the inlet and this makes the condensing pressure and temperature higher.

A dirty condenser will increase head pressure because there is less cooling of the hot gas. Airborne weed seeds can very severely block the condenser. Some dirt will show up readily on the surface of the condenser coil. Fine dust may collect between the fins of the coil. A close examination is necessary to detect it.

A heavy refrigerant overcharge will increase head pressure because it reduces condenser surface. If this is suspected, bleed off some refrigerant. If the pressure drops, bleed off more refrigerant until the reading comes into line.

If there is a large amount of air in the system it will make the head pressure go up because it reduces the effective condenser surface. This is in addition to the other harmful effects of air in the system.

A pull-down period caused by having the unit off for an extended period of time in extremely warm weather will temporarily increase head pressure.

If the head pressure rises, there will also be a very slight increase in suction pressure, particularly on capillary tube systems.

If the head pressure is running low, it will probably be the result of low suction pressure and will be discussed under that heading.

#### Suction pressure

If the specific unit information is not available on suction pressure, refer to Table 1.

If the suction pressure is high, possible causes are as follows:

The unit requires a pull-down period. In extremely warm weather the warmer air flowing over the evaporator boils off refrigerant faster which raises the suction pressure.

A unit that is undersized and cannot properly cool the space will consistently run a higher than normal suction pressure.

A system that moves too much air over the evaporator will have a higher than normal suction pressure. This can normally be corrected by slowing down the blower. If this is not possible, resistance must be added to the system. This can be done by blocking off part of register openings, blocking part of the duct area, or putting expanded metal across the duct.

A mix-match application in which the evaporator has larger capacity than the condensing unit will run a higher suction pressure. Table 1 does not apply to such systems.

Bad valves or gaskets in the compressor will cause the suction pressure to run high, usually by a large amount which sets it apart from other causes of high suction pressure.

The suction pressure may run low and possible causes are as follows:

A low refrigerant charge, ordinarily the result of a leak, is the most common cause of low suction pressure. Every effort must be made to find and repair the leak, or leaks, and then charge the system. Until this is done refrigerant must be added periodically to keep the system in operation.

Short circuiting of air from the supply registers to the return grilles returns cold air to the evaporator. This condition does not add enough heat to the evaporator to keep the suction pressure up where it should be. Directional registers or deflectors added to existing registers are used to make the supply air mix with the room air.

If too little air is flowing over the evaporator, even though it is at normal return-air temperature, the heat added to the coil will not keep the suction pressure up to normal.

A restricted refrigerant line can cause varying degrees of low suction pressure. A severe restriction can easily cause the suction pressure to fall as low as half its normal value. A complete blockage can cause the suction pressure to pull down to zero and then go into a vacuum.



A restriction, not a complete blockage, means that refrigerant is flowing. At the point of restriction a high pressure drop occurs. The high pressure drop will cause a refrigerating effect and the line will be very cold at this point. This will be especially true if the restriction is in the liquid line, and less sharply defined if in the suction line.

Carefully examine all exposed portions of the liquid line, and then the suction line for a cold spot. Look for condensation, or frost, and run the fingers along the line to detect a temperature difference. Give special attention to all joints, both soldered and mechanical.

Where lines are totally concealed so that inspection is impossible, it will be necessary to install access valves on each end of the liquid line, and in turn the suction line, to measure the pressure drop in the line.

#### **Condenser Entering-Air Temperature**

The air temperature entering the condenser does not have a simple meaning by itself, but it has a bearing on most of the other readings. It is tied into the head pressure in Table 1 and into the superheat in Table 2.

Ordinarily the air temperature entering the condenser and the outdoor air temperature are the same. Therefore this temperature relates to the cooling load the system is required to handle. The other readings move with changes in outdoor temperature.

#### Superheat

The suction-line temperature and the saturation suction temperature calculated from compressor suction pressure are only a means to an end; that is the superheat. Superheat tells us when the flow of refrigerant is metered and controlled so that the full capacity of the cooling coil is being utilized, and also that all of the liquid refrigerant is being boiled off inside the cooling coil. Calculating superheat is explained on page 9.

If the superheat is less than  $6^{\circ}$  F there is risk that liquid refrigerant is being returned in the suction line. If this occurs, it means cooling is taking place outside the conditioned space. This is inefficient. It also means there is risk of liquid slugging of the compressor which may damage it so as to make a replacement necessary.

If the superheat is high there is a reduction in capacity (because the cooling coil is not fully utilized) which, if severe enough, may result in insufficient cooling of the space and overheating of the compressor.

The most frequent cause of high superheat is a low refrigerant charge. Check this by adding a small but carefully measured amount of refrigerant (4 oz) for the smaller systems and (8 oz) for the larger systems. If this test confirms a low charge, charge the system to the correct amount.

On systems in which the refrigerant is metered by a thermal expansion valve, the ideal superheat should be 6°F to 12°F

at evaporator outlet. If the superheat is outside this range and the valve is adjustable, make a change and check the result. If the valve is not adjustable, or adjustment does not help, and the superheat is less than  $6^{\circ}$ F or more than  $25^{\circ}$ F, the cage assembly and power bellows assembly or complete valve must be replaced.

On systems in which the refrigerant is metered by capillary tubes the superheat will vary over a wider range depending on the outside temperature. Table 2 is an approximation of the way superheat changes with weather.

#### TABLE 2 – EXPECTED SUPERHEAT READINGS, (ON CAPILLARY TUBE SYSTEMS)

OUTDOOR TEMP <sup>°</sup> E	SUPERHEAT ° F		
60-80	20-30		
80-95	10-20		
95-115	6–10		

#### **Return-Air Temperature**

The temperature drop (evaporator return air minus supply air) is related to quantity of air passing through evaporator. Increasing blower speed will reduce the temperature drop; decreasing blower speed will increase the temperature drop. The air quantity to be circulated through evaporator is determined by the design requirements of the installation and the unit.

#### NOTE: CFM SHOULD BE SET BY DESIGN CONDITIONS. TEMPERATURE DIFFERENCE SHOULD NOT BE USED TO SET CFM.

In drier climates, with a given air quantity, more of the unit's total capacity will be used doing sensible cooling and will result in greater dry bulb reduction (temperature split).

In the more humid coastal areas more of the unit's total capacity will be used doing more latent cooling, and will result in less dry bulb reduction and greater wet bulb reduction.

Too much reduction of air flow will cause the cooling coil to start building up ice and begin a vicious cycle that will either shut the system down or bring an insufficient cooling complaint. Obviously this condition must not be brought about deliberately.

On belt-drive systems the air flow and blower speed can be changed by adjusting the motor pulley, or changing the size of the motor pulley. If the blower speed has to be increased by a substantial amount it may be necessary to increase the motor size. The blower speed can be decreased by adjusting, or reducing, the size of the motor pulley.

On direct-drive systems equipped with multitap motors there is some flexibility in obtaining the best blower speed and air flow.





A method of reducing the air flow is to add resistance to the duct system in the most convenient manner. Pinching down on volume dampers, blocking off part of the register opening, or inserting expanded metal in the duct will all add resistance and cut down on air flow and increase temperature difference.

Lack of maintenance in the form of dirty filters and loose and slipping belts will bring on poor operation in a system initially in good shape.

After blower speed has been correctly set initially on a new installation it will never need to be changed. If the temperature drop goes out of bounds it is an indication of other problems such as plugged filters, too many ducts closed, or a low refrigerant charge due to a leak.

## Using YORK Specific Testing and Service Information

The YORK instruction Form 55.05-NM9 provides specific information regarding the checking of unit performance using temperature/pressure service curves. <u>Always</u> use the specific service and performance data when it is available.

The first necessary fact to permit checking unit performance is air quantity off the indoor coil. The easiest field method of measuring this is by static pressure. Using this method, it is necessary to measure only the total static pressure of the unit to determine the CFM. A good instrument to use is a "Dwyer" No. 172 portable manometer with a range of 0 to 1.0 inch of water. The service instructions include charts of total static pressure vs. CFM which can be used to find CFM after total static pressure has been determined. In order to measure total static pressure: (1) Insert the negative tip of the manometer in the return-air duct; (2) Insert the positive tip of the manometer in the supply-air duct. This gives one direct reading. Since an allowance is made for air filters in the total static pressure vs. CFM chart, the filters need not be removed when taking this measurement. However, the filters must be <u>clean</u>.

NOTE: TO ASSURE EFFICIENT OPERATION OF THE UNIT, CHECK THE PRESSURES (MOST YORK UNITS CURRENTLY PRODUCED ARE EQUIP-PED WITH HIGH AND LOW SIDE ACCESS VALVES OR FITTINGS). EXCEPTION: UNITS WHICH DO NOT HAVE ACCESS VALVES OR FITTINGS: "EW" UNITS (OLDER UNITS HAVE A DISCHARGE VALVE ONLY, A LOW SIDE ACCESS VALVE MUST BE ADDED; CURRENT MODELS ARE EQUIPPED WITH BOTH HIGH AND LOW SIDE VALVES. ICE MAKERS & ROOM AIR CONDITIONERS – NO ACCESS VALVES.



Schrader Access Valve (Mounted either in the line itself or on a pigtail)

FIG. 1 — ACCESS VALVES

Typical Backseating Type Valve With Gauge Port Typical Angle Type Access Valve



After the unit has been operating for 15 minutes, record the necessary data to check the unit performance.

- (a) Evaporator coil air "ON" \_\_\_\_\_ °F wb.
- (b) Evaporator coil air "OFF" \_\_\_\_\_ °F db.
- (c) Condenser coil air "ON" \_\_\_\_\_ °F db.
- (d) Suction line temp at evaporator outlet \_\_\_\_\_\_
   °F (Superheated Gas Temp)
- (e) Compressor suction pressure \_\_\_\_\_\_psig. Corresponding saturation temp \_\_\_\_\_°F.
- (f) Liquid line temp at condenser outlet \_\_\_\_\_ °F (Liquid Temp)
- (g) Compressor discharge pressure \_\_\_\_\_\_psig. Corresponding saturation temp \_\_\_\_\_°F.

Before these readings can be evaluated, the liquid subcooling and the superheat must be determined.

#### Calculating Sub-Cooling:

Liquid subcooling is the difference between the condenser saturation temperature, [temperature corresponding to the compressor discharge pressure (f)] and the temperature of the liquid leaving the condenser (e).

Liquid Sub-Cooling = (Saturated Condensing Temp) – (Condenser Outlet Temp) Example: (122) – (115) = 7 Degrees Liquid Sub-Cooling

#### Calculating Superheat:

Superheat is the difference between the suction temperature and the evaporator saturation temperature, [temperature corresponding to the suction pressure (d)]. The condenser saturation temperature and the evaporator saturation temperature can be read from Refrigerant-22 tables. The values of the liquid cooling and the superheat are calculated:

Superheat = (Suction Temp) – (Saturated Evaporating Temp) Example: (62) – (37) = 25 Degrees

Compare unit test data with the service curve for the unit. The performance of the unit will fall into one of four categories:

- (a) The first is that the unit is performing satisfactorily.
- (b) The second possibility is that the unit has <u>low suction</u> pressure and low discharge pressure. This could be caused by one of two things:
  - 1. Low refrigerant charge.
  - 2. Faulty expansion device.

- (c) The third possibility is that the unit has <u>high suction</u> pressure and low discharge pressure. This would be caused by:
  - 1. Poor compressor performance.
- (d) The fourth possibility is that the unit has <u>high suction</u> pressure and <u>high discharge pressure</u>. This could be caused by:
  - 1. Too much refrigerant charge.
  - 2. Air in system.
  - 3. Dirty condenser coil, obstructed condenser, etc.

#### GAS HEATING ONLY

1. Gas connections have been checked for leaks.

WARNING – DO NOT USE AN OPEN FLAME OR OTHER SOURCES OF IGNITION.

- 2. Fan control is adjusted for proper blower operation.
- 3. Limit control shuts off burners at proper setting.
- 4. Flame sensor operates properly.
- 5. Glow coil functions properly.
- 6. Pilot flame adjusted to proper size.

#### **Control Check Out**

Before leaving, installer should check to see that all controls are functioning properly as follows:

- Light pilot burner following instructions on rating plate. Leave main control knob on automatic gas valve in "pilot" position and raise room thermostat temperature setting above room temperature. Burners should not ignite.
- 2. Turn automatic valve to "on" position. Burners should now ignite. Wait for blower to start. Cycle burners several times by interrupting electrical power, or by thermostat.
- 3. With burners operating, disconnect one lead at fan control. In a short period of time, the limit control should shut the furnace down. Replace fan lead. Blower should start and after a brief interval, burners will re-ignite.
- 4. Check safety pilot by turning off gas supply to pilot burner (turn pilot adjustment screw in until pilot is extinguished. In a few seconds, burners will go out). Return pilot adjustment screws to previous setting and relight pilot burner.
- 5. Turn automatic valve to "on" position and set thermostat to desired temperature.



#### Adjustment of Primary Air Shutters

In most cases adjustment of primary air shutters is not necessary when the furnace is piped to natural gas.

However, it may be necessary to adjust the primary air when the furnace is piped to L.P. Gas.

Burners should be in operation for 15 minutes before making a primary air adjustment.

The proper burner flame is one which burns blue. To obtain this, first close primary air shutter assembly until a yellow flame is obtained. Then reopen shutter assembly slowly until yellow flame just disappears. When this is accomplished, lock the air shutter in position by tightening the locking screw.

Too much air permits the flame to burn entirely blue and somewhat noisely. Too little primary air produces a yellow tipped flame which burns very lazily and which may deposit carbon on the combustion chamber.

#### **Adjust Fan Control Settings**

"Fan on" setting of fan control must be high enough to assure that the air in the furnace is sufficiently heated that no cold air is blown into the heated space, but not so high that the furnace might be damaged by excessive heat.

To adjust "fan on" setting:

- 1. Turn furnace on.
- 2. Place thermometer in heated-air duct, about 6 feet from the furnace, where it will not be affected by radiant heat and read the thermometer when the blower starts.
- 3. If this temperature is too high when the blower starts, lower "fan on" setting. If this temperature is too low when the blower starts, raise "fan on" setting.
- 4. If adjustments are made to the "fan on" setting, repeat the previous steps.

"Fan off" setting of fan control must be low enough to adequately cool the furnace, but not so low that cold air is blown into the heated space.

#### To adjust "fan off" setting:

- 1. Turn furnace on.
- 2. Let furnace operate for 20 mintues.
- 3. Turn furnace off.
- 4. Place thermometer in heated-air duct, about 6 feet from the furnace, where it will not be affected by radiant heat and read the thermometer when the blower stops.

- 5. If this temperature is too high when the blower stops, lower the "fan off" setting. If this temperature is too low when the blower stops, raise the "fan off" setting.
- 6. If adjustments are made to the "fan off" setting, repeat the previous steps.

Usually the fan control is set so that the thermometer reads about 125 degrees when the blower starts, and about 100 degrees when the blower stops.

#### Check Gas Input (Natural Gas Only)

Gas pressure to the burners should be adjusted so that optimum performance is obtained. When there is an indication of overfiring or underfiring, it can easily be checked by reading the gas meter. Overfiring a furnace causes serious safety hazards, noisy ignition, flame roll-out and possible damage to the heat exchanger.

NOTE - TO FIND THE BTU INPUT, MULTIPLY THE NUMBER OF CUBIC FEET OF GAS CON-SUMED PER HOUR BY THE BTU CONTENT OF THE GAS IN YOUR PARTICULAR LOCA-LITY. (CONTACT YOUR GAS COMPANY FOR THIS INFORMATION AS IT VARIES FROM CITY TO CITY.)

To determine the actual BTU input to a natural gas furnace is a relative easy task. First, check to make sure the only gas appliance in operation is the furnace. With the furnace in operation, measure the time in seconds it will take for one revolution of the smallest dial on the meter. One method of determining the actual BTU input to a natural gas furance is: To multiply a constant of 3600 (when using a one cubic foot dial) by the BTU per cubic foot rating of gas, then dividing that result by the time in seconds it required the one cubic foot dial to make one revolution. Use a constant of 1800 for a 1/2 cubic foot dial and 7200 for a two cubic foot dial.

Formula:

Input BTU/HR =  $\frac{\text{Heating Value of Gas (BTU/FT}^3) \times 7200}{7}$ Time in Seconds (for 2 cu ft) of Gas

If the pilot flame of another gas appliance was burning during the furnace input test, it must be deducted from your total input calculation. A good rule of thumb is to deduct 800 BTU per hour for each pilot flame. If the BTU input of the gas is not within 95 to 100% of the furnace input raing, utilizing the permissible adjusting range of the regulator setting, it will be necessary to replace the orifice spuds with spuds of the proper size.

#### CAUTION: NEVER OVERFIRE A FURNACE.

#### Adjustment of Manifold Gas Pressure

Measure gas manifold pressure. Manifold pressure should be set approximately as follows: Natural gas – 3.5 and Propane gas - 10.5 inches water column.

For NATURAL gas application of furnaces the gas flow may adjusted by means of the pressure regulator adjustment.



#### Check Gas Input (Propane Gas Only)

The gas pressure regulator at the storage tank is normally adjusted to maintain an operating pressure of 10.5 inches of water column at the furnace manifold. This pressure will result in the correct gas input when the proper burner orifices are installed on the furnace.

#### **Adjust Temperature Rise**

The temperature rise, or temperature difference between the return-air and the heated-air from the furnace, must lie within the range shown on the A.G.A. rating plate. After temperature rise has been determined, the CFM can be calculated.

After about 20 minutes of operation, determine the furnace temperature rise. Take readings of both the return-air and the heated-air in the ducts, about 6 feet from the furnace, where they will not be affected by radiant heat. Increase the blower CFM to decrease the rise; decrease the blower CFM to increase the rise.

To measure temperature rise:

- 1. Let furnace operate for 20 minutes.
- 2. Measure return-air temperature.
- 3. Measure heated-air temperature about 6 feet from the furnace where it will not be affected by radiant heat.
- 4. Difference is temperature rise.

#### Check Air Quantity (CFM)

To convert temperature rise to CFM:

1. Indoor furnace

$$CFM = \frac{BTU/Hr Input (Cu Ft Gas.per Hr x BTU per Cu Ft^*)}{1.35 x (°F temp rise)}$$

2. Outdoor furnace

$$CFM = \frac{BTU/Hr Input (Cu Ft Gas per Hr x BTU per Cu Ft^*)}{1.44 x (°F temp rise)}$$

Oil Furnace – determine amount of oil in gallons per minute and BTU per gallon.

$$CFM = \frac{Gallons of oil per hour x BTU per gallon}{1.45 x Temperature Rise}$$

Determine the total KW that is turned on when getting the temperature rise.

$$CFM = \frac{KW \times 3410 \text{ BTU per } KW}{\text{Temperature Rise } x 1.08} \text{ OR } CFM = \frac{\text{BTUH Input}}{1.08 \times \text{F}^{\circ} \text{Temp Rise}}$$

WHERE: BTUH = 5.92 x Volts x Amps (1\$\phi\$) 5.92 x Volts x Amps x 1.73 (3\$\phi\$) To adjust temperature rise:

- 1. Increase blower CFM to decrease temperature rise.
- 2. Decrease blower CFM to increase temperature rise.

#### When changing drives on blowers:

For each 1" increase in pulley size – increase belt length by 2". For each 1" decrease in pulley size – decrease belt length by 2".

Increasing the RPM of the blower increases the Brake Horsepower (BHP) required.

#### Adjusting Blower Speed (CFM)

On belt-driven blowers, speed can be varied by changing the motor pulley ratio. Opening the pulley decreases speed. Closing the pulley increases speed.

After each adjustment, position and tighten the set screw on one of the flats of the pulley hub. Always align the fixed flange of the motor pulley with the blower pulley. Improper adjustment will cause noise and belt wear.

Adjust belt tension with the motor adjusting bolt until the belt can be depressed with the fingers about 1/2 inch at a point halfway between the two pulleys. Make speed adjustments as necessary until the desired temperature range is obtained.

On initial start-up or after increasing air flow, check fan motor amps and compare to full load amps listed on motor data plate. The panel on the fan section must be in place when checking fan motor amps. Should the current drawn by motor exceed the full load amps by more than 15%, unload motor by releasing belt tension or by reducing fan speed. This permissible increase of 15% above full load nameplate amps is the result of the motor being located in a cool area with increased air flow over the motor.

Direct Drive blowers have multi-speed motors. Variation in furnace temperature rise can be obtained by selecting the low, medium or high speed hookup as desired. Refer to the furnace wiring diagram.

Check the fan control settings to assure that air is being heated sufficiently but not excessively prior to blower operation. This check is made by placing a thermometer in the heated air duct about 6 feet from the furnace, and by measuring the air when the blower comes on and when it shuts off. It is usually desirable to set the fan control so that the thermometer will read 120 degrees when the blower comes on and about 90 degrees when the blower stops.

Permit the furnace to operate about 20 minutes prior to shutting it down and reading the duct air temperature when the blower stops. Repeat the temperature checks to assure satisfactory settings.

Complete the furnace installation by making a check to assure that all controls are functioning properly.



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# W1LC530A25A, W1LC530A40A, W1LC530A46A, W1LC530A50A (AIR COOLED WATER CHILLER)

**RENEWAL PARTS** 

Supersedes: Nothing

570.05-RP5Y (1187)

1 of



# FIG. 1 - AIR COOLED WATER CHILLER

SECTION	FIG.	ITEM	DESCRIPTION	W1LC530A25A	WILC530A40A	W1LC530A46A	W1LC530A50A
COMPRESSORS					1000	19.1.190	
and the second second	1	1	COMPRESSOR, SEMI-HERMETIC (SYS. 1) (5)	4RK2-2500-TSK	4RK2-2500-ESX	4RK2-2500-TSK	4RK2-2500-FSD
	1	2	COMPRESSOR, SEMI-HERMETIC (SYS. 2) (5)	6RP2-3500-TSK	6RP2-3500-ESX	6RP2-3500-TSK	6RP2-3500-FSD
MOTORS			and the second			1994	
	1	3	MOTOR, DIRECT DRIVE FAN	024-18396-900	024-18397-900	024-18397-900	024-18397-900
	1	4	MOTOR, DIRECT DRIVE FAN (7)	024-19879-000	024-19878-000	024-19878-000	024-19878-000
ELECTRICAL				a far an a third		Contractor Consultable	
and the sea	1	5	BLOCK, TERMINAL (1TB)	025-20573-000	025-20710-000	025-20710-000	025-20573-000
	1	6	BLOCK, TERMINAL SECTION (2TB-3TB) (3)	025-20945-900	025-20945-900	025-20945-900	025-20945-900
State 1	1	7	BLOCK, TERMINAL (4TB-5TB)	025-09469-000	025-09469-000	025-09469-000	025-09469-000
	1	8	BLOCK, TERMINAL END (2TB-3TB) (3)	025-20946-900	025-20946-900	025-20946-900	025-20946-900
and the second second second	1	9	CAPACITOR, RUN (1RC THRU 7RC) (15MFD/370V)	024-20446-000	024-20446-000	024-20446-000	024-20446-000
	1	10	COIL, CHOKE (1CH, 2CH)	025-20704-001	025-20704-002	025-20704-002	025-20704-002
	1	11	COIL, SOLENOID (1115, 2115)	025-27514-000	025-27514-000	025-27514-000	025-27514-000
	1	12	CONTACTOR, ELECTRICAL (1M)	024-19889-000	024-19889-000	024-19889-000	024-20451-000
	1	13	CONTACTOR, ELECTRICAL (2M)	024-19172-000			024-20449-000
	1	14	CONTACTOR, ELECTRICAL (3M)	024-21777-000	024-21777-000	024-21777-000	024-20450-000
	1	15	CONTACTOR, ELECTRICAL (4M)	024-21778-000			024-18056-006
	1	16	CONTACTOR, ELECTRICAL (5M)	024-20423-000	024-20423-000	024-20423-000	024-20423-000
and setting a start	1	17	CONTACTOR, ELECTRICAL (6M)	024-19633-000	024-20423-000	024-19633-000	024-19633-000
	*	18	CONTROL, PRESSURE (1HP, 3HP)	025-17620-009	025-17620-009	025-17620-009	025-17620-009
	+	19	CONTROL, PRESSURE (2HP, 4HP)	025-20709-000	025-20709-000	025-20709-000	025-20709-000
	*	20	CONTROL, PRESSURE (1LP, 2LP)	025-17620-005	025-17620-005	025-17620-005	025-17620-005
	*	21	CONTROL, PRESSURE (OIL, 10P, 20P)	025-21463-900	025-21463-900	025-21463-900	025-21463-900
	*	22	CONTROL, TEMPERATURE (FREEZE STAT) (4)	025-27499-000	025-27499-000	025-27499-000	025-27499-000
Contd.Page 2	+	23	CONTROL, TEMPERATURE (1TH, 3TH)	025-19499-001	025-19499-001	025-19499-001	025-19499-001

#### \* NOT SHOWN

NEW REPLACEMENT PARTS.

(3) TERMINAL BLOCKS ARE BUILT UP IN SECTIONS. EACH SECTION IS ONE CIRCUIT AND EACH BLOCK REQUIRES AN END PIECE.

(4) GENEROUSLY COAT BULB AND SENSOR WITH COMPOUND 013-00898-900 BEFORE INSTALLING IN WELL AND SEAL THE WELL WITH INSULATING TAPE.

(5) OBTAIN REPLACEMENT COMPRESSOR FROM LOCAL COPELAND WHOLESALER.

(7) MOTOR CAN OPERATE AT REDUCED SPEED


570.05-RP5Y



#### FIG. 1 - AIR COOLED WATER CHILLER

SECTION	FIG.	ITEM	DESCRIPTION	W1LC530A25A	W1LC530A40A	W1LC530A46A	W1LC530A50A
ELECTRICAL			(Continued from page 1)		and the second	Section States	Country of the
	+	24	CONTROL, TEMPERATURE (2TH, 4TH)	025-19499-002	025-19499-002	025-19499-002	025-19499-002
141 T. 182	*	25	CONTROL, TEMPERATURE (5TH)	025-19499-005	025-19499-005	025-19499-005	025-19499-005
	+	26	CONTROL, TEMPERATURE (7TH)	025-27525-000	025-27525-000	025-27525-000	025-27525-000
a second second	+	27	CONTROL, TEMPERATURE (TC) (4)	025-18752-000	025-18752-000	025-18752-000	025-18752-000
	+	28	CONTROL, WATER FLOW SWITCH	024-24609-000	024-24609-000	024-24609-000	024-24609-000
	1	29	FUSE (1FU-2FU-3FU)	025-04649-900	025-16670-000	025-12804-900	025-12804-900
	1	30	FUSE (4FU-7FU)	025-23069-000	025-17883-000	025-17883-000	025-17883-000
	1	31	FUSE (5FU)	025-17881-900	025-17881-900	025-17881-900	025-17881-900
	1	32	FUSE HOLDER (1FU-2FU-3FU)	025-18281-000	025-14213-900	025-18284-900	025-18284-900
	1	33	FUSE HOLDER (4FU-7FU)	025-17407-900	025-17407-900	025-17407-900	025-17407-900
	1	34	FUSE HOLDER (5FU)	025-13991-900	025-13991-900	025-13991-900	025-13991-900
	1	35	HEATER (COOLER SHELL)	025-22691-900	025-22691-900	025-22691-900	025-22691-900
Constant of	1	36	HEATER, CRANKCASE	025-18611-002	025-18611-003	025-18611-003	025-18611-003
	1*	37	LUG, GROUND	025-19282-000	025-19282-000	025-19282-000	025-19282-000
	1	38	RELAY, CONTROL (1R, 6R, 7R, 14R)	024-14519-900	024-14519-900	024-14519-900	024-14519-900
	1	39	RELAY, CONTROL (16R, 17R, 19R)	024-24608-000	024-24608-000	024-24608-000	024-24608-000
	1	40	RELAY, CONTROL (15R, 18R, 20R, 21R)	024-24607-000	024-24607-000	024-24607-000	024-24607-000
	1	41	RELAY, CONTROL (3R, 4R, 10R, 11R, 12R)	024-19866-000	024-19866-000	024-19866-000	024-19866-000
	1	42	RELAY, TIME DELAY (3TR, 7TR)	024-19865-000	024-19865-000	024-19865-000	024-19865-000
	1	43	RELAY, TIME DELAY (4TR, 8TR)	024-18220-900	024-18220-900		024-18220-900
	+	44	SENSOR, TEMPERATURE (FREEZE STAT) (4)	025-17896-001	025-17896-001	025-17896-001	025-17896-001
	1	45	TIMER (ITR, 5TR)	025-18477-001	025-18477-001	025-18477-001	025-18477-001
1	1	46	TRANSFORMER (1T)	025-26309-000	025-26309-000	025-26309-000	025-26312-000
Contd.Page 3	1	47	TRANSFORMER (4T)		025-26305-000	) —	<u></u>

\* NOT SHOWN

NEW REPLACEMENT PARTS.

(4) GENEROUSLY COAT BULB AND SENSOR WITH COMPOUND 013-00898-900 BEFORE INSTALLING IN WELL AND SEAL THE WELL WITH INSULATING TAPE.



FIG. TO BE SUPPLIED AT A LATER DATE

#### FIG. 1 - AIR COOLED WATER CHILLER

2

SECTION	FIG.	ITEM	DESCRIPTION	W1LC530A25A	W1LC530A40A	W1LC530A46A	W1LC530A50A
AIR MOVING		Station .	(Continued from page 2)			and the second second	Sector Sector
	1	48	BLADE, FAN	026-21917-900	026-21917-900	026-21917-900	026-21917-900
REFRIGERANT		1.4	the second second second second	and the second second	The second second	and the second state	and the second second
CIRCUIT	1	49	COIL, CONDENSER (SYS. 1) (6)	363-82473-000	363-82473-000	363-82473-000	363-82473-000
	1	50	COIL, CONDENSER (SYS. 2) (6)	363-82474-000	363-82474-000	363-82474-000	363-82474-000
an an is saint	1	51	CONNECTION, DISCHARGE LINE (SYS 1) (1)	063-67809-000	063-67809-000	063-67809-000	063-67809-000
	1	52	CONNECTION, DISCHARGE LINE (SYS 2) (1)	063-67808-000	063-67808-000	063-67808-000	063-67808-000
	1	53	COOLER, INSULATED	376-63813-905	376-63813-905	376-63813-905	376-63813-905
	•	54	FILTER DRIER	029-14777-909	029-14777-909	029-14777-909	029-14777-909
	1	55	HEADER (LIQUID) (SYS 1)	363-67797-000	363-67797-000	363-67797-000	363-67797-000
	1	56	HEADER (LIQUID) (SYS 2)	363-67782-000	363-67782-000	363-67782-000	363-67782-000
and the second	1	57	HEADER (DISCHARDE) (SYS 1)	363-67786-000	363-67786-000	363-67786-000	363-67786-000
	1	58	HEADER (DISCHARCE) (SYS 2)	363-67789-000	363-67789-000	363-67789-000	363-67789-000
	+	59	INDICATOR, MOISTURE	026-15305-900	026-15305-900	026-15305-900	026-15305-900
	1	60	VALVE, EXPANSION (SYS. #1)	025-27535-000	025-27535-000	025-27535-000	025-27535-000
	1	61	VALVE, EXPANSION (SYS. #2)	025-27536-000	025-27536-000	025-27536-000	025-27536-000
	1	62	VALVE, LIQUID STOP	022-02992-000	022-02992-000	022-02992-000	022-02992-000
	1	63	VALVE, SOLENOID (2)	025-27513-000	025-27513-000	025-27513-000	025-27513-000
FABRICATED			•	•			
PARTS	1	64	BOX, ELECTRIC	363-94106-000	363-94106-000	363-94106-000	363-94106-000
	1	65	BRACKET (OIL PRESSURE SWITCH)	063-66899-000	063-66899-000	063-66899-000	063-66899-000
and and the	1	66	COVER, TEMP. CONTROL	063-93946-000	063-93946-000	063-93946-000	063-93946-000
	1	67	DOOR, CONTROL BOX	363-67971-000	363-67971-000	363-67971-000	363-67971-000
	1	68	HINGE, CONTROL BOX DOOR	063-67970-000	063-67970-000	063-67970-000	063-67970-000
and the second	1	69	LEG (1 PER UNIT)	063-32667-000	063-32667-000	063-32667-000	063-32667-000
	1	70	LEG (3 PER UNIT)	063-32666-000	063-32666-000	063-32666-000	063-32666-000
Contd.Page 4	1	71	ORIFICE, FAN (FANS NO. 1.2.3)	063-67813-000	063-67813-000	063-67813-000	063-67813-000

\* NOT SHOWN (1) MADE TO ORDER ONLY.

(2) FURNISHED LESS COIL.

NEW REPLACEMENT PARTS.

(6) THREE REQUIRED PER UNIT. COIL IS FURNISHED WITHOUT HEADERS.



		DATE
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## FIG. 1 - AIR COOLED WATER CHILLER

DESCRIPTION	W1LC530A25A	WILC530A40A	W1LC530A46	W1LC530A50A
ued from page 3)		1993	and the second	Carl Carl
, FAN (FANS NO. 4,5,6,7)	063-67812-000	063-67812-000	063-67812-000	063-67812-000
RONT (CENTER)	363-68007-000	363-68007-000	363-68007-000	363-68007-000
FRONT (LH)	363-67847-000	363-67847-000	363-67847-000	363-67847-000
FRONT (RH)	363-67849-000	363-67849-000	363-67849-000	363-67849-000
ÆAR	063-67852-000	063-67852-000	063-67852-000	063-67852-000
SIDE (LH)	363-67833-000	363-67833-000	363-67833-000	363-67833-000
SIDE (RH)	363-67836-000	363-67836-000	363-67836-000	363-67836-000
SIDE (COMP. END, LH)	063-67845-000	063-67845-000	063-67845-000	063-67845-000
SIDE (COMP. END, RH)	063-94041-000	063-94041-000	063-94041-000	063-94041-000
TOP (COMPRESSOR)	063-67851-000	063-67851-000	063-67851-000	063-67851-000
				A Part & Prost with
(MOTOR SUPPORT)	026-17579-900	026-17579-900	026-17579-900	026-17579-900
VRE	023-11018-000	023-11018-000	023-11018-000	023-11018-000
TOR SHAFT	028-07364-900	028-07364-900	028-07364-900	028-07364-900
AGNETIC (DOOR)	029-15650-000	029-15650-000	029-15650-000	029-15650-000
PASS BAFFLE (FRONT)	076-61035-900	076-61035-900	076-61035-900	076-61035-900
PASS BAFFLE (BACK)	076-61036-900	076-61036-900	076-61036-900	076-61036-900
AN	026-25365-000	026-25365-000	026-25365-000	026-25365-000
(RAIN SHIELD) '	028-04209-900	028-04209-900	028-04209-900	028-04209-900
(COMP. MOUNT)	028-07362-000	028-07362-000	028-07362-000	028-07362-000
(FAN MOUNT)	028-04210-900	028-04210-900	028-04210-900	028-04210-900
ACCESS PANEL	029-08701-900	029-08701-900	029-08701-900	029-08701-900
R (RAIN SHIELD)	062-30549-000	062-30549-000	062-30549-000	062-30549-000
COMP. MOUNTING (BLACK)	029-11729-900	029-11729-900	029-11729-900	029-11729-900
COMP. MOUNTING (BLUE)	029-13662-000	029-13662-000	029-13662-000	029-13662-000
COMP. MOUNTING (GREEN)	029-10111-000	029-10111-000	029-10111-000	029-10111-000
8	P. MOUNTING (BLACK) P. MOUNTING (BLUE) P. MOUNTING (GREEN) NOT SHOWN	P. MOUNTING (BLACK)         029-11729-900           P. MOUNTING (BLUE)         029-13662-000           P. MOUNTING (GREEN)         029-10111-000           NOT SHOWN	P. MOUNTING (BLACK)         029-11729-900         029-11729-900           P. MOUNTING (BLUE)         029-13662-000         029-13662-000           P. MOUNTING (GREEN)         029-10111-000         029-10111-000           NOT SHOWN         NEW REF	P. MOUNTING (BLACK)         029-11729-900         029-11729-900         029-11729-900           P. MOUNTING (BLUE)         029-13662-000         029-13662-000         029-13662-000           P. MOUNTING (GREEN)         029-10111-000         029-10111-000         029-10111-000           NOT SHOWN         NEW REPLACEMENT P

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# **TAB PLACEMENT HERE**

# **DESCRIPTION:**

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Renovation of Building M231 Marine Corpos Base Camp Lejeune, NC. Conract: N62470-88-C-3764

General Contractor:

Temperature Controls

CBC Enterprises, Inc. 1312 E. Little Creek Road Norfolk, Virginia 23518

Mechanical Contractor:

G.R. Michaels & Co. 331 32nd Street Newport News, Va. Phone: (804) 622-3099

Wholesaler and Supplier:

Environmental Control Service 833 St. Brides Road West Chesapeake, Va. 23322

(804) 421-7775 Harper Powell







## TEMPERATURE CONTROL SYSTEM O & M SUBMITAL DATA and AS-BUILT DRAWINGS

#### PROJECT

#### BOQ Renovations Marine Corps Base, Building M-231 Camp Lejeune, North Carolina Contract No. N62470-88-B-3764.

## Submitted by

ENVIRONMENTAL CONTROL SERVICES 833 St. Brides Road West Chesapeake, Virginia 23322



## TEMPERATURE CONTROL SYSTEM O & M SUBMITTAL DATA and AS-BUILT DRAWINGS

Job No.: ECS 90051

Date: July 29,1991

#### PROJECT

#### BOQ Renovations Marine Corps Base, Building M-231 Camp Lejeune, North Carolina Contract No. N62470-88-B-3764

Environmental Control Services is pleased to submit this Operation and Maintenance Data for the Temperature Control System. The as-built drawings are also incorporation into this section for documentation. The recommended spare parts listed for this project are indicated under the as-built drawings Bill of Material. All temperature control devices can be purchased from our local branch office by phoning (804) 421-7775.

Respectfully submitted, ENVIRONMENTAL CONTROL SERVICES

ap four

J. Harper Powell Project Manager

> Environmental Control Services SUBMITTING OFFICE

833 St. Brides Road West ADDRESS Chesapeake, Virginia 23322 CITY/STATE/ZIP



#### SEQUENCE OF OPERATION FOR CAMP LEJEUNE, NC

#### SUMMER-WINTER CHANGEOVER CONTROL:

The dual temperature water pump P-1 shall be manually controlled by an ON-OFF Switch S-2 located on the control panel.

The Summer-Winter Switch S-1 located on the control panel shall manually switch the heating or cooling mode of operation.

With S-1 in the winter position control relay CR-1 shall start dual temperature pump P-1 three way changeover V-1 shall remain normally closed to the chiller while CR-1 positions 3 way changeover valve V-2 open to the hot water loop. Aquastat A-2 located in the dual temperature return water prior to the steam convertor heating loop shall not allow changeover valve V-2 to be positioned opened to the hot water loop until the dual temperature return water is above 70F. Control relay CR-1 shall allow the normally closed steam convertor valve V-3 to operate. On a fall in water temperature as sensed by TS-1, located in the convertor hot water supply, controller C-1 will control to modulate valve V-3 to supply an increased amount of steam to the convertor. Controller C-1 will be inversely reset upon a rise in outside air temperature as sensed by TS-2 located in the outside air. On a fall in outside air temperature the reverse operation will occur.

With S-1 switched to the summer position control relay CR-2 shall start the dual temperature pump P-1. Changeover valve V-2 shall remain normally closed to the convertor hot water loop while CR-2 positions changeover valve V-1 open to the chilled water loop. Aquastat A-1 located in the dual temperature pump discharge water prior to the chilled water loop shall not allow changeover valve V-1 to position opened to the chilled water loop until dual temperature pump discharge water is below 90F. The chiller shall be energized by the control relay CR-2 but will not start until flow is proven by the chilled water flow switch. Chiller shall operate through controls furnished by the chiller manufacturer.

	BI	BILL OF MATERIAL FOR CAMP LEJEUNE										
TAG	:0	TY	IVENDOR	CODE NO.	DESCRIPTION							
A1,2	====	2	:=====================================	ITC2974	'Aquastat							
IC1	1	1.	IBC	(CP8102	:Controller							
CP-1	1	1	IAPC	ICPC-16	Control Panel							
CR1,2	1	2	:IDEC	IRH3B/SH3B	. IRelay							
PL1-3	1	3	:IDI	1052005	(Filot Light (Green)							
51	1	1	CARLING	12X464	:Switch							
IS2	1	1	ICARLING	12X467	ISwitch .							
TS1	1	1	:BC	IAT201	:Well							
TS1	:	1	:BC	ITS8201	:Temperature controller							
TS2	1		1	IAT211	Sun shield							
TS2	1	1	(BC	ITS8501	:Temperature sensor							
V1.2	+	2	INELSON	I de la companya de l	(Valve(See Valve List)							
V3		1	I BC	IVS9223 353	4 10:Valve(See Valve List) !							















\* At SO % OPEN

SYSTEM NO.	SYSTEM & LOCATION	MODEL NO.	SIZE	QUANT.	SYSTEM PRESS,	GPM	LES/HR	C.V.	(P\$1)	PILOT	RANGE	BODY PATTERN	POST.	ACTUATOR NO.
V-1	CHANGE OVER VALUE	341-D	24"	1	A STAR	110	*	70	2.5			BTRFLY		E300-12
V-2	CNANGEOUER VALVE	341- C	2 4 "	1	-	110	*	70	2.5			BTRFLY		E300-12
<i>u-3</i>	CONVERTER VALVE	VS 9223-353-4-10	1 /2 "		15		729	254	12			<u>: N</u> C *		010282M
							2 Mar 199					Ista A		· ·
		1 100 100										1		
										9				· · · · ·
			-								•			
<b>EC</b> 833 St.	S Controls, Brides Rd. W. • Chesapeak	Inс. е, VA 23322		DB NAME: DCATION: NGINEER: DNTRACTOR:	BUILDIN CAMPLO PROFEN G.R.M	G. ASS ICHAE	231		SHE	VÀL		_IST		CHECKED BY: <b>THP</b> DATE: 12-5-90



# VALVE SELECTION

V-3: 1P1.4.1.a

朝 デ E E E E E E



- 1 Union End
- 2 Flared End
- 3 Screwed or Flanged
- 4 Union Sweat End

For VX-111, VX-6XX this digit is Actuator Series Type. For VB-111 this digit is blank.



APPLICATION



ct Valve Body including TABLE 1. P Code (V Code) or s correct Inp less Actua P Code (S (See Page

P Code (Valve Size, Cv Rating, Port				Chilled or Hot Water 281°F Max. 35 nsig Steam	Hot Water 300°F Max. 100 psig Steam	366°F Max. 150 psig Steam		
Code) or	select Valve As	sembly w	/ith	Corewood	Inion Sweat	Flanged	Scr	ewed
correct In ess Actu P Code ( See Pag	ator Code (XXX Size, Cv Rating, es 334-338 for V	Table 3 a ) including , Port Code Valve Sizir	ilso) j the e). ig.)	SUTING			0	þ
	9	ize <sup>a</sup>	1000 A. 100	1/2"-3"	1/2"-2"	2-1/2"-4"	1/2"-2"	1/2"-2"
OIZE Valve Rady			VB-9213-0-4-P	VB-9214-0-4-P	VB-9213-0-5-P	VB-9253-0-4-P	VB-9273-0-4-P	
Normally -	Value Accombly 2.1	5 Vdc Innut 4-2	Am O'	VS-9213-XXX-4-P	VS-9214-XXX-4-P	VS-9213-35X-5-P	VS-9253-XXX-4-P	VS-9273-XXX-4-P
Valves	2 Position SPS	T Valve Assemb	lv	VA-9213-2XX-4-P	VA-9214-2XX-4-P	<u> </u>	VA-9253-2XX-4-P	VA-92/3-2224-4-P
	2-r usition 51 5	e Bady	1	VB-9223-0-4-P	VB-9224-0-4-P	VB-9223-0-5-P	VB-9263-0-4-P	VB-9283-0-4-P
Normally	Value Accombly 2.1	15 Vdc input 4-	20 mA	VS-9223-XXX-4-P	VS-9224-XXX-4-P	VS-9223-35X-5-P	VS-9263-XXX-4-P	VS-9283-XXA-4-P
Valves	2 Position SPS	T Valve Assemb	lv	VA-9223-2XX-4-P	VA-9224-2XX-4-P	400	VA-9263-2XX-4-P	VA-9283-2XX-4-P
	Z-r usition or o	Flow Type		Equal %	Equal %	Equal %	Equal %	Equal %
NOTE: T	hese charts are	1.0.0	Body	Bronze	Bronze	Cast Iron	Bronze	Bronze
color code	ed as shown	Section 1	Seal	Bronze	Bronze	Bronze	Stainless Steel	Stainless Steel
below to a	assist valve	and strends	Stem	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
selection.	Note it is	Material	Plug	Brass	Brass	Brass	Stainless Steel	Stainless Steel
possible t	o select either		Packing	Spring Loaded	Spring Loaded Tellon Cone	Spring Loaded Tellon Cone	Spring Loaded Teflon Cone	Spring Loaded Teflon Cone
a valve as	ot parts	1.000	Diec	Composition	Composition	Composition	Teflon	None
Contuctor	valve linkane		DISC	Unipodition	STEA	M	and the second second	
actuator,	valve linkaye.		Ctatic	250	250	125	250	250
valve bou	y).		Inlet	35	35	35	100	150
ORDERI	NGEXAMPLES	(psig)	Recom.	20	20	20	35	50
1. Valve Assembly: VS-9223-211-4-8		Fluid Temp.	Max.	281 (138)	281 (138)	281 (138)	340 (171)	366 (180)
2. Valve	Body:			the States of Lands	WAT	ER		050
VB-9223-0-4-8		A COLORADO	Static	250	250	125	250	250
Actua	tor:	Pressure (psig)	Recom.	35	35	35	35	50
MP-5	210	Fluid Tarra	Min	40 (4)	40 (4)	40 (4)	40 (4)	40 (4)
Linkage: AV-600		Pluia temp.	May	281 (138)	281 (138)	281 (138)	300 (149)	366 (180)

#### TO SELECT A PORT CODE (P)

P Code	Valve Sizet		Server Like Strange	CV		0.4
1 0000	- Size	04	0.4		0.4	0.4
-1		13	- 13		1.3	1.3
-2***	1/2"	22	22		2.2	2.2
-3**		2.2	36	Manter I and	3.6	3.6
-4		3.0	5.0		5.0	5.0
-5**	3/4"	5.0	5.0	and the second of the second	6.2	6.2
-6		6.2	0.2	the second of the Probes	82	8.2
.7**	1"	8.2	8.2		110	11.0
-8	a second second second	11.0	11.0		160	16.0
-9	1-1/4"	16.0	16.0		25.0	250
-10	1-1/2"	25.0	25.0		23.0	40.0
-11	2	40.0	40.0		40.0	40.0
-12	2-1/2"	65		56		and the second
.13	3"	85	and the state of	85	and the second second	
.14	4"	And the second second	The second second second	145	1	L

\*Maximum recommended differential pressure in full open position. Do not exceed recomme pressure (pressure drop) or integrity of parts may be affected.

NOTE: Do not exceed close-off rating.

"NOTE: Factory assemblies are not available for 2-position applications using reduced port valve bodies.

tValve size refers to NPT on globe valves or nominal I.D. of copper tubing for union sweat valves CAUTION: Solder, tubing and/or pipe schedules must meet or exceed working static pressure requirements



- Valve Body Data less P Code (Size, Cv Rating, Port Code) or Valve Assembly less Actuator Code (XXX) and less P Code (Size, Cv Rating, Port Code)
- P Code (Size, Cv Rating, Port Code)

Actuator or Actuator Code (XXX) for Valve Assemblies

Valve Linkage

4



**TABLE 2.** Select Actuator Type or Actuator Code (XXX) series with correct Input Signal having sufficient close-off for the application. If selecting Component Parts, select **Value Enkage**.

alve Linkag	<b>9</b> 2				T		
	Input Signal	<u>. 1960</u> (197)			Two-Position SPST	Electronic	Electronic
	Valve Linking 1/2	A Valve			247 AY-600	AV-600	
Sec. Star	BESKONVANTINT OF STIT	- VIVI -	Color S et			States - Bear	AV-430
	Valve Unikante S1/2	Valve					A14955
	* Actuator Code (XX	X)	er en selfage	1000	2XX	ZXX	35X
	Actuator	and a second		MP-5X1X MA-521X-XXX MPR-51X MPR-51X		MS-8301X MSR-8601X MSR-8701X MSR-8801X	
Normal Pesition	Factory Avail. Valve Assembly	Valve Body	P Code	Size	CLI	DSE-OFF PRESSURE RATIN	G*
	VA-9213-2XX-4-P		-1-2-3-4	1/2"	180	190	
	VA-9214-2XX-4-P		-5-6	3/4"	75	85	
	VA-9253-2XX-4-P	VB-9213-0-4-P	-7-8	1"	40	45	Sector Constant
	VS-9213-XXX-4-P	VB-9253-0-4-P	-9	1-1/4"	25	30	AN THE STATE
	VS-9214-XXX-4-P	VB-9273-0-4-P	-10	1-1/2"			65
Normally	VS-9253-XXX-4-P		-11	2"			35
Ohen	USSETS ANA T	VB-9213-0 4-P	-12	2-1/2"	and a start of the start of the	Maria and Andrews	20
	VS-9213-3XX-4-P		-13	3"	and the second second	States and the	12
and the second			-12	2-1/2"		1	20
	VS-9213-35X-5-P	VB-9213-0-5-P	-13	3"			12
A State of the second	Las Pres	1. Start 1.	-14	4"		Marken States	6
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	VA-9223-2XX-4-P	a de la constante de la	-1-2-3-4	1/2"	250	220	and the second second
	VA-9224-2XX-4-P	WD 0222 0 4 P	-5-6	3/4"	140	90	
	VA-9263-2XX-4-P	VB-9223-0-4-P	-7-8	1"	75	50	and the second second
	VS-9223-XXX-4-P	VB-9263-0-4-P	-9	1-1/4"	45	30	The second second
VS-9224-XXX-4-P Normally VS-9263-XXX-4-P Closed VS-9263-XXX-4-P	VS-9224-XXX-4-P	VB-9283-0-4-	-10	1-1/2"			65
	VS-9203-XXX-4-P	and the second second	-11	2"	Constraints and the second		35
		WD 0000 0 + D	-12	2-1/2"			20
	VS-9223-3XX-4-P	VB-9223-0-4-P	-13	3"	A Second Second	ALC: STATE M	12
ALL CARDON STATE		1 . B. L. P.	-12	2-1/2"	and the second second	California and an and	20
Spile State	VS-9223-35X-5-P	VB-9223-0-5-P	-13	3"			12
	States and the second second	Sector Schuler	-14	4"	1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -	1. 加速增速的高速的 行	6

\*Close-off pressure ratings apply when valves are installed with pressure under the seat.

\*MP-541X, MPR-5XXX use AV-600 and AV-601.

**TABLE 3.** Factory Assemblies, select exact Actuator Code (XXX). Any MA-52XX, MP-5XXX, MPR-5X1X can be assembled to 1/2"-1-1/4" valve bodies with the close-off pressure ratings listed in Table 2. Any MS-8XX1X and MSR-8X01X can be assembled to 1-1/2" & 2" valve bodies with the close-off pressure ratings listed in Table 2. Select below listed **Hydraulic Actuators** or Actuator Codes (XXX) for factory available assemblies. For applications that factory assemblies are not available, select actuator, linkage, valve body and field assemble.

Input Signal	Wiring Figure No.	Voltage Vac 50/60 Hz	VA	Aux. Switch	Actuator Part No.	Actuator Code (XXX) For Factory Available Assembly
and the second		24		No	MA-5213	201
Two-position SPST	See Figure 1	120	18	No	MA-5210	211
	Oll Page 339	240		No	MA-5211	221
0 15 Vide Custom 8000		24		No	MP-5213	201
2-15 VOC, System 6000, stroke occurs 6-9 Vdc approx	See Figure 10	120	18	No	MP-5210	211
non-positive positioning	on Page 341	240		No	MP-5211	221
		24	1	No	MP-5413	247
2-15 Vdc, System 8000,	See Figure 10	120	18	No	MP-5410	244
start 6 Vdc factory set.	on Page 341	240		No	MP-5411	245
adjustable 2-12 Vdc, 3 Vdc span,	See Figure 10	24	36	No	MS-83013	351
positive positioning	on Page 341	120	37	No	MS-83010	353
	A	24	dere in a	No	MPR-5613	267
4 to 20 mA	See Figure 17	120	18	No	MPR-5610	264
	on Page 345	240		No	MPR-5611	265

VALVES



#### TABLE 4. Dimensions (Inches)

					Actuator Series				
*\$	i Vat	ve Body		i i i i i i i i i i i i i i i i i i i	MA/MP/MPR-5XXX*	MS/MSR-BXXXX			
Part Number	Size	A	B**	C	E	. E			
	1/2"	3	4-1/4	1	8-3/16	and the second			
VB-9213-0-4-P	3/4"	3-5/8	5-1/2	1-3/8	8-11/16				
	1	4-5/8	6-3/4	1-1/2	9				
VB-9253-0-4-P	1-1/4"	4-5/8	6-7/8	1-5/8	9				
VB-9273-0-4-P	1-1/2"	6-1/8	9-1/8	2-1/2		19-1/8			
	.2	6-1/8	9-3/8	2-1/2	and the second second second	19-1/8			
	2-1/2"	8-1/2		3-3/4		19-13/16			
VB-9213-0-4-P	3"	9-1/2	Sec. Sec. No.	4-1/4		20			
	2-1/2"	8-1/2	1.141.2014	3-1/2		19-13/16			
VB-9213-0-5-P	3"	9-1/2	Sec. Maria	3-3/4	100 (201)	20-3/16			
an a dharan da talapaga a	4	11-1/2		4-1/2		21-7/16			
2	1/2"	3	4-1/4	1-7/16	8-3/16	<ul> <li>Strandary Constraint</li> </ul>			
W8 0000 0 4 B	3/4"	3-5/8	5-1/2	1-3/4	8-11/16				
V8-9223-0-4-P	1	4-5/8	6-3/4	2	9				
VB-9263-0-4-P	1-1/4"	4-5/8	6-7/8	2	9	A CONTRACTOR OF THE OWNER			
VB-9283-0-4-P	1-1/2"	6-1/8	9-1/8	3-3/16		· 18-5/8			
	2"	6-1/8	9-3/8	3-3/16		18-5/8			
	2-1/2"	8-1/2		3-3/4		19-3/16			
VB-9223-0-4-P	3"	9-1/2		4-1/4		20			
	2-1/2"	8-1/2		4-1/8		19-7/16			
VB-9223-0-5-P	3"	9-1/2		4-1/8		19-13/16			
	4"	11-1/2		5-1/16	A PARTING A PARTING	20-7/16			

\*Add 2-1/32" (52 mm) to the "E" dimension for a valve assembly using an AV-601 linkage extension.

\*\*Use B dimension for VB-9214 and VB-9224 valve bodies.

Dimensions in inches (metric conversion 25.4 mm = 1 inch)

NOTE: Allow 3 inches clearance above actuator for removal. Mount MA/MP/MPR-5XXX actuators above the valve body at 45°

from vertical on steam applications.











C







VB-9213-0-5-P with MS/MSR-8XXXX

See Flange Detail Table on following page

294



#### American Standard 125 lb. Cast Iron Pipe Flanges



**Flange Detail** 

Dimensions in inches (metric conversion 25.4 mm = 1 inch)

STUTIN'

	Fla	nges	Dri	ling	Bol	Length of	
Neminal Pipe Size	Flange Diameter A	Flange Thickness B	Diameter of Bolt Circle D	Diameter of Bolt Holes E	Number of Bolts	Diameter of Bolts	Machine Bolts F
2-1/2	7	11/16	5-1/2	3/4	4	5/8	2-1/2
3	7-1/2	3/4	6	3/4	4	5/8	2-1/2
4	9	15/16	7-1/2	3/4	8	5/8	3

#### TABLE 5. Restrictions on Maximum Ambient Temperature for Valve Actuators

A State Bucks	CP 11 Anna Anna Anna Anna Anna Anna Anna A	TEMP	ERATURES °F (°C)		1
Actuator Code (XXX) Actuator Series Maximum Ambient		2	OX, 21X, 22X	24X, 26X	35X MS-8XX1X MSR-8XX1X 140 (60)
		MA-521X-XXX MP-521X-XXX	MA-521X-XXX MP-521X-XXX w/AV-601 Linkage Extension	MPR-561X, MPR-571X, MPR-581X, MP-541X w/AV-601 Linkage Extension	
		140 (60)	140 (60)	140 (60)	
Max. Allowable Fluid		181 (83)	181 (63) 281 (138) 140 (60)		281 (138)
VB-9213 VB-9214-0-4-P VB-9223 VB-9224-0-4-P	Maximum Fluid	281 (138)	281 (138)	281 (103)	281 (138)
	Max. Allow. Ambient	115 (46)	140 (46)	103 (39)	140 (60)
VR-9253	Maximum Fluid	340 (171)	340 (171)	340 (171)	340 (171)
VB-9263	Max, Allow, Ambient	100 (38)	100 (38)	93 (34)	122 (50)
VB-9273	Maximum Fluid	366 (180)	366 (180)	366 (186)	366 (180)
VB-9283	Max, Allow, Ambient	90 (32)	90 (32)	88 (31)	114 (35)

NOTE: With 40°F (4°C) water the minimum dew point temperature is 68°F (20°C).





### Damper/Valve/Butterfly Valve, Spring Return Actuators

#### APPLICATION

For electronic positive positioning proportional control of dampers, valves or butterfly valves which require the return to normal position on power interruption.

#### SPECIFICATIONS

Controller Signal: 2 to 15 Vdc from System 8000 controller. Stroke: Over a nominal 6 Vdc (fully retracted) to 9 Vdc (fully extended) input range. See Table 1. Start Point: Factory set at 6 Vdc, adjustable 2 to 12 Vdc. Input Impedance: 10,000 ohms or greater. Spring Return: Damper linkage provides return to normal position on power interruption. Power Requirements: See Table 1. Power Supplies: 20 Vdc, 75 mA; 50 mA available when optional auxiliary switch (AM-158) is installed.

Environment:

#### Ambient Temperature Limits,

Operating, Shipping and Storage

-40 to 140°F (-40 to 60°C). Humidity, 5 to 95% RH, non-condensing. Locations, NEMA Type 1 indoor only.

Connections: Color coded 6" (152 mm) leads.

Case: Die cast aluminum.

**Mounting:** Any position for damper actuators. In any upright position with actuator above the center of the valve body. **Dimensions:** 

#### Dimensions:

**MS-8301X**, 10-1/2" high × 7-7/8" wide (267 mm × 200 mm).

**MS-8304X**, 10-1/8" high × 5-15/16" wide × 15-1/2" deep (257 mm × 151 mm × 394 mm).

MS-8305X, 8-3/8" high × 5-15/16" wide × 21-3/4" deep (213 mm × 151 mm × 552 mm).

#### ACCESSORIES

AM-158	Auxiliary switch kit; 175 VA @ 120/280 Vac, 35 VA @ 24 Vac				
TOOL-201	Calibration kit for System 8000				
Damper Link	age Accessories				
AM-111	Crank arm for 5/16" diameter damper shaft				
AM-112	Crank arm for 3/8" diameter damper shaft				
AM-113	Crank arm for 1/2" diameter damper shaft				
AM-115	Crank arm for 7/16" diameter damper shaft				
AM-122	Linkage connector straight type				
AM-123	Damper clip				
AM-125	5/16" diameter × 20" damper rod				
AM-125-048	5/16" diameter × 48" damper rod				
	D. H.1. 1. A conservation				



#### TABLE 1. VALVE ACTUATOR SELECTION SPECIFICATIONS

Part Number	Currely Voltage	VA Rating	Output Description	Force	Valve	Timing at 70°F (21°C)	
	50/60 Hz (Vac) 10 Watts					No Load Stroke*	Retract
MS-83010	120 (+10%, -15%)	47	Proportional 1" (25 mm) stroke	150 pounds	VB-9XXX 1-1/2 thru 4". See Table 3.	2-1/4 min. ±25 sec.	1/2 min. ±10 sec.
MS-83011	240 (+10%, -15%)*	46					
MS-83013	24 (±10%)	44					

\*220 Vac at 50 Hz (+10%, -15%) the power stroke is approximately 25% slower and the VA is 20% more.



MS-83050 Series

in ocnes sing
Valve linkage
Valve linkage
5X Series Only
90 degree mounting bracket for pivot mounting
Crank arm for 1/2" dameter damper shaft holes for
3-1/2" stroke
Bolt-on frame lug and damper blade clip kit
Actuator shaft extension
Pivot stud for pivot mounting
Clevis for pivot mounting
Mounting plates for pivot mounting on ducts or damper frame






# POSITION AND MODULATING CONTROL VALVE ASSEMBLIES

The NCMA 2 position and modulating assembly package offers you versatility, dependability and long life with maximum economy!

# BUTTERFLY VALVE CONSTRUCTION

Specifications for HVAC 150 psig W.O.G. Semi-lug

BODY — Cast Iron DISC — Aluminum Bronze STEM — Stainless Steel SEAT — EPDM (for -40°F through 250°F) STEM BUSHING — Acetal STEM PACKING — Buna N

# **OPTIONS** (Valve Trim)

DISCS 316 Stainless Steel Ductile Iron

# SEATS

Buna N (0°F through 212°F) F.D.A. regulations for Food & beverage, and preferred sanitary service.

Teflon lined Buna N (0°F through 250°F) Not suitable for abrasive service.

Teflon lined EPDM (-20° through 300°F) Not suitable for abrasive service.

NOTE: For Teflon Seated Valves the body configuration will vary.



# **ORDERING INFORMATION**

# 2 - position and modulating Control Valve Arrangements

2 WAY	Style
N.C	К
N.O	L

3 WAY	Style
N.C	A
N.O	В
N.C. N.O.	c
N.O. N.C.	D
N.C N.O.	E
N.O N.C.	F

Valve Size	Part No.	Actuator Model	Arrangement Style
2″	242		
21/2"	241	10	
3″	243		
4"	244		
5″	255	· · · · · · · · ·	
6″	256	and the second s	<u>- 600 8</u> 
8″	268		e
10″	2610	A State of the second	
12″	2612		

Modulating control

Valve Size	Part No.	Actuator Model	Arrangement Style
2″	342	1 - 1	
21/2"	341	<u>avanti -</u>	and the second second
3″	343		
4″	344		
5″	355	N. Lander	
6″	356		
8″	368		
10″	3610	and the state	and the second second
12″	3612	and the second second	

# QUANTITY

# EXAMPLE DESCRIPTION

3" - 243 - (Actuator Model #) - K

NOTE: 8" - 12" Order No.'s are based upon 50 AP reduced disk diameter butterfly valves. For higher pressure applications actuators may need to be re-sized.







# Pneumatic





# **Assembly Dimensions/Pneumatic**

SIZE	Α	В	C	D	E	F	G	Н	1	J	К	L
2''	9	1 1 %	4 1/2	2	715/16	14 1/2	3	3/4	71/8	<b>5</b> %₀	1⁄4	51/2
2½"	10	13⁄4	5	2	8½	14 1⁄2	3½	3/4	7%	5%	1/4	6
3''	11	13/4	5½	2	9	14 1⁄2	3¾	3/4	71/8	6¾	1/4	6¼
4''	13	2	6½	2	9¾	14 1⁄2	4 1/2	3/4	8 %	71/2	1/4	7
5''	15	21/8	7 1/2	23/4	12	173/4	5	11⁄4	9¼	8%6	3/4	71/2
6''	16	21/8	8	2¾	12 1⁄2	173⁄4	5½	1¼	9¾	9%6	3/4	8
8''	18	21/2	9	3%6	15	223/4	6¾	11/4	111/2	101/4	3/4	91/2
10''	22	21/2	11	3%6	17	223/4	8	11/4	123/4	121/4	3/4	10 3/4
12''	24	3	12	3%6	19	223/4	91/2	11/4	14 1/4	131/2	3/4	121/4





	A	ssembly	y Dimer	nsions/E	Electric	
Valve Size	2''	21/2"	3''	4′′	5′′	6"
A	131/16	14%	15¾	17¼	18 <sup>13</sup> /16	19 <sup>1</sup> <sup>3</sup> / <sub>16</sub>
В	61/8	6 3/4	7 1/4	8½	9%	101/8
С	41/16	4¾	43/8	4 1/4	4¾ <sub>16</sub>	43/16
D	17½	18½	19	201⁄2	21 1/2	221/2
E	1 1 1%	1 3/4	1 3/4	2	21/8	21/8
F	4 1/2	5	5 ½	6 1/2	7 1/2	8
G	10%	113/4	12¾	15	171/8	181/8





# **Control Valves And Mechanical Assemblies**

# Rated Flow Coefficient $C_v$

		A	NGLE	OF D	SK O	PENIN	G	
VALVE SIZE	10	20	30	40	50	60	70	90
2	2	8	18	30	50	80	130	220
2 1/2	3	11	25	44	70	110	180	320
3	4	16	38	68	110	170	280	500
4	6	28	63	110	180	280	460	820
5	10	44	100	180	280	460	740	1300
6	17	60	140	250	400	640	1100	1900
8	24	110	250	440	640	1100	1800	3200
10	38	180	400	710	1100	1800	3000	5100
12	57	260	590	1000	1700	2700	4400	8000

# Torque

Seating (150 p	and Uns for Stan osig W.O	eating To dard Disk .G. bubble	rque Req Diameter e tight sh	uirement ut-off).
VALVE SIZE	ΔP 0	<u>А</u> Р 50	ΔP 100	ΔP 150
2	110	120	130	140
21/2	135	146	155	165
3	160	180	200	220
4	240	270	300	330
5	325	375	425	475
6	450	550	650	750
8	750	950	1150	1350
10	1150	1450	1760	2050
12	1550	2050	2550	3050

Torque Requirement for Reduced Disk Diameter (50 psig W.O.G. bubble tight shut-off.)

VALVE SIZE	ΔP 0	۵.Р 50
4	165	195
5	220	270
6	305	405
8	500	700
10	. 750	1050
12	1000	1500
No. 1. There is an anti-field of the set	the state of the s	

Cv = The volume of water in U.S.G.P.M. that will pass through a given valve opening with a pressure drop of 1 lb. per sq. in.





Automax Electric Actuators provide precise, dependable control of quarter-turn valves, dampers, flow controls and other rotary devices. Automax Actuators are used in all areas of industry including chemical processing, power, gas and oil, HVAC and marine. The simple, yet rugged design results in a compact package which produces torque up to 3500 inch pounds. Automax additionally designs electric actuator systems to customer specifications. And, our engineering department develops valve mounting hardware for all types of ball, butterfly and plug valves. Consult your Automax representative today for the best value in actuation!





Automa





# A HEATHAR HULLON ALLUNGS

Easy to adjust travel limit switch cams for precise open and closed position setting. Protected manual override is standard on E600, 1000, 1500, 3500.

Motor brakesstandard on all models.

Rugged, single phase permanent split capacitor motor.

Zinc base, aluminum cover are polyurethane coated for superior corrosion resistance.

Reversible and unidirectional motors available.

Massive precision cut gearsnot subject to breakage or premature failure. Permanently lubricated, enclosed gear train on all models—protects gears from moisture and corrosion.



# Technical Data

Model	Action	Torque (in lbs)	Cyc	le Time® 90°	(À) Voltage® (Ì	B)	Locked Rotor Amps 115VAC	Switches	Motor Brake	Manual Override	Approx. Weight
E98.6*	Reversible	100	3.	5 sec.	115VAC, 60	)Hz	.6	2 Spdt (Std) 5 Amps	Standard	N/A	3.7#
E300-12	Reversible	300	7.	5 sec.	115VAC, 60	)Hz	1.0	2 Spdt (Std) 10 Amps	Standard	Optional	10#
E600-12	Reversible	600	15	sec.	115VAC, 60	)Hz	1.0	2 Spdt (Std) 10 Amps	Standard	Standard	14#
E1000-12	Reversible	1000	5	sec.	115VAC, 60	)Hz	3.0	2 Spdt (Std) 10 Amps	Standard	Standard	34#
E1500-12	Reversible	1500	6	sec.	115VAC, 60	)Hz	3.0	2 Spdt (Std) 10 Amps	Standard	Standard	36#
E3500-12	Reversible	3500	15	sec.	115VAC, 60	Hz	3.0	2 Spdt (Std)	Standard	Standard	38#

### NOTES:

(b) These times are approximate under no load conditions and may vary slightly under actual load conditions

( Optional voltages available

\*For further information, see E98.6 Compact Electric Rotary Actuator bulletin.

# **Electric Actuator Options**

# Voltages

12 V.D.C. 24 V.D.C. Other voltages, consult factory

<b>Limit Swi</b>	tches (2 spdt standard)
Model	Additional Switche Available
E98.6	2
E300	1
E600	2
E1000	2
E1500	2
E3500	2

# **Feedback Potentiometer**

0-135 Ohm (Over 90° Nominal) 0-1000 Ohm (Over 90° Nominal) 0-5000 Ohm (Over 90° Nominal) 1-10,000 Ohm (Over 90° Nominal)

Heater and Thermostat 25 Watt Heater 70°F Standard Thermostat

# **Control Relay**

2 Wire Control Pilot

# Controls

Manual-Off-Auto Local-Remote Position Indication Travel Indication Potentiometer Open-Close Customized Controls Available

Speed Control Variable Speed Control

Positioner ESP (Electronic Servo Positioner) See Page 5

Housing Nema 4-Weatherproof





Standard Reversible Permanent Split Capacitor Actuator with Position & Travel Indicator



\*Brake external to motor on E1000 thru E3500

- Millinite Millinite

# **Potentiometers**



Will provide infinite position indication and other feedback functions . 5000 ohm standard, single or dual with other values available.

# Heater and Thermostat.



For high humidity or low temperature applications. Will reduce condensation. 25 Watt Heater with thermostat set for 70° F.

# **Symbols & Descriptions**

- 1. WHITE
- Motor Common 2. BROWN
- Travel Indicator
- 3. BLUE Full CW Position Indicator
- 4. BLACK Power Will Turn Actuator CW
- 5. GREEN Full CCW Position Indicator
- 6. RED
- Power Will Turn Actuator CCW
- NO–Normally Open NC–Normally Closed C–Common

# **Extra Switches**



Individual mechanical adjustment will provide independent/isolated electrical control for alarms, lights, motor starters, etc.

# **Other Options**

- Modulating Controls ESP Positioner (see page 5)
- Adjustable Speed Controls
- DC Motors
- Shaded Pole Motors
- Unidirectional
- Wiring diagrams for specific applications available, consult factory.



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M	lodel No.	Α	B	С	D	E	F	G	н	J	к	L
100	E98.6	See	E98.6	6 Bulle	tin				ale a la			(error de
1	E300	51/8	1	1/2	1/2	3⁄16	3/16	21/4	29/32	71/4	411/16	3⁄8
	E600	713/16	1	_	3/4	5/16	5/16	21/4	13⁄8	81⁄4	45/16	21/32



Model No.	A	В	С	D	E	F	G	н	J	ĸ
E1000, E1500, E3500	1215/16	13/16	13⁄8	7	1/4 x 3/4	11/16	25/8	81⁄4	103/16	11/4

Actuators shown in full clockwise (CW) position as viewed from top.

•



# **APPLICATION**



Electronic two-input temperature or humidity controller for heating, cooling, humidification or dehumidification in **HVAC systems.** 

# SPECIFICATIONS

Features: Self-contained package incorporating an amplifier with two input bridges for TS-8XXX temperature sensors, humidity sensors or remote setpoint adjustor.

### Sensors:

- Temperature, TS-8XXX one or two; three sensors through a CN-8101.
- Humidity, HS-8X01 or HSP-6X81.

Control Action: Direct (D.A.) or reverse (R.A.) selectable by jumper. Factory set D.A.

Authority Ratio Adjustment: 0.5:1 to 25:1, adjustable by dial. Control Output Voltage: 1 to 15 Vdc, 10 mA maximum. Unit factory calibrated for 7.5 Vdc output with sensor at setpoint temperature.

Power Requirements: 20 Vdc (-1.5, +1), 23 mA.

Power Supply Available: 6.2 Vdc, 7 mA maximum; regulated and filtered power supply must not be connected to +6.2 of other supplies.

Remote Setpoints: Order separately AT-8122, AT-8155 or AT-8158.

Setpoints, Ratio and Throttling Potentiometers: Visible and accessible without removing controller cover.

Controlled Devices\*: Maximum of six System 8000. **Environment:** 

#### **Ambient Temperature Limits,**

Shipping and Storage -40 to 160°F (-40 to 71°C). Operating 40 to 135°F (4.4 to 57°C).

Humidity, 5 to 95% RH, non-condensing. Locations, NEMA Type 1 indoor only.

Connections: Coded screw terminals for 14 to 20 AWG. Cover: Aluminum.

Mounting: Unit is provided with plastic track for panel mounting. AD-8912 enclosure can be ordered separately for remote installations.

Dimensions: 4" high × 11" wide × 2-1/2" deep (102 mm × 279 mm × 64 mm).

## **\*TYPICAL CONTROLLED DEVICES**

CC-8100 Series Relays

MMR-400 Series Modular Motors w/MMC-8000 Control Module MMR-500 Series Modular Motors w/MMC-8000 Control Module MP-300-600 Series Actuators MP-400-600 Series Actuators MP-5000 Series Actuators MS-1233 Series Damper Actuators MS-80000 Series Actuators SP-40000 Series Step Controllers

VS-9000 Series Valve Assemblies



## TABLE 1. SPECIFICATIONS

Part Number	Control Dial Range Setpoint "A"	Control** Dial Range Setpoint "B"	Throttling Range for 3 Vdc Output Change		
CP-8102	20 to 120°F	20 to 120°F	Adjustable 2 to 10°F by dial*		
CP-8102-116	-6 to 48°C	-6 to 48°C	Adjustable 1 to 6°C by dial*		

\* 15, 25, 40 and 60°F by pin selection (use J9 jumper). With the use of AD-8969-901 (order separately), the following T.R.'s can be obtained: 55, 65, 75, 85, 100, 115, 125 and 140°F

For reset control, set setpoint "B" at zero reset point and setpoint "A" at control point desired with no reset action from sensor "B"

#### ACCESSORIES

AD-8122	Signal adaptor for dual outputs (two direct acting)
AD-8123	Signal adaptor for dual outputs
	(one direct, one reverse acting)
AD-8124	Signal adaptor for dual outputs
ne ore .	(one reverse, one direct acting)
AD-8912	12" (305 mm) enclosure
AD-8969-201	Offset resistor kit: 5, 10, 15 & 20°F
AD-8969-901	Extended throttling range jumper
ASP-8301	Power supply
AT-8122	Remote setpoint adjuster, dual scale 20 to 120°F
	(-6 to 49°C)
AT-8155	Remote setpoint adjuster, dual scale 50 to 250°F
	(10 to 121°C)
AT-8158	Remote setpoint adjuster, dual scale 55 to 85°F
ATOTOO	(13 to 29°C)
AT-8222-101	Setpoint scale for humidity 20% to 100%
AT-8435	Remote setpoint adjuster, dual scale 50 to 450°F
11 0100	(10 to 232°C) for use with TS-8204 only
CN-8101	Multi-purpose bridge
HS-8000 Series	Humidity sensors
HSP 8000 Series	Humidity transmitters
TOOL 201	Calibration kit for System 8000
TC 8000 Series	Temperature sensors
13-0000 Selles	Tomporatoro concere

CP-8102



# **Two-Input Temperature or Humidity Controller**

# CP-8102, CP-8102-116 Continued from preceding page





# **TABLE 2. JUMPER CONNECTIONS**

to JC6 to JC5	Bridge "B" J5 to JC5 J6 to JC6		
to JC6 to JC5	J5 to JC5 J6 to JC6		
In ICE			
to JC6	J5 to JC6 J6 to JC5		
to JC1	J2 to JC3		
to JC2	J2 to JC4		
Remove Jumper from AB2 to AB3			
1	to JC6 to JC1 to JC2 ove Jumper		

# Figure 1. Typical Temperature Control Wiring





# General Instructions

# FUNCTIONS

Electronic controller receives temperature or humidity sensor inputs and sends a variable electronic signal, 1 to 15 Vdc, to up to six System 8000® actuators or relays (controlled devices). Additional devices can be controlled with the use of adapters. These actuators or relays operate heating, cooling, humidification or dehumidification equipment in HVAC systems.

# FEATURES AND BENEFITS

The reliable, easy to install CP-8102 electronic controller incorporates an amplifier with inputs for 1000ohm Balco® temperature sensors, humidity sensors or remote setpoint adjustor. Two setpoint dials, ratio authority dials, throttling range dials and calibration potentiometers are visable and accessible without removing controller cover allow for easy field adjustment. Coded screw terminals make sensor, remote setpoint, power supply and output signal wiring easy to install and change. The CP-8102 controller is used with other System 8000 devices.



**CP-8102 Electronic Two Input** 

**Temperature or Humidity** Controller

CP-8102

Wiring Connections: Coded screw terminals for all control inputs and outputs.

# Safe Ambient Temperature Limits:

Operation: 40 to 135°F (4.4 to 57°C) Storage: -40 to 160°F (-40 to 71°C)

Dimensions: 4" (102 mm) high × 11" (279 mm) wide × 2-1/2" (64 mm) deep

Part Number	Control Dial Range Setpoint "A"	Control Dial Range Setpoint "B"	Throttling Range for 3 V Output Char	l Vdc 1ge	Authority Ratio Adjustment Setpoint "A" Setpoint "B"	Cont Outj Volta	trol out ge†	Power Required	Power Supply Available
CP-8102	20 to 120°F	20 to 120°F	Adjustable 2 to 10°F by D	e Dial*	.5:1 to 25:1 Adjustat	1 to 15 10 mA Fact	1 to 15 Vdc 10 mA Max. Factory	20 Vdc	6.2 Vdc
CP-8102-116	-6 to 48°C	-6 to 48°C	Adjustable 1 to 6°C by Dial*		by Dial	Set	for A.	23 mA	7 mA Max.
* See ADJUSTME	ENTS for additional th	hrottling ranges.	1. 10 M	TS	S-8111 Ro	om senso	or wit	h setpoint	
<ul> <li>† Units factory calibrated for 7.5 Vdc output with sensor at setpoint temperature.</li> <li>Options: None.</li> </ul>			TS TS	TS-8131 Room button type sensor TS-8201 Duct/immersion sensor					
			TS	6-8204 Hig	h temp.	duct/	immersion s	sensor	
ACCESSORIE	S:		and the second		rec	uires AT	-8435	5 remote set	point for all
AD-8122 Signal adaptor for dual outputs				ap	olications	exce	ept differenti	al control	
	(two direct acting) Signal adaptor for dual outputs (one direct, one reverse acting) Signal adaptor for dual outputs (one reverse, one direct acting)			15	S-8241 Dif	tuser sen	sor		
AD-8123				15	S-8261 Lig	nt fixture	sens		required)
				15	5-8331 La	jgeo sen	SOF (		required)
AD-8124				15	5-8405 5 6	averaging	sen	sui	
AD 8012	12" enclosure			10		tdoor sor	iy se	11501	
AD-8969-201	Off set resistor kit: 5, 10, 15 & 20°F			Т	S-8501 OU	ar sonso	r (CN	1-8101 is rec	nuired)
AD-8969-901	Extended throttling range jumper			т	5-0531 50	Econostat sensor			
ASP-301	Power supply required for HSP-6X81			To	ool-201 Ca	libration	kit for	system 800	00
ASP-581	Indication meter 20 to 80% RH			D	EFINITIONS				
AT-8122	Remote setpoint adjuster, dual scale 20 to			M	ode of Operation:	Either d	irect-	acting or re-	verse-acting.
IT OTEL	120°F (-6 to 49	°C)		Direct-acting (DA) means that an increase in temperature a					
AT-8155	Remote setpoint adjuster, dual scale 50 to 250°F (10 to 121°C)			the sensor(s) causes the voltage output (OP1) to increase.					
AT-8158	Remote setpoint adjuster, dual scale 55 to 85°F (13 to 29°C)			Reverse-acting (R.A.) means that an increase in temperature at the sensor(s) causes the voltage output (OP1) to decrease					
AT-8222-101	Setpoint scale f	or humidity 20%	to 100%	R	eset Control Acti	on: The	dire	ction of res	et determine
AT-8435	Remote setpoint adjuster, dual scale 50 to 450°F (10 to 232°C) for use with TS-8204 only			whether input A setpoint is reset upward or downward on temperature decrease at input B.					ownward on
CN-8101	Multi-purpose b	oridge		Direct reset: (D.R.) A temperature decrease on input B rese				n input B reset	
HS-8101	Room humidity	sensor		in	put A setpoint down	nward.			
HS-8201	Duct humidity s	ensor		R	everse reset: (R.F	.) A tem	peral	ure decreas	se on input l
rs-8101	Room sensor			re	sets input A setpoi	nt upward	<b>1</b> .		
ITHO IN U.S.A.	9-84								F-14969-







Figure 1. CP-8102

# **CONTROL TERMINAL INPUTS** (See Figure 1)

ISA: Any TS-8000 Temperature Sensor (1000 ohm Balco)

ISB: Any TS-8000 Temperature Sensor (1000 ohm Balco)

**AB1, AB2, AB3:** Auxiliary inputs; any remote setpoint adjuster AT-8000 series, HS-8X01 humidity sensor, CN-8101 multipurpose bridge

**CONTROL TERMINAL OUTPUT** (See Figure 1)

**OP1:** 1 to 15 Vdc (10 mA maximum). Units factory calibration for 7.5 Vdc output with sensor at setpoint temperature.

ADJUSTMENTS: (See figure 1)

**Temperature Setpoint "A":** By dial 20 to 120°F (-6 to 48°C), or by remote setpoint adjuster (See Accessories).

**Temperature Setpoint "B":** By dial 20 to 120°F (-6 to 48°C), or by remote setpoint adjuster (See Accessories).

Setpoint "A" Calibration: By potentiometer.

Setpoint "B" Calibration: By potentiometer. For reset control, set Setpoint "B" at value where Setopint "A" will be reset. Adjust Setpoint "A" at control point required with no reset from sensor "B".

**THOTTLING RANGE:** By dial 2 to 10°F, 1 to 6°C. By pin selection 15, 25, 40 and 60°F (8, 14, 22, 33°C). Remove J9 jumper from JC9 and attach to required throttling range pin. By extended throttling range adjuster, AD8969-901 (order separately), 55, 65, 75, 85, 100, 115, 125 and 140°F (31, 36, 42, 47, 56, 64, 69 and 78°C). The throttling range is the sum of the T.R. pins connected.

# AUTHORITY RATIO

**ADJUSTMENT:** By dial .5 to 25:1. Ratio is the number of degrees change at Sensor "B" required to reset Setpoint "A" one (1) degree. Example: 25:1 means a 25°F (14°C) change at Sensor "B" will reset Setpoint "A" 1°F (.5°C).

Table 2					
Controller Function	Jumper Connections Required				
Controller Function	Bridge "A"	Bridge "B"			
Direct Acting*	J4 to JC6 J3 to JC5	J5 to JC5 J6 to JC6			
Reverse Acting	J4 to JC5 J3 to JC6	J5 to JC6 J6 to JC5			
Internal Setpoint Active*	J1 to JC1	J2 to JC3			
Internal Setpoint Inactive for Remote Setpoint	J1 to JC2	J2 to JC4			
Disable Bridge "B" for Single Sensor Input	Remove from AB	e Jumper 2 to AB3			

As supplied from factory.

To Obtain Reverse Reset: Both bridges should have the same action. Example: both direct acting, or both reverse acting.

**To Obtain Direct Reset:** Bridges should have different action. Example: one direct and one reverse acting.

Disable "A" Bridge Setpoint



Disable 'B'' Bridge Setpoint if "B" Bridge is to be used. Disconect Jumper J2 from JC3 Pin and reconnect to JC4 Pin.

Figure 2. Disabling Setpoint "A" and/or Setpoint "B"





Figure 3. CP-8102 Controller Block Diagram

**PRE-INSTALLATION:** Open the carton and visually inspect the device for part number and obvious defects before proceeding with the installation.

#### \_\_\_ NOTE .

Mounting screws are not provided.

**INSTALLATION:** Device may be mounted, in any position, in an inside location near the controlled equipment using the two slots in the track. AD-8912 enclosures can be ordered separately for remote installations.

#### CAUTION

Avoid locations where excessive vibration, moisture, corrosive fumes or vapors are present, or where high radio frequency or electro-magnetic interference generating devices are near.

See Figure 4 for mounting dimensions.



**Figure 4. Mounting Dimensions** 

# GENERAL WIRING INFORMATION

Make all connections according to job wiring diagrams and in compliance with national and local codes.

Two separate No. 18 twisted pair wires (six turns per foot [.3m]).

Class II, low voltage, are suitable for up to 1000 feet (300 m) for the sensor leads. See table 3 for longer runs.

# \_ CAUTION .

Never run line voltage in the same conduit with unshielded sensing element leads. Use copper conductors only.

Shielded cable (Belden No. 8422 or equivalent) must be used when it is necessary to install the DC signal leads in the same conduit with power wiring, or when it is known that high RFI/EMI generating devices are near. Ground the shield at the controller only on the COM (-) terminal.



	LENGTH OF RUN IN FEET**							
Wire Gauge	"HS" Sensor To CP-8102	"TS" Sensor To CP-8102	CN-8101, AT-81X4 TS-8601 To CP-8102	"HSP" Transmitter To CP-8102	TSP-8101 To CP-8102	CP-8102 To Controlled Device	CP-8102 To Adaptor*	
22	125			alite and the second second	Should be	a the second		
18	300	1.000	1.000	250	in Same	1,000	1,000	
16	_	2,250			Panel as	2,250	2,250	
14		4.000	_	-	Controller	4,000	4,000	

\* AD-8101, AD-812X, AD-8201, AD-8301, AD-8501 \*\*1 Ft. approx. 3 meter

# GENERAL RULES FOR WIRING CP-8102 TO CONTROLLED DEVICE(S)

- Never connect red lead (or +20 terminal) of any controlled device which has a regulated power supply to the red lead (or +20 terminal) of any other controlled device (see Figure 5).
- Controlled devices (MP-52XX) with unfiltered and unregulated power supplies must be filtered. CP-8102 will provide filtering for a maximum of two MP-52XX by connecting the two red leads together at the controller's +20 terminal (see Figure 6).
- 3. Controlled devices with filtered and unregulated supplies: Up to six controlled devices with the red leads (+20 terminals) can be connected together. Number of units paralleled depends on the current (mADC) requirements of the controller or adaptor.

# Table 4. Controlled Device Power Supply Characteristics

Filtered &	Filtered &	Unfiltered &		
Regulated	Unregulated	Unregulated		
CC-8101 CC-8102 CC-8103 CC-8111 Series CC-8118 Series CC-8218 Series CP-8161 Series CP-8301 Series* CP-8425 Series CP-8501 Series	MP-54XX MS-8XXX Actuators	MP-52XX Actuators		

\* Except CP-8301-101 which does not have a power supply.





# FIELD CHECKOUT

Units are factory calibrated and tested and should not require field checkout. If required, proceed as follows (see Figure 1):

#### NOTE .

The following procedures can be used for either reverse or direct acting connected CP-8102 controllers.

1. Initial Conditions for CP-8102

- A. Jumper between AB2 and AB3 disconnected.
- B. 20 Vdc +1 1.5 Vdc (23 mA) applied to the +20 and common terminals. This power is normally supplied by the controlled device.
- Connect a 20,000 ohm/volt DC VOM meter between the OP1 (+) terminal and COM (-) terminal of the CP-8102. Use a 20 Vdc or less range.
- Disconnect the temperature sensing element "A" from the ISA terminals of the CP-8102. Short ISA terminals together and VOM reading should be 1 Vdc or less if bridge "A" is direct acting and more than 15 Vdc if bridge A is reverse acting.
- Open ISA terminals and VOM reading should be greater than 15 Vdc if bridge "A" is direct acting and less than 1 Vdc if bridge "A" is reverse acting.
- 5. The CP-8102 is a good unit if it passes tests in steps 3 and 4. Replace the unit if tests 3 and 4 are not met.



Figure 6. At Least One of the Controlled Devices in MP-52XX (Unfiltered)



# FIELD CALIBRATION PROCEDURES FOR CONTROLLERS WITH ONE AND TWO INPUTS (See Figures 7 and 9):

The following procedures can be used for either reverse or direct acting connected CP-8102 controllers.

The CP-8102 is factory calibrated and shipped with both inputs connected for direct acting output.

Normally, the CP-8102 (connected for either direct or reverse acting) requires no field calibration but if a field calibration check or recalibration becomes necessary, then proceed as follows:

- 1. Initial Conditions for CP-8102:
  - A. Setpoint "A" set for: 70°F.
  - B. Setpoint "B" set for: 70°F
  - C. Ratio adjustment set for: 1:1
  - D. Throttling range adjustment set for: 3°F.
  - E. Jumper between AB2 and AB3 disconnected.
  - F. 20 Vdc (23 mA) applied to the +20 and common terminals. This power is normally supplied by the controlled device.
- Connect a 20,000 ohm/volt DC VOM meter between the OP1 (+) terminal and COM (-) terminal of the CP-8102. Use a 20 Vdc or less range.
- Calibration of "A" input. Use one of the following two methods.
  - A. Temperature measurement methods:

Accurately measure the temperature at the temperature sensing element "A". Adjust setpoint "A" until the dial reading agrees with the temperature measured. Rotate setpoint "A" calibration potentiometer (located just to the right of setpoint "A" dial) until a VOM reading of 7.5±.2 Vdc is obtained.

B. Sensing element substitution method:

Disconnect the temperature sensing element "A" from the ISA terminals of the CP-8102. Reconnect a 1000 ohm  $\pm$ .1% wire wound resistor (TOOL-203) to the ISA terminals. Adjust setpoint "A" for 70°F. Rotate setpoint "A" calibration potentiometer (located just to the right of setpoint "A" dial) until a VOM reading of 7.5 $\pm$ .2 Vdc is obtained.

### \_ NOTE .

Method B above does not calibrate out any errors due to sensing element tolerances or wire lead resistance.

4. Calibration of "A" input complete.

If "B" input is not being used (jumper between AB2 and AB3 removed) then proceed to step 7 below.

- 5. Reconnect jumper between AB2 and AB3.
- Calibration of "B" input. Use one of the following two methods.
  - A. Temperature measurement method:

Accurately measure the temperature at the temperature sensing element "B". Adjust setpoint "B" until the dial reading agrees with the temperature measured. Rotate setpoint "B" calibration potentiometer (located just to the right of setpoint "B" dial) until a VOM reading of 7.5±.2 Vdc is obtained.

B. Sensing element substitution method:

Disconnect the temperature sensing element "B" from ISB terminals of the CP-8102. Reconnect a 1000 ohm ±.1%, wire wound resistor (TOOL-203) to the ISB terminals. Adjust setpoint "B" for 70°F. Rotate setpoint "B" calibration potentiometer (located just to the right of setpoint "A" dial) unti a VOM reading of 7.5±.2 Vdc is obtained.

#### NOTE

Method B above does not calibrate out any errors due to sensing element tolerances or wire lead resistance.

 CP-8102 calibration is complete. Remove all test meters, test resistor, etc. Reconnect all elements, place setpoints, throttling range and ratio adjustments as required for the application.



Figure 7. One or Two sensor Application

# FIELD SERVICE

Units are factory calibrated and tested for direct acting control (D.A.) and reverse reset (R.R.) and should not require service. If required, proceed as follows (see Figure 8):

# **Power Supply**

Apply +20; +1, -1.5 Vdc (23 mA) to the +20 and common terminals. Proper power supply is always required for unit to function properly. The +6.2 ( $\pm$ .3) Vdc should be available from the controller, if required.

# Test

Connect a 20,000 ohm/volt DC VOM meter between +20 and common terminals. Controller power supply +20, +1 -1.5 Vdc (indicated by M1 in Figure 8) should be measured. Power supply is normally supplied by controlled device. Check +6.2 (±.3) Vdc power supply of controller with VOM.

# Service

If the +20 Vdc level is not measured, service the (lead) controlled device, power supply or installation wiring as necessary to insure proper power supply.

## **Controller** Output

See Field Calibration Procedures, on this page, for calibration of "A" setpoint using sensor element substitutes.







### Test

### Service

With signal output measured between OP1 and COM at 7.5  $\pm$  .2 Vdc, rotate setpoint "A" dial several degrees (in increments of 1°F) each way from 70° setting to vary the M2 reading from 1 to 15 Vdc. The number of degrees that setpoint dial "A" is changed to vary the reading on M2 3 Vdc should be approximately 3°F (if T.R. is set at 5°F, 3 Vdc will change over 5°F).

See Field Calibration Procedures, on page 5, for calibration of "B" setpoint using sensor element substitutes. (Make certain that jumper is connected to AB2 and AB3.)

Adjusting setpoint "B" several degrees from 70°F setting will cause the M2 reading to vary from 1 to 15 Vdc.

If output voltage cannot be made to vary over a 1 to 15 Vdc range, then replace the CP-8102 as defective.







CALIBRATE B

Figure 9.

# MAINTENANCE

This is a quality product. Regular maintenance of the total system is recommended to assure sustained optimum performance.


# **TYPICAL APPLICATIONS**



# Figure 10. One or Two Temperature Sensor Application

Hot water reset is typical application for a two sensor application of the CP-8102. For example, perimeter radiation temperature, with hot water as a heating medium, is increased as the temperature of the outside air decreases. This method of control is known as reverse reset. A reset schedule shown below in table requires the hot water temperature to increase from 100° to 170°F, a change of 60°F, as the outside air temperature decreases from 60° to 0°F. If the throttling range of the CP-8102 controller is 10°F the setting of the CP-8102 will be as follows:

Setpoint "A": 110°

Setpoint "B": 60°

Ratio Adjustment: 1 (change in outside air temperature/ change in hot water temperature)

Throttling Range: 10°F

**Note:** Controller function is Direct Acting \* (see table 2) \* Factory setting

# Table 5. Reset Schedule

Outside Air Temp. (°F)	Water Temperature (°F)
60	110
0	170







# Figure 12. Three Temperature Sensor Application\*

7









Figure 14. Single Input with Remote Setpoint



Figure 15. Single Unit Winter-Summer Switching

Cut both jumpers that are located between the terminal 1. strip and cover on the left hand side of the device. (See Figure 15).

# Connect D.P.D.T. Switch (CYZP-11 or equivalent) according to Figure 15.

NOTE .

Switch contacts should have pilot duty ratings and maintain a 1 ohm or less contact rating over its normal life.

No recalibration of CP-8102 is required. 3.



# SINGLE UNIT SUMMER/WINTER SWITCHING (Continued):



# Table 6. Bridge Connections for Summer/Winter (See Figure 15.)

						JUN	IPER TO PIN	CONNECTI	ONS
BRIDGE "A" (MAIN SENSOR)		BRIDGE "B" (RESET SENSOR)		RESET OF SETPOINT "A"		J3	J4	J5	J6
Winter	Summer	Winter Summer Winte	Winter	Winter Summer					
D.A.	R.A.	D	.A.	Reverse	Direct	JC5	JC6	COM	+6.2
R.A.	D.A.	D	.A.	Direct	Reverse	JC6	JC5	COM	+6.2
D.A.	R.A.	R	.A.	Direct	Reverse	JC5	JC6	+6.2	COM
R.A.	D.A.	R	.A.	Reverse	Direct	JC6	JC5	+6.2	COM
	).A.	D.A.	R.A.	Reverse	Direct	COM	+6.2	JC5	JC6
F	R.A. *	D.A.	R.A.	Direct	Reverse	+6.2	COM	JC5	JC6
[	).A.	R.A.	D.A.	Direct	Reverse	COM	+6.2	JC6	JC5
F	R.A.	R.A.	D.A.	Reverse	Direct	+6.2	COM	JC6	JC5



## **Table 7. Typical Reset Schedule**

Outside Air Temp. (°F)	Water Temperature(°F)
70°	110°
0°	140°
Above 70°	85°

Outside air temperature reset of supply water temperature with fixed temperature of 85°F with outside air temperature of 70°F.

Setpoint "A": 110°F Setpoint "B": 70°F Ratio Adjustment: 2.33 Throttling Range: 10°F

**AT-8122:** Set 45°F for S.P. of 85 where O.A. is above 70°F. Relay is energized with outside air temperature below 70°.

Figure 15. Outside Air Temperature Reset of Hot Water with Fixed Temperature with Outside Air Temperature Above Selected Value





(i.e., timeclock, manual switch)

Resistor (5, 10, 15, 20°F offset) use AD-8969-201 kit. Offsetting setpoint for Direct Acting Controller: Raise, connector resistor to +6.2 terminal. Lower, connect resistor to COM terminal. Offsetting setpoint for Reverse Acting Controller: Raise, connect resistor to COM terminal.

Lower, connect resistor to +6.2 terminal.

NOTE .

Standard two conductor twisted wire should be used if remote switching is employed.

Resistor must always be located at stat.





Install 1000 ohm 1% (TOOL-203) resistor in ISB. Install AE-178 7 day time clock. Set setpoint "B" as desired for night setback.

#### Table 8.

Setpoint "B"	Night Setback
70°F (21.1°C)	No Setback
65°F (18.3°C)	5°F (2.8°C) Setback
60°F (15.6°C)	10°F (5.6°C)Setback
55°F (12.8°C)	15°F (8.3°C) Setback









Note: Settings of 2-6 throttling range result in 2-6% RH throttling range for 3 Vdc output change. 6 TR is maximum setting.

Figure 18. Humidity Control







# APPLICATION

Electronic sensing of temperature at remote room locations, ducts, plenum chambers, liquid lines, tanks, outdoor air, etc.

# SPECIFICATIONS

Sensing Element: Balco resistance. 1000 ohms ±0.1% at 70°F (21°C); TS-8405, TS-8422 - ±1% at 70°F (21°C). Changes 2.2 ohms per 1°F (0.5°C) at 70°F (21°C). TS-8204 only - 1657 ohms ±0.1% at 300°F (149°C); changes 2.5 ohms per 1°F (0.5°C) at 300°F (149°C).

NOTE .

TS-8204 is not compatible with internal setpoints of controllers (except for differential control), TSP-8101 or TSP-8111 temperature transmitters. Order AT-8435, 200 to 400°F (93 to 204°C) when setpoint is required.

See Tables 1 and 2 for additional specifications.

#### ACCESSORIES

- Duct mounting kit for TS-8201-105 (included with TS-8204) AT-208
- Stainless steel bulb well for TS-8201 or TS-8204 AT-215
- Stainless steel bulb well for TS-8201-106 AT-225
- Remote setpoint adjuster, dual scale 200 to 400°F (93 to 204°C); AT-8435 required for all TS-8204 applications except differential control

### TABLE 1. AMBIENT TEMPERATURE LIMITS °F (°C)

Part Number	Shipping & Storage	Operating
TS-8131* TS-8261* TS-8281 Series*	-40 to 160 (-40 to 71)	40 to 140 4 to 60)
TS-8201 TS-8201-106 TS-8201-110	-40 to 250 (-40 to 121)	-40 to 250 (-40 to 121)
TS-8405 TS-8422 TS-8501	-40 to 220 (-40 to 104)	-40 to 220 (-40 to 104)
TS-8204	-40 to 400 (-40 to 204)	200 to 400 (93 to 204)

\*Humidity, 5 to 95% RH, non-condensing

# TABLE 2 SPECIFICATIONS





TABLE L. C.	Mounting		Di	Wiring	
Part	Description	Connection	Element	Enclosure	Connections
TS-8131	Unitary*	7/32" (13.5 mm) dia. Mounting Hole	3/4 dia. × 1-1/4 long (19 × 32)	None	1/4" Spade Connections
TS-8201	Duct/Immersion**	Plate, 1/4" NPT**	1/4 dia. × 6 long (6 × 152)	3-1/2 high × 2-1/4 wide × 2-1/4 deep (89 × 57 × 57) with 2-1/2 (64) extension to	12" (305 mm) Black Piotail Leads
TE-8201-106	Immersion***	1/4" NPT Nul***	1/4 dia. × 4 long (6 × 102)	element; 1/2" knockouts (top & bottom)	
TS-8201-110	Strap-on	Nylon Wire Tiet	1/4 dia. × 2-1/4 long (6 × 57)	None	12" (305 mm) Black Pigtail Leads
TS-8204	Duct/Immersion**	1/4" NPT Nut**;	1/4 dia. × 8 long (6 × 203)	None	16" (401 mm) Yellow Pigtail Leads
TC 8261	Comb. Light Fixtures	None	1/4 dia. × 8-1/8 long (6 × 206)	None	6' (1.8 m) Black Pigtail Leads
TS-8281	& Ceiling Diffuser	e trade de la contre	(0 ~ 200)	and the second second	6' (1.8 m) (1) Red, (1) Black Shielded & Jacketed
TS-8281-101	Duct	Plate	5/16 dia. × 3-5/8 long (7.9 × 92)	None	6' (1.8 m) (1) Red, (1) Black Shielded & Jacketed Plenum Rated Cable
TS-8405	Averaging (Duct)	Plate	5' (1.5 m) long	3-1/2 high × 2-1/4 wide × 2-1/4 deep (89 × 57 × 57) with 2-1/2 (64) extension to	12" (305 mm) Black
70 0400	Averaging (Duct)	Plate	22' (6.7 m) long	element; 1/2" knockouts (top & bottom)	Pigtail Leads
TS-8422	Outdoor	1/2" Conduit	1-1/8 dia. × 5 long (29 × 127)	None	3' (0.9 m) Black Pigtail Leads

\*\*Immersion requires AT-215 bulb well. \*\*\*Immersion requires AT-225 bulb well. \*For mounting through fan coil of unit ventilator cabinet or similar application. +Factory supplied, 2-1/2" × 2" (64 mm × 51 mm) loam insulation tape and 30" (762 mm) nylon tie for 1-1/2" thru 8" (38 mm thru 203 mm) dia. pipes.



# Strap-on Changeover Thermostat





#### Figure 1. Switch Action and Lead Identification

### TABLE 1. SPECIFICATIONS

ſ				Section and	')	Non-		
	Number	Туре	Connections	Voltage (Vac)	FLA (Amps)	LRA (Amps)	Pilot Duty (VA)	Inductive (Amps)
	TC-2931	Strap-on	Three (3) color-coded 16 gauge leads 3' (914 mm) long	120	5.8	34.8	105	N1/A
	TC-2942	Strap-on enclosed*	Three (3) color-coded 16 gage leads 3' (914 mm) long	240	2.9	17.4	125	N/A
1	TC-2974	Strap-on	Three (3) color-coded 16 gage leads 3' (914 mm) long	120 240	9.8 8	58.8 48.8	360	22

"Has 1/2" conduit adaptor.







# APPLICATION

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Lock cover screw kit modifies room thermostats so as to prevent unauthorized tampering of either the dial setting or the internal mechanism.

Electric	Elect	ronic	Pneumatic
All except	SLC-800X	TS-5191	All TK-1XXX and
TA-121	TP-810X	TS-5711	TK-5XXX except
TC-114	TP-8232	TS-811X	TK-17XX, TK-18XX

Note: Two kits are required for duplex type thermostals.

# **APPLICATION**

Package of 100 dial stop pins to insert in dial ends to limit the high or low setting of room thermostats.

Electric	Elect	tronic	Pneumatic
All except TA-121 TC-114	TP-810X TP-8232 TS-5191	TS-5711 TS-811X	All TK-1XXX and TK-5XXX except TK-17XX, TK-18XX

# APPLICATION

Immersion well for use with 3/8" (10 mm) temperature bulbs.

# SPECIFICATIONS

Ambient Temperature Limits: -40 to 350 °F (-40 to 177 °C).

	at ingen	Dimensions			Application at 250°F (121	n Limitations °C) Fluid Temp.		
Part Number	O.D. in. (mm)	Insertion Length	Overall Well Length in. (mm)	Fitting in.	Max. Recom. Velocity FPS (m/s)	Max. Recom. Static Pressure psig (kPa)	Used With	
AT-201*	Copper	1/2 (13)**	9-1/2 (241)	10-1/4 (260)	3/4 MNPT	11 (3.3)	250 (1728)	TC-28X, TC-4X1X, TC-4X2X, TC-4X5X, TK-6024, TK-6124, TKS-8000's
AT-203*	Stainless Steel	1/2 (13)**	9-1/2 (241)	10-1/2 (267)	3/4 MNPT	20 (6.1)	500 (3448)	Same as AT-201
AT-206	Copper	1/2 (13)**	4-1/2 (114)	5-13/16 (148)	1/2 MNPT	11 (3.3)	250 (1728)	TC-4X1X, TC-4X2X, TC-4X5X, TK-6024, TK-6124

\*Requires AT-209 for TC-4X1X, TC-4X2X, TC-4X5X, TK-6024, TK-6124. \*\*For 3/8" (10 mm) diameter bulbs.

# APPLICATION

Duct and liquid mounting kit for temperature bulbs.

Part Number	Description	Applications
AT-208	Duct Mounting Kit	Pneumatic & Electric Temperature Bulbs. TS-8201-105, TS-8204 Temperature Sensors.
AT-209	3/4" MNP1 Liquid Line or Tank Mounting Kit	TC-4X1X, TC-4X2X, TC-4X5X TK 6024 or 1K 6124 Series Bulb Thermostats, Bulb Well is Recommended.

368



(1







AT-209

AT-104

AT-101



# APPLICATION

Outdoor bulb shield for mounting bulb to outside wall to protect from damage and foreign matter and direct solar radiation.

# SPECIFICATIONS

**Construction:** Aluminum. **Mounting:** Two 17/64" (7 mm) mounting holes in shield. Kit is furnished with bulb holding clip.

### **APPLICATION**

Bulb well for use with TS-5721, TS-5821, TS-8201, TS-8204 duct/immersion sensor and TSP-8465X temperature transmitters for insertion into a liquid line or tank to allow removal of sensing element without draining the system.

#### SPECIFICATIONS

**Construction:** 316 stainless steel with 3/4" MNPT external thread and 1/4" MNPT internal thread. **Maximum Velocity:** 20 FPS (6 m/s).

## APPLICATION

Bulb well for use with TS-572X-101, TS-582X-101, TS-572X-901, TS-8201-106 sensors and TSP-8XXXX temperature transmitters for insertion into liquid line or tank to allow removal of sensing element without draining the system.

### SPECIFICATIONS

**Construction:** 316 stainless steel 1/2" MNPT external and 1/4" MNPT internal thread. **Maximum Velocity:** 20 FPS (6 m/s).

# APPLICATION

Bulb control enclosures for use in hazardous locations. For use with TC-280 single bulb controls.

# SPECIFICATIONS

**N.E.C. Hazardous Locations:** Class 1, Groups C and D, and Class 2, Groups E, F and G.

Adjustment: External control point adjustment with provisions for locking the dial setting.

**Connections:** One 1" pipe tapped opening for hazardous location joint with rigid metal conduit. 1" to 3/4" reducer installed for smaller conduit when applicable. All control wiring brought out to separate terminals for ease of installation. **Case:** Cast aluminum with bolted cover.

Mounting: Three pads, each with a 21/64" (8.3 mm) hole for mounting lug.

**Dimensions:** 10" high × 8-1/2" wide × 4-3/8" deep (254 mm × 216 mm × 111 mm).





†Only factory enclosure/thermostat assemblies with thermostat types are Underwriters' Laboratories listed or CSA certified.

ENCLOSURE/BULB CONTROL ASSEMBLIES Specify TC6.

Only lactory enclosure/bulb control assemblies using TC-280 series single bulb controls are Underwriters' Laboratories listed.



Dimensions: 2" high × 11-3/4" wide × 1-1/8" deep (51 mm × 298 mm × 29 mm).

Maximum Static Pressure: 500 psig (3448 kPa).

6-1/4" (159 mm) insertion length.

Dimensions: 3/8" O.D × 7" long (9.5 mm × 178 mm).



AT-215





AT-211

**EIGINSSEHHA** 





# R-1; R-2 : TP 1.4.1.9 GENERAL PURFOSE RELAYS

# **RH SERIES**



### FEATURES

Miniature size package allows compact system designing.

1 082

- 10 amp contact capacity. Dielectric strength up to 2,000 volts. UL recognized and CSA certified.
- Indicator light or check button available on 2, 3 and 4-pole models.
- Complete accessories include IDEC's broad line of sockets, hold-down springs and mounting rails.

#### SPECIFICATIONS

Contact Material: Silver cadmium oxide (Ag-CdO) Contact Resistance:  $50 \text{ m}\Omega$  max. (initial value) Operate Time: SPDT(RH1), DPDT(RH2) — 20 msec max..

3PDT(RH3), 4PDT(RH4) — 25 msec max. Release Time: SPDT(RH1), DPDT(RH2) — 20 msec max. 3PDT(RH3), 4PDT(RH4) — 25 msec max.

Power Consumption (Approx.): SPDT(RH1) — AC: 1.1 VA (50 Hz), 1 VA (60 Hz), DC: 0.8W DPDT(RH2) — AC: 1.4 VA (50 Hz, 1.2 VA 60 Hz), DC: 0.9W 3PDT(RH3) — AC: 2 VA (50 Hz), 1.7 VA (60 Hz), DC: 1.5W 4PDT(RH4) — AC: 2.5 VA (50 Hz), 2 VA (60 Hz), DC: 1.5W Insulation Resistance: 100 Ma min. ( at 500V DC megger)

**Dielectric Strength:** 





Between live and non-live parts: 2000V AC, 1 minute Between contact circuit and operating coil: 2000V AC, 1 minute Between contacts of the same pole: 1000V AC, 1 minute DPDT(RH2), 3PDT(RH3), 4PDT(RH4) Between live and non-live parts: 2000V AC, 1 minute Between contact circuit and operating coil: 2000V AC, 1 minute Between contact circuit and operating coil: 2000V AC, 1 minute Between contact circuits: 1500V AC, 1 minute Between contacts of the same pole: 1000V AC, 1 minute Frequency Response: 1800 operations/hour Temperature Rise: Coil: 85 deg. max., Contact: 65 deg. max.

remperature Rise: Coll: 85 deg. max., Contact: 85 deg. max. Vibration Resistance: 0 to 6g (55 Hz max.) Shock Resistance: SPDT(RH1), DPDT(RH2) -- 20g, 3PDT (RH3) 4PDT(RH4) -- 10g Operating Temperature: -22° to +158°F (-30°C to +70°C) Weight (Approx.): RH1: 24g, RH2: 37g, RH3: 50g, RH4: 74g

Life Expectancy:

Electrical: 500,000 operations or more (120V AC, 10A)\* Mechanical: 50,000,000 operations or more

Note\*: 200,000 operations or more (120V AC, 10A) in SPDT(RH1), 3PDT(RH3), 4PDT(RH4) Types.

#### . RI GE SOCKETS FOR RH SERIES

Relay	Socket No.	Hold-Down Spring
RH1B	SH1B-05 (DIN Mount) SH1B-51 (Panel Mount) SH1B-62 (PC Mount)	SY2S-02F1, SFA-202 SY4S-51F1 SY4S-51F1
RH2B RH2B	SH2B-05 (DIN Mount) SH2B-51 (Panel Mount) SH2B-62 (PC Mount)	SY4S-02F1, SFA-202 SY4S-51F1 SY4S-51F1
RH3B	SH3B-05 (DIN Mount) SH3B-51 (Panel Mount) SH3B-62 (PC Mount)	SH3B-05F1, SFA-202 SY4S-51F1 SY4S-51F1
RH4B	SH4B-05 (DIN Mount) SH4B-51 (Panel Mount) SH4B-62 (PC Mount)	SH4B-02F1, SFA-202 SY4S-51F1 SY4S-51F1

#### ACCESSORIES

ND-1000	Aluminum DIN Rail	
BNI-5	Metal End Clip	

Туре	5.9 50	Coll		Con	lact		
	Input	Resist Ohms	Nom. Power Approx.	Arrange- ment	Amps (Max.)	Circuit Diagram	
>	6VAC 12VAC 24VAC 120VAC	18.8 76.8 300 7680	1VA				
RH1	6VDC 12VDC 24VDC 48VDC 110VDC	47 188 750 2600 13800	0.8W	SPDT	10A	13 (-) (+) 14)	
RH2	6VAC 12VAC 24VAC 120VAC 240VAC	9.6 40.5 156.7 4280 15720	1.2VA	0807	10.0		
	6VDC 12VDC 24VDC 48VDC 110VDC	40 160 650 2660 12100	0.9W				
RH3	6VAC 12VAC 24VAC 120VAC 240VAC	6.0 25.3 103 2770 12110	1.7VA	3PDT	10A		
	6VDC 12VDC 24VDC 48VDC 110VDC	25 100 400 1600 8600	1.5W				
RH4	6VAC 12VAC 24VAC 12OVAC 240VAC	5.4 21.2 84.5 2220 9120	2VA	- 4PDT	10A	14 14 12 14 12 14 14 12 14 (+) 13 17 11	
	6VDC 12VDC 24VDC 48VDC 110VDC	24 96 388 1550 7340	1.5W			13 9 (-	

Note: • Options : Light Emitting Diode (LED); Check Button and Neon; Check Button

LED suited for 110VAC and less. Neon suited for greater than 110VAC

#### TYPE LIST

Terminal Style	Contact Config.	Basic Type	with Indi- cator Light	with Check Button	Top Bracket Mntg. Type		
B (Blade)	SPDT DPDT 3PDT 4PDT	RH1B-U RH2B-U RH3B-U RH4B-U	RH2B-UL RH3B-UL RH4B-UL	RH2B-UC RH3B-UC RH4B-UC	RH1B-UT RH2B-UT RH4B-UT		
V2 (PCB)*	SPDT DPDT 3PDT 4PDT	RH1V2-U RH2V2-U RH3V2-U RH4V2-U	RH2V2-UL RH3V2-UL RH4V2-UL	RH2V2-UC RH3V2-UC RH4V2-UC			

Note\*: 2mm (0.078) wide







# CP-1: TP1.4.1.J

# AIR PRODUCTS & CONTROLS, LTD. CPC SERIES CONTROL PANELS

# PRODUCT DESCRIPTION

The CPC control panel is designed to provide a convenient method of surface mounting and protecting either pneumatic or electrical control devices.

The ease of wallmounting, plus a subpanel on which the control devices are mounted, permits installation of the cabinet during construction and mounting of the finished subpanel at the required time.

The cabinet may be either a left or right handed door opening without additional hardware. Two or more cabinets may be mounted side by side or over and under to handle specific requirements. This eliminates the need for large, heavy-to-handle single panels. To join individual cabinets, remove the knockouts and fasten with appropriate fittings and lock nuts. This provides a neat flexible installation. Each side of the cabinet enclosure has convenient knockouts for rigid, soft or flexible tubing or electrical equipment connections.





· · · · · · · · · · · · · · · · · · ·					
Model No.:	CPC CPC CPC	16: 16 20: 20 24: 24	" wide > " wide > " wide >	( 18" h ( 24" h ( 36" h	igh x 6" deep igh x 6" deep igh x 6" deep
Mounting:	Keyh	ole sur	face mor	unting	
Construction:	Cabin Subpa	et: anel:	Heavy of Steel pe 7/16" x staggere	duty ste erforate c 1/4" c ed	el d [1/8″ holes enters,
Dimensions:	ΛΙ	В	I C	D	ExF
CPC-16:	16"	8"	9"	18"	16" x 14"
CPC-20:	20"	10"	12"	24"	22" x 18"
CPC-24:	24"	12"	18"	36"	34" x 22"
Knockouts:	Provid See locati	de on data f on.	all four or dime	sides of ensions	f the cabinet. and specific
Door:	Welde Key-c Tamp	ed pian operate per resi	o hinge d latch stant		
Finish:	Textu	ired			
Color:	Tan c	or Oran	ge (spec	ify)	

An Friday is & Controls 1 td

attack 1 ref

Distributed By:



Form No. CPC-01 - Rev. B



PL-1; PL-2; PL-3



# NON-RELAMPABLE

# SERIES 1050QC 1/2" DIA.

FEATURES Mounting: Will snap-fit into .500/.505 (12.70/12.83) dia. hole in panels .020/ .100 (.51/2.54) thick. Push-on speednut SN0461) (see pg. 170) also available.

Terminals: Tinned brass

Lens: Polycarbonate

Bezel: Chrome plated brass

Housing: White nylon

	NEON						
ENS COLOR	MODEL NO. 105-125VAC	MODEL NO. 208-250V					
Red	1050QC1	1051QC1					
Clear	1050QC2						
Amber	1050QC3	1051QC3					
White	1050QC4	1051QC4					
Green	1052QC5*	1053QC5*					
Lamp	C2A +	Resistor					

\* Incorporates G2B lamp and resistor Underwriters Laboratories (UL) File No. E20325 — Canadian Standards Association (CSA) File No. 13346

# **OUTLINE DIMENSIONS**







# **TAB PLACEMENT HERE**

# **DESCRIPTION:**



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Renovation of Building M231 Marine Corpos Base Camp Lejeune, NC. Conract: N62470-88-C-3764

General Contractor:

Fan Coil Units & Air Handlers

CBC Enterprises, Inc. 1312 E. Little Creek Road Norfolk, Virginia 23518

Mechanical Contractor:

G.R. Michaels & Co. 331 32nd Street Newport News, Va. Phone: (804) 622-3099

Wholesaler and Supplier:

AirTherm Manufacturing Co. 9339 Dielman Industrial Drive Olivette, Missouri 63132 (314) 993-3400

Represenative:

Wright & Company P.O. Box 6353 Norfolk, Virginia 23508 (804) 423-8997 Sonny Wright



NATIONAL AIR FILTERS, INC. 1109 New Hope Road Ext. RALEIGH, NORTH CAROLINA 27610



(919) 231-8596 FAX # (919) 231-8296

WARSAW HEATING & A/C HWY 24 E. WARSAW, NC 28398

SHIP WARSAW HEATING & A/C TO: HWY 24 E. WARSAW, NC 28398

NO.	ORDER	R DATE	CUSTOMER NO.	SALES-	PURC	HASE	ÔADE	A NO.	N-S-		SHI	VIA	(all an a bread	DAT	E SHIPPED		TERMS
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TY.	OTY.	QTY.	ITE	M NO.		1	1		DE	SCRI	PTIC	)N	KOCH WAY 24	J. Taken in	UNIT PR	ICE	EXTENDED PRICE
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# AIRTHERM CENTRALAIRE II CENTRAL STATION AIR CONDITIONING UNITS



# **INSTALLATION — START UP — MAINTENANCE INSTRUCTIONS**

#### INTRODUCTION:

All Airtherm Centralaires are completely assembled at the Factory prior to shipment. The job motor and drive are factory mounted. While operating at job RPM, each unit is closely analyzed for vibration and balanced.

Following testing, Centralaires are mounted on skids and shipped fully assembled with motors and drives totally assembled. If units are too large for shipment completely assembled, they are shipped in the most complete increments shipping limitations will allow.

#### **INSPECTION:**

Check items received to insure equipment received is as ordered. Advise your Airtherm representative immediately of any discrepancy.

The complete unit and accessories should be inspected for transportation damage either visible or concealed. Check for bent fan wheel or shaft which may result in future vibration problems. If any damage is found, file a claim with the carrier within 15 days from time of delivery.

#### HANDLING:

Care should be taken when assembling units. Rough handling at the jobsite can result in damage to the shaft and bearings.

Units are furnished with conveniently located 5/8 NC tapped holes for use with field supplied 5/8" eye bolts for hoisting. Use spacer bars when hoisting to avoid damage to the unit.

#### STORAGE:

If storage is necessary, choose a location that is level and sturdy. When storing out of doors, cover entire unit with tarpaulins or plastic. Extend the cover under the unit if it is stored on the ground.

Bearings should be covered and sealed with tape to protect them from moisture, abrasives and corrosion. Inspect the units periodically to be sure no corrosion is occurring. Rotate the fan shafts slowly by hand monthly.

#### INSTALLATION:

The unit should be installed in a level position. Do not remove protective caps from the coil piping connections until ready to connect piping.

Leave Sufficient clearance for:

- 1. Condensate trap.
- 2. Removal of fan shaft and coil.



- Service of filters (30" minimum), fan motor, bearings, damper linkage and damper motors.
- 4. Piping so belt guard can be removed.

When the coil section and fan section are shipped separately or when filter or mixing sections, etc. are to be field mounted to the unit, sufficient screws, nuts and bolts to accomplish field assembly are included.

When the unit is located on a roof, it must be mounted on support beams that span load bearing walls. If this is not done, excessive vibration may occur due to roof resiliency.

Whenever, on an outdoor unit installation, component sections are shipped separately and must be assembled in the field, a weatherproof seal must be effected between the sections. Cartridges of sealer for field caulking between sections are provided for this purpose.

Vibration isolators are ordered as accessory equipment. All isolators will be properly marked and identified as to where (on what section) they should be installed.

#### INITIAL START UP CHECK LIST:

- 1. Remove all construction debris from interior of the unit.
- Check motor mounting to make sure all nuts are tight.
- Check motor sheave and fan pulley for proper alignment, and set screws for tightness. The motor shaft must be parallel to the fan shaft.
- 4. Check belt tension. (See V-Belt Drive section.)
- 5. Check bearing locking collar set screws for tightness.
- 6. Rotate blower shaft by hand to be sure it is free.
- Be sure that fan and motor bearings are properly lubricated. (See section on Motors and Fan Shaft Bearings.)
- 8. Apply power momentarily to fans; check for correct direction of rotation. If rotation is incorrect, it can be corrected as follows: on three phase motors exchange two of the three leads at the motor starter. The rotation of single phase motors can be reversed by exchanging leads inside the motor junction box. (See Motor Wiring Diagram.)
- 9. Check damper operation for full movement. Damper shaft bearings are bronze type which

can be lubricated with a few drops of oil if required to provide freer movement.

- 10. Start fan motor. Check motor voltage and amperage to be sure they conform closely to nameplate data. Observe noise level and secure if unusual vibration or noise is observed. Be sure fans do not rub on scrolls. If excessive vibration is observed, check the following:
  - A. Fan wheel(s) out of balance due to shipping damage or due to foreign material on wheel(s).
  - B. Motor out of balance.
  - C. Sheaves eccentric or out of balance.
  - D. Sheaves loose on shaft.
  - E. Fan wheel(s) loose on shaft.
  - F. Loose anchor bolts.
  - G. Loose bearing mounting bolts.
  - H. Drive alignment.
  - I. Vibration isolators improperly adjusted.
- 11. Check fan RPM and adjust as necessary. See section on V-Belt Drive.
- 12. Water coils that are used for cooling only and will be exposed to below 35°F must be drained or an anti-freeze solution put into the coil to prevent it from freezing. All water coils are provided with vent and drain connections which extend through the unit casing.

#### MAINTENANCE:

#### Motors:

Instructions are included on the motor name plate for greasing ball bearing motors or oiling sleeve bearing type motors. Use only an S.A.E. No. 30 non-detergent electric motor oil with sleeve bearing motors.

#### Fan Shaft Bearings:

Check bearings for wear and for excessive end play. Clean fans if necessary; accumulated dirt will cause unbalance which results in vibration and noise. Check fan set screws for tightness and that fans are properly positioned.

Centralaire fan shaft bearings are self aligning ball bearings that have been factory pre-lubricated by the manufacturer. They are designed for use with grease, not oil.

# AIRTHERM MANUFACTURING COMPANY

9339 DIELMAN INDUSTRIAL DRIVE, P.O. BOX 7039, ST. LOUIS, MO 63177 PHONE: (314) 993-3400 FAX: 314-993-1118

#### **Recommended Bearing Lubrication Schedule**

SHAFT	OPERATING SPEED (RPM)											
SIZE	500	1000	1500	2000	2500	3000						
INCHES	LUBRICATION CYCLE (MONTHS)											
1-7/16	6	6	6	6	6	6						
1.1/2-1.3/4	6	6	6	4	4	2						
1.7/8 2.3/16	6	6	4	4	2	2						
2-1/4-2-7/16	6	4	4	2	2	1						
2-1/2-3	6	4	4	2	1	1						
3.7/16	6	4	2	1	1	1						

Lubricate with the following greases or their equivalent:

Shell -- Alvania EP Grease No. 2

Texaco - Molytex Grease No. 2

Mobil – Mobilux EP2

Gulf - Gulfcrown Grease No. 2

American Amolith Grease No. 2.

If bearings are subjected to temperatures Below 320 or above 200°F, consult factory for proper lubrication.

Apply sufficient grease when relubricating to cause some purging of grease at seals. When bearings are filled to capacity, there will be a rise of approximately 300F in operating temperature.

Increase the frequency of relubrication in conditions of abnormal moisture or dirt.

Lubricate for extended shutdown or storage and rotate shaft monthly for corrosion protection.

#### V-Belt Drive:

Motors are factory adjusted for proper belt tension. After operating for a while the belt will stretch and it will be necessary to take up the slack by adjusting the motor. If a belt is replaced, it will be necessary to readjust the motor.

Replace belts if there are any breaks or shreds. Multiple belts should always be replaced in matched sets.

On units equipped with adjustable drive, adjust the driver sheave to change the fan speed. When this is done, adjustment of belt tension will be necessary. If fan speed is being increased, check current demand of motor to insure it is not overloaded.

#### Filters:

Dirty filters reduce air flow, and in turn, capacity

of the unit. When dirty, replace or clean, depending on the type.

#### Coil:

Periodically check heating and/or cooling coils. Make certain that their surfaces are free of dirt and other airborne deposits. Dirt may be removed by brushing or vacuum cleaning the face of the coil on the entering air side. High pressure air may be blown through the coil in a direction opposite the air flow to dislodge dirt. In some cases it may be necessary to clean the coils with water hose and detergent.

#### **Replacement Parts:**

When replacement parts are required, furnish the factory with a description of the part and the unit size and serial number which are on the nameplate located on the drive end of the blower section.

# LIMITED WARRANTY

Products manufactured by AIRTHERM Manufacturing Company are warranted against defects in material or workmanship for a period of one year from the date of shipment.

Requests for repair or replacement of products under this warranty must be referred to AIRTHERM Manufacturing Company for issuance of a return authorization. Transportation charges must be prepaid on shipments of products returned to the factory.

Products determined to be defective will be repaired or replaced and returned to the purchaser F.O.B. factory.

This warranty does not apply to any equipment which shall have been altered or repaired outside AIRTHERM's factory, or which has been subject to misuse, negligence or operating conditions in excess of those stated in AIRTHERM's catalog. Products of other manufacture, assembled with or accessory to these products, are subject to the warranty of their manufacturer.

Under no conditions shall the company be held liable for consequential damages or repair costs.

The company reserves the right to make changes in design or dimensions, or to add or eliminate products without prior notice.
# UNITAIRE III INSTALLATION—OPERATION—MAINTENANCE INSTRUCTIONS

# INSTALLATION

INSPECTION - Entire shipment should be inspected for damage, either readily visible or concealed. Remove the shipping carton as soon as received and inspect for in-transit damage. Any damage should be noted on the freight bill by the carriers agent and a claim filed as soon as possible. To prevent damage after inspection, each fan coil unit should be kept in its carton until ready for installation.

MOUNTING - Walls should be plumb and continuous behind the fan coil unit. Position the unit, and fasten to the wall or ceiling by means of toggle bolts, anchor or expansion bolts using the four 7/16" diameter holes provided in the cabinet. When installing on panel walls, consult the wall manufacturer or architect for recommended method of fastening.

The units must be installed level and rest evenly on the floor. If the floor is not level, insert shims between the bottom of the cabinet and floor until the cabinet is level.

The installation instructions for surface mounted floor, or wall and ceiling models also apply to recessed models.

On model C-A with rear inlet, maintain 6" minimum clearance from the rear inlet to the wall or other obstruction for proper operation.

When fan coil units are furnished with electric heating elements, ducted units must be installed in accordance with instructions located on the front cover of the control compartment. External static pressure (except when high static PSC motors are supplied) can not exceed .125" of water.

PIPING - A clean system is required to insure against blockage of the coil and to assure proper operation of the control valves. A complete purging of the system is recommended before unit piping connections are made. The basic unit coil connections are 5/8" O.D.

The supply connection is at the top, and the return connection is at the bottom on vertical model fan coil units.

Horizontal model fan coil units have the supply connection located at the bottom and the return connection located at the top.

Field insulation is required on all chilled water piping and components that are not located over the auxiliary drain pan.

Care should be exercised in piping connections to the unit to prevent excess soldering material from entering the system.

Each basic unit is equipped with a manually operated air vent valve. This valve permits air to be vented from the coils and keeps it operating at full capacity.

STOP VALVES - should be provided so that each water coil may be readily removed without draining excessive quantities of water from the system.

Use soft solder to make field connection to hand valves. Avoid excessive heat to prevent destruction of internal functional parts. Most valves may be soldered while in "Open" position. Ball type valves must be in "Closed" position. Disassembly when possible is recommended to avoid chance of overheating. Operate by hand only. Do not force to open or close.



# AIRTHERM MANUFACTURING COMPANY

9339 DIELMAN INDUSTRIAL DRIVE, P.O. BOX 7039, ST. LOUIS, MO 63177

TELEX: 44-7216

PHONE: (314) 993-3400

FILTERS - are shipped installed in units. It is the responsibility of the installer to provide access to filters in model CP-A and CP-B fan coil units.

AUTOMATIC CONTROL VALVES - Certain automatic water control valves are shipped unmounted to prevent transit damage to valve piping components. These valves will be mounted at the factory with union or flare connections. Prior to shipment the valve will be disconnected from the piping cluster, packed in a separate carton and shipped separately or in the end pocket of the unit. Field assembly by the installer is required.

It is recommended these valves be mounted on units before final unit installation.

All water mains must be adequately supported to carry the necessary weight involved. Due to the fact that hot or cold water may be circulated through the water mains, a sizable movement due to expansion or contraction may be expected. If the piping is supported rigidly with no provision for movement, it is possible that breakage of tubing or fitings may result causing water damage.

Consult Airtherm certified drawings for additional piping details.

#### UNITS FOR HYDRONIC COOLING AND HEATING

All codes and local requirements governing the installation of this type of equipment must be followed. Conformance with the National Electric Code is a minimum requirement.

Unit internal wiring is terminated in a junction box located on either the left hand or right hand side of the unit. Each fan coil unit is provided with a data plate stating voltage and ampacity. Field wiring to the electric junction box shall have a temperature rating of no less than 75 degrees C.

UNITS WITH HYDRONIC COOLING COILS AND ELECTRIC HEATING ELEMENTS

WIRING - All electric connections are to be made in the control compartment located on either the left end or right end of the fan coil unit.

Remove the compartment cover and refer to the unit wiring diagram on the reverse side. All codes and local requirements governing the installation of electrical heating equipment must be followed. Conformance to the National Electric Code should be considered the minimum requirement.

The chassis must be electrically grounded, and a grounding lug(s) has been provided for this purpose.

Each fan coil unit is provided with a data plate showing voltage and ampacity. Field wiring to the control compartment shall have a temperature rating of no less than 75 degrees C. (Refer to data located on the outside of the control compartment cover for minimum wire size.)

> ELECTRIC HEAT CONTROL PACKAGE ENCLOSURE CLEARANCE

Control Package*	Sides	Тор	Bottom	Rear**
All models except 24V. Control Pkg.	0 "	0"	0 "	0"
All concealed models with 24V. Control Pkg.	2"	2"	2"	0"

\*Packages having 24V. control voltage end in suffix "24.3". \*\*"Rear" is the unit mounting side.

(CONTINUED, NEXT SIDE)

ELEC

LINE POWER CIRCUIT WIRING - Connections are to be made at the contactor terminals marked Ll and L2 or at power terminal block (when provided) marked Ll and L2. Consult unit wiring diagram located on the reverse side of the control compartment cover.

CONTROL CIRCUIT WIRING - When a separate control power supply is required, wiring connections are to be made to control terminal blocks marked Cl, and C2.

REMOTE MOUNTED COMPONENTS - Units requiring remote mounted thermostats should be installed in accordance with the manufacturer's instructions shipped with the thermostat, and should be connected as shown on the wiring diagram included with the unit.

#### 24V REMOTE THERMOSTAT WIRING MUST BE IN ACCORDANCE WITH N.E.C. CLASS I

Some control packages also require a remote mounted fan speed switch. This switch should be mounted adjacent to the thermostat for ease of operation and installation. The electric connections from the remote components through the control box should be installed in conduit or other protective covering. All wiring should conform to the NEC or local codes.

# OPERATION

THE FOLLOWING OPERATIONAL CHECKS SHOULD BE MADE AFTER EACH FAN COIL UNIT HAS BEEN INSTALLED

ACCESS - The front panel must be removed for access to interior components. Sufficient space for front panel removal must be provided.

FANS - Check the fan wheels for free rotation by spinning manually. Any slight misalignment can be corrected by repositioning the motor base, or reposition fan wheel on motor shaft. When making an adjustment, be certain the fan wheel is centered on the housing inlet.

DATA PLATE - Before energizing fan coil units, check the data plate rating for required power and control voltages. Verify the correct voltages have been wired to the unit.

START-UP - With the front panel in place, allow the fan coil unit to run for several minutes. Rotate the fan speed control selector switch, and observe motor speed changes.

THERMOSTATS - On units with built-in thermostats, check thermostat operation by rotating the temperature adjustment knob, or manually adjust the remote wall thermostat.

CONTACTORS - Check contactors for proper operation. Chattering Indicates low control circuit voltage, and can cause permanent damage to contactor contacts.

CAUTION: DISCONNECT THE LINE AND CONTROL POWER FROM THE FAN COIL UNIT BEFORE MAKING ANY ADJUSTMENTS.

OPERATION - If the fan is shut off for any extended period, when chilled water is being circulated, condensation may occur on the unit when it is installed in a high humidity area. To prevent condensation, it is recommended that a valve at the unit be used to stop the flow of chilled water when the fan is off.

FILTER - Check that the filter is in place and clean.

# MAINTENANCE

Airtherm Unitaire III fan coil units will provide many years of trouble-free service if a regular schedule of inspection and maintenance is followed. Usually inspection every 4 months under normal operating conditions is adequate. However, this period may be varied to suit a particular installation. The following routine maintenance is recommended to insure peak performance. NOTE: DISCONNECT POWER TO THE UNIT BEFORE PERFORMING MAINTENANCE.

CLEANING: Gain entry to unit interior by removing appropriate panels. Remove all accumulated dust and dirt with a suction vacuum cleaner and visually check for loose screws, fasteners, etc.

COILS: Clean the coil once a year, or more often if necessary, so cooling and heating capacity will not be impaired. Dirt may be removed by brushing or vacuuming the base of the coil. High pressure air may be blown through the coil in a direction opposite to air flow to dislodge dirt. In extreme cases it may be necessary to remove the coil from unit and spray with a mild alkaline cleaning solution followed by a rinse.

CONTROL COMPARTMENT: It is not necessary to remove the control compartment of fan coil units for use with electric heating elements for routine maintenance. No adjustments are required, unless malfunction due to control wiring or component failures is suspected.

FILTERS: Disposable filters should be changed a minimum of twice per cooling season and heating season to assure that excessive dust and lint have not accumulated to interrupt free-flow of air. If, due to extreme circumstances and unit location, excessive accumulation is noted, filters should be changed more often. Cleanable filters should be cleaned twice during both cooling and heating seasons with periodic checks for excessive dust and lint accumulation as noted above. Cleanable filters may be cleaned by immersing in water and shaking dry. They can also be cleaned with suction attachment on a vacuum cleaner.

A duplicate set of throw-away filters should be kept on hand for replacement purposes.

MOTORS Are permanently lubricated with provisions for re-oiling to extend their life. Under normal operating conditions, lubricate the motor every 2 years or 8000 hours which ever occurs first. When re-oiling, use #20 non-detergent automotive oil. Inspect the fan and the motor assembly a minimum of once a year for accumulation of dust and dirt. If necessary, remove and clean. Motors and fans are mounted on a removable motor board assembly. When fan wheels are replaced, be sure the blades curve forward in the direction of rotation.

SELECTOR SWITCHES AND THERMOSTATS: Check for satisfactory operation following the same procedure described under the heading above - "Start-Up".

# LIMITED WARRANTY

Products manufactured by AIRTHERM Manufacturing Company are warranted against defects in material or workmanship for a period of one year from the date of shipment.

Requests for repair or replacement of products under this warranty must be referred to AIRTHERM Manufacturing Company for issuance of a return authorization. Transportation charges must be prepaid on shipments of products returned to the factory.

Products determined to be defective will be repaired or replaced and returned to the purchaser F.O.B. factory.

This warranty does not apply to any equipment which shall have been altered or repaired outside AIRTHERM's factory, or which has been subject to misuse, negligence or operating conditions in excess of those stated in AIRTHERM's catalog. Products of other manufacturers, assembled with or accessory to these products, are subject to the warranty of their manufacturer.



Under no conditions shall the company be held liable for consequential damages or repair costs.

The company reserves the right to make changes in design or dimensions, to add or eliminate products without prior notice.





# UNITAIRE III PARTS LIST

UNIT SIZE	PART NO.	DESCRIPTION
	and a start	COILS
n e straa		3 ROW COOLING/HEATING COILS - VERTICAL & HORIZONTAL MODELS
021	C5751 0101 C5753 0101	STANDARD COIL - SPECIFY FOR VERTICAL OR HORIZONTAL MODEL AND PIPING HAND, LEFT OR RIGHT* HIGH CAPACITY COIL - SPECIFY FOR VERTICAL OR HORIZONTAL MODEL AND PIPING HAND, LEFT OR RIGHT*
	and a state of the	1 ROW AUXILIARY HEATING COIL - VERTICAL & HORIZONTAL MODELS
	C4636 3101	AUXILIARY COIL - HOT WATER OR STEAM - PIPING CONN SAME OR OPPOSITE COOLING - 5/8 OD SWEAT CONN.
	A set and set	3 ROW COOLING/HEATING COILS - VERTICAL & HORIZONTAL MODELS
021	C5751 0102 C5753 0102	STANDARD COIL - SPECIFY FOR VERTICAL OR HORIZONTAL MODEL AND PIPING HAND, LEFT OR RIGHT* HIGH CAPACITY COIL - SPECIFY FOR VERTICAL OR HORIZONTAL MODEL AND PIPING HAND, LEFT OR RIGHT*
001		1 ROW AUXILIARY HEATING COIL - VERTICAL & HORIZONTAL MODELS
4 K - 1	C4636 3102	AUXILIARY COIL - HOT WATER OR STEAM - PIPING CONN SAME OR OPPOSITE COOLING - 5/8 OD SWEAT CONN.
		3 ROW COOLING/HEATING COILS - VERTICAL & HORIZONTAL MODELS
041	C5751 0103 C5753 0103	STANDARD COIL - SPECIFY FOR VERTICAL OR HORIZONTAL MODEL AND PIPING HAND, LEFT OR RIGHT* HIGH CAPACITY COIL - SPECIFY FOR VERTICAL OR HORIZONTAL MODEL AND PIPING HAND, LEFT OR RIGHT*
	and the second second	1 ROW AUXILIARY HEATING COIL - VERTICAL & HORIZONTAL MODELS
	C4636 3103	AUXILIARY COIL - HOT WATER OR STEAM - PIPING CONN SAME OR OPPOSITE COOLING - 5/8 OD SWEAT CONN.
A.		3 ROW COOLING/HEATING COILS - VERTICAL & HORIZONTAL MODELS
061	C5752 0101 C5751 0104	STANDARD COIL - SPECIFY FOR VERTICAL OR HORIZONTAL MODEL AND PIPING HAND, LEFT OR RIGHT* HIGH CAPACITY COIL - SPECIFY FOR VERTICAL OR HORIZONTAL MODEL AND PIPING HAND, LEFT OR RIGHT*
		1 ROW AUXILIARY HEATING COIL - VERTICAL & HORIZONTAL MODELS
- The P	C5461 0101	AUXILIARY COIL - HOT WATER OR STEAM - PIPING CONN SAME OR OPPOSITE COOLING - 5/8 OD SWEAT CONN.
		3 ROW COOLING/HEATING COILS - VERTICAL & HORIZONTAL MODELS
081	C5752 0102 C5751 0105	STANDARD COIL - SPECIFY FOR VERTICAL OR HORIZONTAL MODEL AND PIPING HAND, LEFT OR RIGHT* HIGH CAPACITY COIL - SPECIFY FOR VERTICAL OR HORIZONTAL MODEL AND PIPING HAND, LEFT OR RIGHT*
	a state a sur	1 ROW AUXILIARY HEATING COIL - VERTICAL & HORIZONTAL MODELS
	C5461 0102	AUXILIARY COIL - HOT WATER OR STEAM - PIPING CONN SAME OR OPPOSITE COOLING - 5/8 OD SWEAT CONN.
	Strength and the second	3 ROW COOLING/HEATING COILS - VERTICAL & HORIZONTAL MODELS
101/121	C5752 0103 C5752 0104	STANDARD COIL - SPECIFY FOR VERTICAL OR HORIZONTAL MODEL AND PIPING HAND, LEFT OR RIGHT* HIGH CAPACITY COIL - SPECIFY FOR VERTICAL OR HORIZONTAL MODEL AND PIPING HAND, LEFT OR RIGHT*
		1 ROW AUXILIARY HEATING COIL - VERTICAL & HORIZONTAL MODELS
	C5461 0103	AUXILIARY COIL - HOT WATER OR STEAM - PIPING CONN SAME OR OPPOSITE COOLING - 5/8 OD SWEAT CONN.

\*PIPING HAND IS DETERMINED WHILE FACING AIR DISCHARGE.

UNIT	PART NO.	DESCRIPTION	VENDOR I.D. (STAMPED ON PART)
	and the second	ACCESS DOORS - VERTICAL MODELS (EXCEPT CF AND AF)	A MERCENCE CARE
ALL	C4059 1001	ACCESS DOOR LID. 4" x 6"	11 and an and a start in
	C4059 1002	ACCESS DOOR HINGE PIN, 3/32" DIAWIRE	
	n dagar San tan	AUTOMATIC CHANGEOVER SWITCH (AQUASTAT)	
	4420 0011	AUTO CHANGEOVER SWITCH 115/60/1	20425069-95660
	Sec. See	AUXILIARY DRAIN PAN (PLASTIC) - VERTICAL MODELS	Constant of the second
ALL	2121 3001	PLASTIC AUXILIARY DRAIN PAN	
in the second		BLOWER WHEELS	and suggest
ALL	5251 1002	PLASTIC BLOWER WHEEL 5.75" DIA, 7.875" WIDTH (NOTE 1)	524-800
021-101	5251 2002	ALUMINUM BLOWER WHEEL 5.75" DIA, 7.875" WIDTH (NOTE 2)	Q575-400D
		CONTACTORS	
(Charles Hall	4413 0001	CONTACTOR, SPST, 120V HOLDING COIL (ELECTRIC HEAT CONTROL CODE R1*)	R4242A 1015
	4413 0002	CONTACTOR, DPST, 120V HOLDING COIL (ELECTRIC HEAT CONTROL CODE R2*)	R4242B 1005
	4413 0003	CONTACTOR, DPST, 208/240V HOLDING COIL (ELECTRIC HEAT CONTROL CODE R3*)	R42428 1013
	4413 0004	CONTACTOR, SPST, 24V HOLDING COIL (ELECTRIC HEAT CONTROL CODE R4*)	R8242A 1008
And State	4413 0005	CONTACTOR, DPST, 24V HOLDING COIL (ELECTRIC HEAT CONTROL CODE R5*)	R8242B 1006

NOTES: 1. FURNISHED WITH ALL UL CONSTRUCTED HYDRONIC COOLING AND HEATING MODELS, AND VERTICAL MODELS WITH ELECTRIC HEAT. 2. FURNISHED ON HORIZONTAL MODELS WITH ELECTRIC HEAT.

\*REFER TO UNIT WIRING DIAGRAM.

(CONTINUED ON PAGE 2)



AIRTHERM MANUFACTURING COMPANY

9339 DIELMAN INDUSTRIAL DRIVE, P.O. BOX 7039, ST. LOUIS, MO 63177 PHONE: (314) 993-3400 FAX: 314-993-1118

UNIT	PART NO.	DESCRIPTION	VENDOR I.D. (STAMPED ON PART)
		DAMPER MOTORS - VERTICAL MODELS	
ALL	4520 0001	LH DAMPER MOTOR 120/60/1	0453G0077QB00
	4520 0002	RH DAMPER MOTOR 120/60/1	0453G0182QB00
in a set		ELECTRIC HEATING ELEMENTS - 120V	and the second
	4620 0015	1.0KW	and the second second
	4620 0014	1.5KW	Construction of the second second
	4620 0003	1.25KW	- Jos market server was any
	4620 0002	1.75KW	a fair and the second second second
	4620 0026	2.0KW	Sale of the second
1999	4620 0001	2.5KW	
	and the second	ELECTRIC HEATING ELEMENTS 208/240V	
	4620 0004	2.5/3.4KW	
	4620 0005	1.88/2.5KW	and the second
	4620 0006	1.31/1.75KW	and the second
	4620 0007	.94/1.25KW	
	4620 0016	1.5/2.0KW	and the second second
	4620 0017	2.25/3.0KW	COCCUDATION DE L'AGRE
	4620 0018	3.0/4.0KW	
	4620 0021	.75/1.0KW	
		ELECTRIC HEATING ELEMENTS 277V	
	4620 0027	.75KW	
	4620 0025	1.3KW	and the second
	4620 0024	.5KW	
	4620 0023	1.5KW	and the second
	4620 0022	1.0KW	
	4620 0020	4.0KW	and the second second second
	4620 0019	3.0KW	
	4620 0013	2.0KW	and a state of the second s
	4620 0012	1.25KW	nor en protected internet construction of the
	4620 0011	1.75KW	The second s
	4620 0010	2.5KW	
	4620 0009	3.2KW	Sector Branchadar
	4620 0008	3.4KW	10、1990年前300年前300年
	and the serve	ELECTRIC VALVES	
	1	5/8" O.D 60 HZ, 1 PHASE	
	5620 1002	2-WAY VALVE 120V 30" ELECTRICAL LEADS SWEAT	VA1403-213-4-4
	5620 1011	2-WAY VALVE 120V 30" ELECTRICAL LEADS SWEAT	V4043-E-1003
	5620 1018	2 WAY VALVE 2004 30" ELECTRICAL LEADS FLARE	V4043-A1002
	5620 1017	2-WAT VALVE 200V 30" ELECTRICAL LEADS FLARE	V4043-A1028
	5620 1018	2-WAY VALVE 2400 30 ELECTRICAL LEADS FLARE	V9042-A1002
	5620 1003	3-WAY VALVE 244 30 ELECTRICAL LEADS FLARE	VA3403-215-6-4
	5620 1013	3-WAY VALVE 120V 30" ELECTRICAL LEADS SWEAT	VADAA_A1001
	5620 1014	3-WAY VALVE 208V 30" ELECTRICAL LEADS FLARE	VA044_A1025
	5620 1015	3-WAY VALVE 240V 30" FLECTRICAL LEADS SWEAT	V4044-A1043
	5620-1012	3-WAY VALVE 24V 30" ELECTRICAL LEADS FLARE	V8044-A1002
		FAN SPEED CONTROL SWITCHES	1.0011-11002
1	T	115/240/277/60/1	
	4240 1002	3-SPEED SWITCH WITH AUXILIARY CIRCUIT (CONTROL CODE S1*)	3D107
	4240 1008	3-SPEED SWITCH - NO AUXILIARY CIRCUIT	3A168
	4240 1005	3-SPEED SWITCH (CONTROL CODE S2*)	3TA217
	4240 1004	2-PUS. KEY SWITCH (CONTROL CODE S3*)	639-855039-1
	1200 1000	1 3 CREED CUITCU U/O UALL DIATE LITTU AUVIL TADU OTDOUTT	20034

(CONTINUED ON PAGE 3)

WHEN ORDERING REPLACEMENT PARTS, SPECIFY PART NUMBER, PART DESC-RIPTION AND UNIT SERIAL NUMBER. EXAMPLE: 5251 2002 BLOWER WHEEL, UNIT SERIAL NO. 8-84.

UNIT	PART NO.	DESCRIPTION	VENDOR I.D. (STAMPED OI PARD)
. S. Same	the second	FILTERS	
021	5310 1010 5310 2004	1" THROW AWAY FILTER 9"x20-7/8" 1" FOAM MEDIA CLEANABLE FILTER 9"x20-7/8"	
031	5310 1011 5310 2005	1" THROW AWAY FILTER 9"x26-7/8" 1" FOAM MEDIA CLEANABLE FILTER 9"x26-7/8"	
041	5310 1012 5310 2006	1" THROW AWAY FILTER 9"x30-7/8" 1" FOAM MEDIA CLEANABLE FILTER 9"x30-7/8"	
061	5310 1013 5310 2007	1" THROW AWAY FILTER 9"x44-7/8" 1" FOAM MEDIA CLEANABLE FILTER 9"x44-7/8"	
081	5310 1015 5310 2008	1" THROW AWAY FILTER 9"x56-7/8" 1" FOAM MEDIA CLEANABLE FILTER 9"x56-7/8"	
101/121	5310 1014 5310 1012 5310 2009	1" THROW AWAY FILTER 9"x46" 1" THROW AWAY FILTER 9"x30-7/8" 1" FOAM MEDIA CLEANABLE FILTER 9"x76-7/8"	
		LINEAR LIMIT CONTROLS	
21.021	4420 0100	I INEAR I INIT CONTROL 24" CARTILLARY (CONTROL CODE 11+)	210909
041	4420 0100	LINEAR LINIT CONTROL 30" CAPTILARY (CONTROL CODE LI")	210927
061	4420 0102	LINEAR LIMIT CONTROL, 42" CAPILLARY (CONTROL CODE L1")	210962
081/101	4420 0103	I INFAR LIMIT CONTROL, 72" CAPILLARY (CONTROL CODE L1*)	220831
	1		
	balang salahang sal	MOTORS - 60 HZ, 1 PHASE	STATISTICS IN
( Ash	4310 0101	120V STANDARD PSC MOTOR SINGLE SHAFT	CE3D003N
	4310 0301	120V HIGH STATIC PSC MOTOR (M-24) SINGLE SHAFT	DE2D076N
021	4310 0206-2	208V PSC MOTOR (M-25) SINGLE SHAFT	DE3D293N
	4310 0206-2	230V PSC MOTOR (M-26) SINGLE SHAFT	DE3D293N
	4310 0204-2	277V PSC MOTOR (M-27) SINGLE SHAFT	DE3D290N
t spilling	4310 0102	120V STANDARD PSC MOTOR SINGLE SHAFT	CE3E003N
031	4310 0302	120V HIGH STATIC PSC MOTOR (M-24) SINGLE SHAFT	DE2E042N
081	4310 0206-3	208V PSC MOTOR (M-25) SINGLE SHAFT	DE3D293N
	4310 0206-3	230V PSC MOTOR (M-26) SINGLE SHAFT	DE3D293N
12 11	4310 0204-3	277V PSC MOTOR (M-27) SINGLE SHAFT	DE3D290N
	4310 0103A	120V PSC MOTOR DOUBLE SHAFT	7176 2939
	4310 0103	12OV STANDARD PSC MOTOR DOUBLE SHAFT	DEJE188N
	4310 0303	120V HIGH STATIC PSC MOTOR (M-24) DOUBLE SHAFT	DE2JU23N
041	4310 0207-3	208V PSC MOTOR (M-25) DOUBLE SHAFT	DESEUSON
	4310 0207-2	230V PSC MOTOR (M-26) DOUBLE SHAFT	DESEUBON
	4310 0205-2	277V PSC MOTOR (M-27) DOUBLE SHAFT	DE3E003M
	4310 0104A	120V PSC MOTOR DOUBLE SHAFT	/1/0 1452
001	4310 0104	120V STANDARD PSC MOTOR DOUBLE SHAFT	DE2 102AN
081	4310 0304	120V HIGH STATIC PSC MOTOR (M-24) DOUBLE SHAFT	DESEOBON
101	4310 0207-5	2084 PSC MOTOR (M-25) DOUBLE SHAFT	DE3E086N
	4310 0207-4	230V PSL MUTUR (M-28) DUBLE SHAFT	DE3E085N
	4310 0205-3	27/V PSC MOTOR (M-27) DOUBLE SHAFT	DE2ED64N
	4310 0111	120V PSC MOTOR DOUBLE SHAFT	DE2.1024N
101	4310 0304	2000 DEC MOTOR (M-25) DOUBLE SHAFT	DE2J024N
121	4310 0304	2200 PSC MOTOR (M-25) DUUDLE SHAFT SPECIFY VENDOR IN MICH OKOEKING	OR
	OR	2377 PSC MOTOR (M-20) DUUDLE SMAFT SPECIFT VENUOR ID WHEN ORDERING	DE2F064N
1999 - 1997 -	4310 0111	CITY FOL PUTUR (P-27) DUUDLE SHAFT SPECIFI VENDUR 10 MHEN UNDERING	100010011
		SAFETY THERMAL CUTUPES (FUSIBLE LINKS)	
	4240 2125	SAFETY THERMAL CUTOFF (FUSIBLE LINK)	4D4194A
	4240 2123		4D9194

\*REFER TO UNIT WIRING DIAGRAM

(CONTINUED ON PAGE 4)



WHEN ORDERING REPLACEMENT PARTS, SPECIFY PART NUMBER, PART DES-CRIPTION AND UNIT SERIAL NUMBER. EXAMPLE: 5620 1002 ELECTRIC VALVE, UNIT SERIAL NO. 8-84.

UNIT	
SIZE	Dec.1

	VENDOR I.D.
	(STAMPED ON
2	PART

UNIT SIZE	PART NO.	DESCRIPTION	(STAMPED ON PART)
•		THERMOSTATS 60 HZ. 1 PHASE	
	4420 0003	UNIT MOUNTED THERMOSTAT, LINE VOLTAGE HYDRONIC CONTROL PKG. TP-4, TP-4A, TP-4B TP-4C, STP-4C (ELECTRIC HEAT CONTROL CODE T2*)	TF-103-007
	4420 0007	UNIT MOUNTED THERMOSTAT, LINE VOLTAGE HYDRONIC CONTROL PKG. TP-4C4P, STP-4A (ELECTRIC HEAT CONTROL CODE T2*)	C17-100-36
	4240 1004	KEY OPERATED SWITCH TP-4, TP-4A	639-855039-1
	4420 0001	WALL THERMOSTAT, LINE VOLTAGE, HYDRONIC CONTROL PKG. TP-3, TP-3A	TB-136-001
	4420 0002	WALL THERMOSTAT, LINE VOLTAGE, HYDRONIC CONTROL PKG. TP-3B, TP-3C, STP-3C	TC-126-001
	4420 0008A	WALL THERMOSTAT, LINE VOLTAGE, HYDRONIC CONTROL PKG. TP-9	TC-154-037
	4420 0009A	WALL THERMOSTAT, LINE VOLTAGE, HYDRONIC CONTROL PKG. TP-9A	TC-154-038
	4420 0039A	WALL THERMOSTAT, LINE VOLTAGE, HYDRONIC CONTROL STP-9A	TC-154-035
	4420 0006	WALL THERMOSTAT, LINE VOLTAGE, HYDRONIC CONTROL PKG. TP-3C4P	TH-126-001
	4420 0062	WALL THERMOSTAT, LINE VOLTAGE, HYDRONIC CONTROL PKG. STP-3A	T651A2010
	4420 0060	THERMOSTAT SUBBASE , HYDRONIC CONTROL PKG. STP-3A	0473A2006
	4420 0010	WALL THERMOSTAT, LINE VOLTAGE, HYDRONIC CONTROL PKG. TP-9B, TP-9C, STP-9C	TD-136-001
	4420 0013	WALL THERMOSTAT, LINE VOLTAGE, HYDRONIC CONTROL PKG. TP-9C4P	TC-136-001
	4420 0019	WALL THERMOSTAT, LINE VOLTAGE, ELECTRIC HEAT CONTROL CODE T3*	T694F1009
	4420 0012	WALL THERMOSTAT, LINE VOLTAGE, ELECTRIC HEAT CONTROL CODE T4*	T4039M-1004
	4420 0020	WALL THERMOSTAT, 24V , ELECTRIC HEAT CONTROL CODE T6*	T87F1800
	4420 0021	THERMOSTAT SUBBASE , ELECTRIC HEAT CONTROL CODE T6*	053981005
	4420 0050	LOCKING THERMOSTAT COVER	
		TRANSFORMERS 60 HZ, 1 PHASE	
	4240 0803	AUTOFORMER SPEED CONTROL, 120V (SIZE 121 WITH DE2J024N MOTOR)	6907
	4240 0804	AUTOFORMER SPEED CONTROL, 277V (ELECTRIC HEAT CONTROL CODE A1**)	6177
	4240 0820	TRANSFORMER, 45VA 277/27V (ELECTRIC HEAT CONTROL CODE A2**)	AT874-1189

\*REFER TO UNIT WIRING DIAGRAM

WHEN ORDERING REPLACEMENT PARTS, SPECIFY PART NUMBER, PART DES-CRIPTION AND UNIT SERIAL NUMBER. EXAMPLE: 4420 0007 THERMOSTAT, UNIT SERIAL NO. 8-84.

OPERATION & MAINTENANCE MANUAL Reno. Interior/Exterior of Bldgs. M-232, 233, 234, 235, 236 MCB CLNC Contract #N62470-86-C-5490

General Contractor -

Blizzard Construction P.O. Box 372 Beulaville, NC (919) 298-4740

Installing Contractor -

Climate Control 269 Center St. Jacksonville, NC (919) 353-9040

Manufactors Rep. -

York Heat Pump Allison-Erwin Co. Charlotte, NC 800-333-4092

"It is hereby certified that the (equipment) (material) shown and marked in this submittal is that proposed to be incorporated into Contract Number C - 5490 is in compliance with the Contract drawings and specifications, can be installed in the allocated spaces, and is submitted for Government approval." Date 13FEB 89

# 1

Certified by\_ . Shomos



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- 1. Installation & Operaing Instructions Model #F2EH090 Air Handling Units Electric Heat Accessory 16 kw
- 2. Installation & Operating Instructions Model #ElCH090 Heat Pump Units



INSTALLATION INSTRUCTION

# **CHAMPION SERIES** SPLIT SYSTEM HEAT PUMPS **INDOOR UNITS**

TAR

Supersedes: 515.40-N2 (481)

515.40-N2 (485) ECH/FEH

035-06913

# MODELS F2EH090 & 120 **INDOOR UNITS**



# GENERAL

These completely assembled indoor units include a wellinsulated cabinet, a copper tube/aluminum fin coil, throwaway filters, a centrifugal blower, a blower motor, an adjustable V-belt drive, a blower motor contactor and a small holding charge of refrigerant-22. They also include a filter-drier, an expansion valve and a distributor that are only used during the cooling cycle plus three check valves to provide the proper flow of refrigerant through the coil during both the cooling and heating cycles.

The YORKGUARD solid state logic module is included in the matching outdoor unit.

Supplemental resistance heaters, a supply air plenum, a return air grille and a base are available as accessories for field installation.

The units are shipped in the vertical position ready for field installation. For horizontal installation, reverse the solid bottom panel and the return air duct flange on the front of the unit.

# INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing. Refer to Form 50.15-NM for additional information.

# REFERENCE

Additional information on the design, installation, operation and service of refrigeration equipment is available in the reference material listed below.

Form 55.70-N1	- General Installation
Form 55.70-N2	- Pre-start & Post-start Check List
Form 55.70-N3	- General Service Information
Form 55.05-NM	<ul> <li>Evacuation and Charging</li> </ul>
Form 1505.05-AD	<ul> <li>Refrigerant-22 Piping</li> </ul>

**Renewal Parts:** 

- Refer to parts list within this instruction for Key Replacement Parts.
- Refer to Parts Microfiche for complete listing of replacement parts on this equipment.

All forms referenced in this instruction may be ordered from:

**Publications Distribution Center** Borg-Warner Central Environmental Systems Inc. P.O. Box 1592, York, PA 17405

This instruction covers the installation and operation of the indoor unit. For information on the installation and operation of the matching outdoor unit, refer to Form 515.40-N1.

Installer should pay particular attention to the words: NOTE, CAUTION and WARNING. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert the installer that personal injury and/or equipment damage may result if the installation procedure is not handled properly.

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REFE	RENC	E			1																		1	
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DRAI	N CON	NI	EC	TIC	ON																		6	
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#### INSTALLATION

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LOCATION		•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	3
VERTICAL/	HO	DR	i	z		N	Г/	11	.1	iN	is	T	À	L	Ľ	47	FI	ò	N	•	•	•		•	:	•	•	•	•	5

Refer to the matching outdoor unit installation instruction (Form 515.40-N1) for the operating sequence of the entire system.

# MAINTENANCE

INDOOR COIL .															12	
FILTERS											1				12	
DRAIN PAN															12	
LUBRICATION															12	
BELTS															12	

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Blower Performance 8	
Accessory Static Resistance	1
Blower Motor & Drive Data 9	Í.
Electrical Data	



# INSTALLATION

# LIMITATIONS

These units must be installed in accordance with all national and local safety codes. If no local codes apply, installation must conform with the appropriate national code. Units are designed to meet National Safety Code Standards. If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or the customer's expense. See Table 2 for application data.

# RIGGING

Be careful when moving the unit. Do not remove any packaging until the unit is near its final location.

The packaging consists of a bottom wooden skid that can be lifted with a fork truck from any direction, a cardboard container that covers the entire unit, and strapping that secures the cardboard container to the bottom skid.

These units can be rigged with slings under the bottom skid.

CAUTION: Spreader bars should be used to prevent the slings from crushing the unit panels and frame.

Before rigging any unit, determine its weight from Table 1. Before rigging a unit for horizontal installation, determine its center of gravity from Figure 1, and make sure that its weight will be distributed equally.

# LOCATION

These indoor units are not designed for outdoor installation. They must be located within the building structure, either inside or outside the conditioned space.

The units should be located as close to the outdoor units as practical and positioned to minimize bends in the refrigerant piping.

Units being installed vertically or horizontally can be set directly on a floor or platform, or they can be supported by metal or wooden beams.

Units being installed horizontally can be suspended from above. Four 3/8" weld nuts are provided in the unit frame to accommodate hanger rods. Knockouts must be removed from the unit panels to expose these weld nuts. Refer to Figure 1 for their location and the individual load on each hanger rod.

WARNING: Be careful when attaching the hanger rods. Use a washer with a back-up nut on each rod and tighten down against the cabinet so they will not be allowed to turn or slip.

# **CLEARANCES**

The clearances listed on the unit dimension drawing (Fig. 12) are required for the proper service and operation of the unit.

	Model		F2EH090	F2EH120
Indoor Coil	Rows Deep Rows High Finned Length (in.) Fins/Inch Tube O.D. (in.) Face Area (Sg. Ft.)		4 24 45.5 14 3/8 7.6	4 32 45.5 14 3/8 10.1
Centrifugal Blower	Wheel Dia. x Width	(in.)	15 x 15	15 x 15
Blower Motor*	Nominal Rating (HP	)	1-1/2	2
Filters (4) (Throwaway)	Size (in.) Total Face Area (Sg. Ft.)		16 x 25 x 1 11.1	16 x 25 x 1 11.1
Pumpdown Capacity**, Lbs.	Refrigerant -22		18.4	24.2
Weight (Lbs.)	Shipping Operating		405 365	425 385
Accessory Operating	Electric Heaters		63 66 71 74	63 66 71 74
Weight (Lbs.)	Supply Air Plenum	Providence Barris	102	102
support and standard standard states and states	Base	and the analysis of the second	60	60
	Return Air Grille	and the set bear and	15	15

#### TABLE 1 - PHYSICAL DATA



\*All of these 1750 RPM motors have a solid base, a 56 frame, a 1.15 service factor and inherent protection. Refer to Table 6 for additional motor and drive data.

\*\*Refer to Form 515.40-N1 for system charge.

# TABLE 2 - APPLICATION DATA

	Power Voltage		Supp	ly Air	Ente	ring Air Ter	ng Air Temperatures, °F		
Model	Supply	Variation'		CFM		Cooling - wb		Heating - db	
	ouppiy	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
FAFLIORA	208/230-3-60	187	252	2400	0000	57	72	50 <sup>2</sup>	80
F2EH090	460-3-60	432	504		3600				
50511400	208/230-3-60	187	252	0000	4000		70	=02	
F2EH120	460-3-60	432	504	3200	4800	5/	12	502	80

<sup>1</sup>Utilization Range "A" in accordance with ARI Standard 110.

<sup>2</sup>The system may operate below 50° F for a short period of time when warming up the conditioned space after a long shutdown.



1.000		B	Based on a S	tandard	Blower	Moto	r	1. 1. 1.
Model	Accessory	Center o Dimens	Weight Distribution, Lbs.					
		A	В	W1	W2	W3	W4	Total
	Basic Unit Only	25-5/8	23-1/4	99	104	79	83	365
550000	Unit with Electric Heat	30-3/4	23-3/8	90	150	72	121	433
FEH090	Unit with Plenum	35-1/8	23-1/2	71	186	58	152	467
	Unit with Electric Heat & Plenum	38	23-5/8	62	232	51	190	535
	Basic Unit Only	24-1/8	23-1/4	112	102	89	82	385
المراجع	Unit with Electric Heat	29-1/4	23-3/8	100	150	81	122	453
FEH120	Unit with Plenum	33-3/8	23-1/2	85	184	68	150	487
and have specific the state	Unit with Electric Heat & Plenum	36-5/8	23-5/8	74	230	61	190	555

NOTE: Unit weights (with electric heat accessory) are based on an average heater weight of 68 lbs.

FIG. 1 - UNIT SUSPENSION MOUNTING (Horizontal Application)

# VERTICAL/HORIZONTAL INSTALLATION

These indoor units are shipped for vertical installation with vertical air discharge as shown in Figure 2(A) but may be converted for horizontal installation as shown in Figure 2(B) by interchanging the solid bottom panel and the return air duct flange.



# DUCT CONNECTIONS

All ducts should be designed and installed in accordance with all national and/or local codes.

Ducts should be sized no smaller than the duct flanges on the unit or the electric heater (if used). Refer to the unit dimensions (Fig. 12) and the heater detail (Fig. 3) for these sizes. Refer to Form 550.13-N10.1 for installation instructions on the electric heater.

Use flexible fiber glass or plastic cloth collars or other nonflammable material at the unit duct connections to minimize the transmission of noise and vibration.

Insulate all ductwork running through unconditioned areas to prevent moisture condensation and to provide more economical operation.

The return air duct flange is factory-mounted on the front of the unit, but it can be reversed with the solid bottom panel for horizontal applications.

A supply air plenum (Fig. 4), a base (Fig. 5) and a return air grille (Fig. 6) are available as field-installed accessories,

Borg-Warner Central Environmental Systems Inc.

and one of the following respective instructions will be packed with each.

Form 550.13-N10.2	- Supply Air Plenum
Form 550.13-N10.3	- Return Air Grille
Form 550.13-N10.4	- Base

The supply air plenum and the return air grille should be used in lieu of ductwork only when a free blow/free return application is practical.



Plenum should be field mounted on the supply air end of indoor units for either vertical or horizontal application. For rear discharge, rotate plenum  $180^{\circ}$ . For horizontal discharge on a horizontal unit, the grille panel and the top panel will be arranged differently. Refer to Form 550.13-N10.2 for installation and assembly instructions.

#### FIG. 4 – SUPPLY AIR PLENUM ACCESSORY (Vertical Arrangement Shown)



FIG. 5 — BASE ACCESSORY (For Vertical Arrangement Only)





# **REFRIGERANT MAINS**

Many service problems can be avoided by taking adequate precautions to provide an internally clean and dry system and by using procedures and materials that conform with established standards.

Use hard drawn copper tubing where no appreciable amount of bending around pipes or other obstructions is necessary. Use long radius ells wherever possible with one exception — small radius ells for any traps in a vapor riser. If soft copper is used, care should be taken to avoid sharp bends which may cause a restriction.

Fiber glass insulation and a sealing material such as permagum should be packed around refrigerant lines where they penetrate a wall to reduce vibration and to retain some flexibility.

Support all refrigerant lines at minimum intervals with suitable hangers, brackets or clamps.

Braze all copper to copper joints with Sil-Fos 5 or equivalent brazing material. DO NOT USE SOFT SOLDER.

Never braze or solder the liquid and vapor lines together. The complete vapor line should be insulated with minimum 1/2" ARMAFLEX or equivalent.

If it is desirable to tape or wire these lines together for support purposes, they must be completely insulated, one from the other.

Refer to the installation instruction (Form 515.40-N1) for the matching outdoor unit for piping limitations, line sizes, and other design considerations.

# INSTALLING REFRIGERANT MAINS

The units are evacuated and dehydrated at the factory and shipped with a holding charge of Refrigerant-22. The vapor and liquid connections are sealed with copper discs.

### CAUTION: Always puncture both sealing discs with a small drill bit before unbrazing to prevent the pressure in the line from blowing them off.

Before starting installation of the mains, be sure the unit has not developed a leak in transit by drilling a small hole in the sealing discs. If pressure still exists, the coil may be considered leak free. If pressure does not exist, the coil should be leak tested per Form 55.05-NM and the necessary repairs should be made.

The temperature required to make or break a brazed joint is sufficiently high to cause oxidation of the copper unless an inert atmosphere is provided.

CAUTION: Dry nitrogen should flow through the system whenever heat is being applied and until the joint has cooled.

The liquid and vapor connections must be piped outside the unit. Refer to the unit drawing for the locations and the dimensions of these connections.

Before brazing the refrigerant lines to these connections, remove the short panel from the unit frame and slide the grommets onto the refrigerant lines. After the brazed joints have cooled, slide the grommets back into place and secure the panel to the unit frame.

NOTE: These coils can only be piped from one side of the unit.

# **DRAIN CONNECTION**

The drain line *MUST* be trapped because the coil is located on the negative side of the supply air blower, and it must be protected from freezing temperatures.

A 7/8" OD drain connection extends through right hand side of cabinet. Refer to Fig. 7 for recommended drain piping.

The drain connection is located on the same side of the unit as the refrigerant connections. The line should be insulated where moisture drippage will be objectionable or cause damage to the area.





The 3" dimension must equal or exceed the negative static pressure developed by the supply air blower. If it does not, the condensate will not drain properly and may overflow the drain pan. The trap must be at least 2-1/2" deep to maintain a water seal under all operating conditions, expecially during blower start-up.

NOTE: The unit may have to be raised off the floor to allow enough height for the trap.

# SUPPLY AIR BLOWER ADJUSTMENT

The RPM of the supply air blower will depend on the required CFM, the unit accessories and the static resistances of both the supply and the return air duct systems. With this information, the RPM for the supply air blower can be determined from the blower performance in Table 4.

Knowing the required blower RPM and the blower motor HP, the setting (turns open) for the supply air motor pulley can be determined from Table 3.

# TABLE 3 – SUPPLY AIR BLOWER MOTOR PULLEY ADJUSTMENT

TURNS	DRIVE F	RANGE
OPEN*	655-880 RPM	700-950 RPM
5	655	700
4	760	750
3	745	800
2	790	850
1	835	900
0	880	950

\*Pulleys can be adjusted in half-turn increments.

Each motor pulley has:

- 1. A threaded barrel with two flats (or notched recesses) 180 degrees apart.
- 2. A movable flange with one set screw.

After the movable flange has been rotated to the proper number of "turns open", the set screw should be tightened against the flat on the barrel to lock the movable flange in place. If the pulley includes a locking collar, the locking collar must be loosened to adjust the setting of the movable flange.

Note the following:

- 1. The supply air CFM must be within the limitations shown in Table 2.
- 2. All pulleys can be adjusted in half turn increments.

- 3. The tension on the belt should be adjusted for a deflection of 3/16 of an inch per foot of belt span with an applied force of 2 to 3 pounds. This adjustment is made by moving the blower motor mounting plate. Refer to Figure 8. Turning the adjustment bolt (B) moves the motor mounting plate up or down. Note Never loosen the two nuts (C). Two hex nuts (A) have to be loosened to move the mounting plate and retightened after the mounting plate has been moved to the proper position.
- 4. All pulleys are factory aligned.
- 5. All supply air motor pulleys are factory set at 2 "turns open".

After the supply air blower motor is operating, adjust the resistances in both the supply and the return duct systems to balance the air distribution throughout the conditioned space. The job specifications may require that this balancing be done by someone other than the equipment installer.



FIG. 8 - TYPICAL MOTOR MOUNTING ASSEMBLY

To check the supply air CFM after the initial balancing has been completed:

- 1. Drill two 5/16 inch holes in the side panel as shown in Figure 9.
- 2. Insert at least 6" of 1/4 inch tubing into each of these holes for sufficient penetration into the air flow on both sides of the indoor coil.
  - NOTE: The tubes must be inserted and held in a position perpendicular to the air flow so that velocity pressure will not affect the static pressure readings.

515.40-N2



- FIG. 9 HOLE LOCATIONS FOR PRESSURE DROP READINGS
- 3. Using an inclined manometer, determine the pressure drop across a dry indoor coil. Since moisture on the coil may vary greatly, measuring the pressure drop across a wet coil under field conditions would be inaccurate. To assure a dry coil, the heat pump system should be de-activated while the test is being run.
- 4. Knowing the pressure drop across a dry coil, the actual CFM through the unit can be determined from the curve in Figure 10.

If the CFM is above or below the specified value, the supply air motor pulley may have to be re-adjusted. After one hour of operation, check the belt and pulleys for tightness and alignment.

# WARNING: Failure to properly adjust the total system CFM can result in extensive blower damage.

After readings have been obtained, remove the tubes and seal up the drilled holes in the side panel. Dot plugs (5/16" -P/N 029-12880-000) are available through normal York parts ordering procedures.

NOTE: Shut down the heat pump system before taking any test measurements to assure a dry indoor coil.



FIG. 10 - PRESSURE DROP ACROSS A DRY INDOOR COIL VS. SUPPLY AIR CFM

DDM								CFM							
RPIN	SP <sup>2</sup>	BHP <sup>3</sup>	KW	SP <sup>2</sup>	BHP <sup>3</sup>	KW	SP <sup>2</sup>	BHP <sup>3</sup>	KW	SP <sup>2</sup>	BHP <sup>3</sup>	KW	SP <sup>2</sup>	BHP <sup>3</sup>	KW
anter a co	al an	and a second	an Nama ang ang ang ang ang ang ang ang ang an	and the second	apres in the	in in	F	EH090	Georgenete	gane and	an se gente	And see const	ing sa kacing	a second	and and a second
- 12 m		2400	- Andrews	a labora de	2700	territa de la	a subscription of	3000			3300	NG253	an en la	3600	S. M.S.
600	0.35	0.62	0.59	0.26	0.70	0.66	0.13	0.78	0.73	-	-		_		_
655	0.49	0.70	0.66	0.41	0.78	0.72	0.30	0.87	0.82	0.07	0.96	0.90	and Thereit		
700	0.60	0.77	0.73	0.53	0.85	0.80	0.43	0.95	0.89	0.29	1.06	0.99	0.12	1.17	1.09
800	0.92	0.97	0.90	0.85	1.06	0.99	0.77	1.18	1.10	0.65	1.30	1.21	0.49	1.42	1.32
880	1.18	1.11	1.04	1.11	1.24	1.16	1.03	1.37	1.28	0.91	1.50	1.38	0.77	1.64	1.53
900	1.24	1.15	1.07	1.18	1.28	1.19	1.10	1.42	1.32	0.98	1.55	1,43	0.84	1.70	1.57
1000	1.58	1.35	1.26	1.53	1.48	1.38	1.46	1.63	1.48	1.37	1.81	1.65	1.24	2.02	1.85
						1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	F	EH120							
	and the second	3200	(all all all all all all all all all all		3600	1. 2.1		4000	16 16	in Mean	4400	16.17 2018	all des	4800	
700	0.49	1.01	0.94	0.34	1,17	1.09	0.14	1.33	1,24	_		1	10. <b>—</b> 11		-
800	0.84	1.25	1.16	0.71	1.42	1.32	0.53	1.60	1.48	0.30	1.80	1.64		-	
900	1.18	1.48	1.38	1.06	1.70	1.57	0.91	1.92	1.75	0.70	2.18	1.99	0.43	2.45	2.24
950	1.37	1.61	1.50	1.26	1.86	1.71	1.11	2.12	1.95	0.91	2.39	2,18	0.65	2.67	2.44
1000	1.56	1.75	1.62	1.46	2.02	1.85	1.32	2.30	2.10	1.13	2,60	2.38	0.87	2.90	2.65

# **TABLE 4** — SUPPLY AIR BLOWER PERFORMANCE<sup>1</sup>

Unit resistance is based on a wet indoor coil and clean filters.

<sup>2</sup>Available static pressure in IWG to overcome the resistance of the duct system and any accessories added to the unit. Refer to Tables 5 & 6 for the resistance of these accessories and for additional motor and drive data. NOTE: Refer to Form 515.40-AD1 for blower performance curves.

<sup>3</sup>Motors can be selected to operate into the service factor because they are located in the moving air stream, upstream of any heating device.

LEGEND:

RPM range for the standard drive components.

Exceeds the BHP limitation of the standard blower motor.



TABLE 5 - ACCESSORY STATIC RESISTANCE (IWG) (To Be Included With Duct System Static Resistance)

Model	Acce	ssory		Static	Resistance,	IWG	
BLOWER	CFM		2400	2700	3000	3300	3600
England and the th		10KW	0.01	0.01	0.01	0.02	0.02
	Electric	16KW	0.01	0.02	0.02	0.03	0.04
FEHOOO	Heat	26KW	0.03	0.04	0.05	0.06	0.07
T Enoso	1	36KW	0.05	0.07	0.08	0.10	0.11
	Supply Air Plenum		0.03	0.03	0.04	0.05	0.06
	Return Air Grille		0.02	0.03	0.04	0.05	0.06
BLOWER	CFM		3200	3600	4000	4400	4800
and the second second		10KW	0.02	0.02	0.03	0.03	0.04
	Electric	16KW	0.03	0.04	0.05	0.06	0.07
EEU120	Heat	26KW	0.06	0.07	0.09	0.11	0.13
T LITT20	1000	36KW	0.09	0.11	0.14	0.17	0.20
	Supply Air	Plenum	0.05	0.06	0.07	0.08	0.10
	Return Air	Grille	0.05	0.06	0.07	0.08	0.10

# TABLE 6 - BLOWER MOTOR AND DRIVE DATA (208/230/460-3-60)

	Motor	Blower	Adjustable N	Notor Pulley	Fixed Blow	er Pulley	Be	lt
Model	HP*	RPM	Pitch Dia. (Inches)	Bore (Inches)	Pitch Dia. (Inches)	Bore (Inches	Desig- nation	Pitch Lg. (Inches)
FEH090	1-1/2	655-880	20 20	7/0	7.5		4.90	07.0
FEH120	2	700-950	2.8 - 3.8	//8	7.0	1	A36	37.3

These factory-mounted motors are wired for a 460V power supply. Refer to the wiring diagram inside the motor terminal box when reconnecting the motor leads for a 208 or 230 volt power supply.

# TABLE 7 - ELECTRICAL DATA

Model	Power Supply	Blower Motor HP	FLA	Maximum Fuse Size,* Amps	Maximum Wire Length,** Ft.
FEH090	208-3-60 230-3-60	1-1/2	5.7 5.2	10 10	191 233
Sec. 1	460-3-60	Capita	2.6	5	933
FEH120	208-3-60 230-3-60	2	7.5 6.8	10 10	145 178
and the	460-3-60		3.4	5	714

NOTE: Refer to Form 550.13-N10.1 for electrical data on units equipped with an electric heat accessory.

\*Dual element, time delay fuses.

\*\*Based on three 60°C, 14 AWG insulated copper conductors in steel conduit and a 3% voltage drop.

#### CONTROL WIRE SIZING

Wire Size	Maximum Total Circuit Length (Feet)
#19 Solid	130
#18 Solid	170
#18 Stranded	180
#16 Stranded	270
#14 Stranded	455
#12 Stranded	730

To determine the total circuit length, add the following distances:

1 - Outdoor Unit to Indoor Unit

2 - Indoor Unit to Thermostat

3 - Thermostat to Indoor Unit

4 - Indoor Unit to Outdoor Unit. 5 - Outdoor Unit to Elec. Heater

**Total Circuit Length** 

# POWER AND CONTROL WIRING

Install electrical wiring in accordance with the latest National Electrical Code (NFPA standard No. 70) and/or local regulations. The unit should be grounded in accordance with these codes.

Route the power wires into the unit through the 1-3/8" knockout in the rear panel, and connect them to the terminals on blower motor contactor 10M. Route the control wires into the unit through the 7/8" hole in the rear panel, and connect them to the terminals on block 4TB. Refer to the unit drawing in Fig. 12 for the locations of these knockouts.

If the unit includes an electric heat accessory, route the power wires into heater control box in lieu of the unit. Refer to electric heat instruction Form 550.13-N10.1 for additional installation information.

Refer to Table 7 to size the disconnect switch, the power wiring, the fuses and the control wiring. Refer to Figure 11 for field wiring diagram.

NOTE: Motors are wired for a 460V power supply. Refer to the wiring diagram inside the motor terminal box when reconnecting motor leads for a 208 or 230 volt power supply.

If the supply air blower rotates in the wrong direction, reverse two of the motor leads at blower motor contactor 10M.





and the control wiring.

<sup>4</sup>Allow enough clearance to trap the condensate drain line.

12"3 Side with access for both POWER & CONTROL WIRING -4 Bottom

FIG. 12 - UNIT DIMENSIONS & CLEARANCES

# **KEY REPLACEMENT PARTS**

Replacement parts are available from local BWCES HVAC contractor/dealers or the nearest BWCES distribution center.

	DESCRIPTION	and the second second	MODEL			
and the second second		2019年,1997年1月1日日日 1997年 - 1997年 - 1997年 - 1997年 1997年 - 1997年 - 1997年 - 1997年 - 1997年 - 1997年	F2EH090A33	F2EH120A33		
And the second	Motor	1½ HP	024-19623-015			
Electrical	motor	2 HP		024-19623-016		
Salar Marine Marine	Contactor	The angeler in the	024-18056-002	024-18056-002		
And the constraint of the	Belt		028-09573-000	028-09573-000		
Blower	Pulley, Varia	ble Pitch	028-04764-000	028-04764-000		
DIOWEI	Pulley, Fixed	Pitch	028-07220-000	028-10564-000		
	Wheel, Blowe	er	026-22683-000	026-22683-000		
	Coil, Evapora	ator	363-82651-000	363-82652-000 026-14777-012 022-05251-000		
Refrigerant	Filter-Drier	and Bellevin and	026-14777-012			
Circuit	Valve, Check		022-05251-000			
	Valve, Expan	sion	025-21484-000	025-21484-000		
	Pan, Drain		363-70814-000	363-70814-000		
	Panel (Botto	m & Frame Assy)	363-70937-000	363-70937-000		
	Panel (Retain	ner, Air)	363-70835-000	363-70835-000		
	Panel, Front	(Upper)	363-70883-000	363-70883-000		
and the second provide of	Panel, Rear		363-70867-000	363-70867 -000		
Miscellaneous		San de contras		and the second second		
	Panel, Side(L	ower RH Front)	363-70881-000	363-70881-000		
	Panel, Side(L	ower RH Rear)	363-70888-000	363-70888-000		
	Panel, Side (I	Jpper RH)	363-70880-000	363-70880-000		
in operation (Self-Self-Self-Self-Self-Self-Self-Self-	Panel, Side (I	LH)	363-70875-000	363-70875-000		
	Panel, Top ([	Discharge)	363-70982-000	363-70892-000		
a non possible sector a sector	Filter (1 x 16	5 x 25)	026-03611-000	026-03611-000		

# MAINTENANCE

# INDOOR COIL

Do not allow dirt to accumulate on the indoor coil or other parts of the supply/return air circuit. Clean as often as necessary to assure good system performance. Use a brush, vacuum cleaner attachment or other suitable means.

If the coil becomes extremely dirty, it may be necessary to use an industrial grade detergent and a hose to clean the finned surfaces. This is recommended to prevent any loss in capacity and efficiency.

# **FILTERS**

The filters must be replaced as often as necessary to assure good air flow and filtering action. Clean filters will prevent any loss in capacity and efficiency.

Refer to the unit drawing in Figure 12 for the location of the filter access panel.

# **DRAIN PAN**

The condensate drain pan should be inspected regularly to assure proper drainage.

# LUBRICATION

The bearings for the blower shaft and the blower motor are permanently lubricated and should not require any additional lubricant.

# BELTS

Maintain belt tension to extend belt life. Replace when signs of failure begin to appear.

Supersedes: 515.40-N2 (481) Subject to change without notice. Printed in U.S.A. Copyright © 1986 by Central Environmental Systems- ALL RIGHTS RESERVED SHU 3M 786 .48

Code: SBY

515.40-N2



Central Environmental Systems

Post Office Box 1592

York Pennsylvania 17405-1592

# INSTALLATION INSTRUCTION

# ELECTRIC HEAT ACCESSORY 10, 16, 26, 36 & 72 KW

Supersedes: 550.13-N10.1 (683)

550.13-N10.1V (485)

035-06936

# FOR SPLIT-SYSTEM AIR CONDITIONERS 060, 090, 120 & 180 MBH SPLIT-SYSTEM HEAT PUMPS 090 & 120 MBH SINGLE PACKAGED WATER COOLED AIR CONDITIONERS 060, 090, 120 & 180 MBH





# GENERAL

This instruction covers the installation and operation of these electric heat accessories.

Every electric heat accessory is shipped completely assembled and pre-wired with all of the power and control wiring that will be required to interconnect this accessory with the basic unit. Refer to Table 1 for accessory model numbers and for capacity ratings based on the voltage of the power supply and the mode of operation.

These electric heaters can be installed on either vertical or horizontal units, on units with ductwork, or on free standing units equipped with a supply air plenum accessory.

NOTE: The Electric Heat Accessory is not UL approved on free standing units equipped with a Supply Air Plenum Accessory.

Single packaged units equipped with an electric heat accessory will require two power supplies, one for the heater elements and one for the basic unit.

Split-system units equipped with an electric heat accessory will require only one power supply for both the heater elements and the supply air blower motor. Refer to Figure 1 for the locations of both the power and the control wire access openings and to the following instructions for routing and connecting the wires.

All heat pump systems and all air conditioning systems with one of these electric heat accessories will require a special thermostat. Refer to the field wiring diagram on pages 10 and 11 to determine the proper thermostat model number. NOTE: Heat pump systems with or without electric heat use the same thermostats.

Air conditioning systems with one of these electric heat accessories will require a special thermostat that can cycle the supply air blower motor with a call for heating as well as a call for cooling.

When an indoor unit is equipped with an electric heater, provide at least 1-inch clearance to combustible material around heater cabinet, supply air plenum and supply air ducts up to 3 feet from the unit.

# REFERENCE

Refer to one of the following instructions for additional information on the installation of the basic unit, for the application limitations of the total system and for the minimum clearance requirements of the indoor unit.

Split-System Air Conditioners:
060, 090 and 120 MBH Form 550.13-N10Y, -N10W
180 MBH Form 550.13-N7Y, -N7W
Single Package Air Conditioners: 060, 090, 120 and 180 MBHForm 560.20-N1Y, -N1W
Heat Pumps: 090 and 120 MBH – Form 515.40-N2Y, -N2W

Renewal Parts: Refer to parts microfiche.

The above forms may be ordered from:

Publications Distribution Center Central Environmental Systems P.O. Box 1592, York, Pa. 17405

Installer should pay particular attention to the words: NOTE, CAUTION and WARNING. Notes are intended to clarify or make the installation easier. <u>Cautions</u> are given to prevent equipment damage. <u>Warnings</u> are given to alert the installer that personal injury and/or equipment damage may result if the installation procedure is not handled properly.

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### TABLE 1 - HEATING CAPACITY

	1941 I.C. 73-5 F		the first of	1.1	1.00	Succession of the			A STATES	Heating	Capacity1	. Barre 1	and the second	a diam'n	
Heater Model Number		Sugar 1	in the second	No	minal	w/AC 060, 090, 120 & 180 MBH					w/Heat Pump 090 & 120 MBH				
		Use With	UL Test Voltage	Ra	itings <sup>1</sup>	S	tage 1	s	tage 2	De	frost	Supple	emental	Stand Eme	by and rgency
		N. Saint	学的情况	KW	Mbh	KW	Mbh	KW	Mbh	KW	Mbh	KW	Mbh	KW	Mbh
2HT045010	25	060 *	2402	1.0	24.0	10			Sec. 1	10	24.0	10	24.2	10	24.2
2HS045010	46	000,	4803	1 10	34.2	10	34.2	1	anag <del>a</del> sheki	10	34.2	10	34.2	10	34.2
2HT045016	25	1 120	2402	10	647	10	24.2	c	20.5	10	24.2	16	54.7	16	54.7
2HS045016	46	120,	4803	1 10	54.7	10	34.2	0	20.5	10	34.2	10	54.7	10	54.7
2HT045026	25		2402	20	00 0	16	E4 7	10	24.2	16	547	26	00.0	26	00 0
2HS045026	46		4803	20	88.8	10	54.7	10	34.2	10	54.7	20	0.00	20	0.00
0110045020	25	090, 120,	2402	200	102.0	10	E4.7	20	60.2	16	E4 7	26	00 0	26	122.0
2H5045036	46	180 MBH	4803	30	123.0	10	54.7	20	00.3	10	54.7	20	0.00	30	123.0
20046072	25	100 MDU	2402	72	246.0	26	122.0	26	122.0	-	1.1.1.1.1.1				
2H3045072	46		4803	112	240.0	30	123.0	30	123.0	Station .				E. W. C.	

1 Capacity ratings do not include the heat generated by the supply air blower motor.

2 For 208 volts, multiply the MBH and KW values by (208/240)2 or 0.751. For 230 volts, multiply the MBH and KW values by

(230/240)<sup>2</sup> or 0.918.

<sup>3</sup> For 460 volts, multiply the MBH and KW values by (460/480)<sup>2</sup> or 0.918. \* Use HT models on all 060 MBH units; HS models on larger units. HT models are only available for a 208/230-3-60 power supply.

# INSTALLATION

# SPLIT SYSTEM AIR CONDITIONERS AND HEAT PUMPS

Install these electric heat accessories per the following step-by-step procedures and the illustration shown in Figure 1.

- 1. Remove the electric heat accessory from its shipping container.
- 2. Remove the control box access panel from the heater cabinet.
- 3. Remove the access panel of the blower motor compartment from the indoor unit for access to the blower motor contactor box and low voltage terminal block 4TB. (Refer to Figure 2.)
- 4. Remove the cover from the blower motor contactor box.
- 5. Remove the 1-23/32" knockout from the top of the indoor unit. Refer to Figure 1 for its exact location.

- 6. Remove the two screws from the "A" locations and save them for step 9.
  - CAUTION: Do <u>NOT</u> remove the screw from location "B".

On all 060, 090 and 120 MBH units, this screw must be left in place to keep the angle support for the heater wiring harness in place while the heater accessory is being installed. A clearance hole in the bottom of the heater control box at this location allows the cabinet to fit flush against the top of the indoor unit.

On the 180 MBH unit, this screw is outside the dimensions of the heater accessory and will not interfere with its installation.



#### 550.13-N10.1V

- Set the heater cabinet on top of the unit as shown in Figure 1. Route its wiring harness through the knockout removed per step 5.
- 8. Position the heater so that:
  - a. The duct flanges around the unit's supply air opening fit into the heater opening.
  - b. The head of the screw at location "B" (on 060,090 and 120 MBH units only) fits into the clearance hole in the bottom of the heater control box.
  - c. The strain relief bushing on the bottom of the heater control box fits into the 1-23/32" opening. (Knockout removed per step 5.)
  - d. The three holes in the bottom of the heater control box align with the three holes on the top of the unit – the two holes at the "A" locations and the hole at location "C".
- 9. Secure the heater to the unit at the holes aligned per step 8 (d) using the two screws removed per step 6 and one of the  $\#10 \ge 1/2$ " screws provided with the accessory.
- 10. Drill three 5/32" holes through the top of the unit using the holes in the mounting flange on the opposite end of the heater as templates.
- 11. Secure the heater to the unit at these locations using the three remaining  $\#10 \ge 1/2$ " screws provided with the accessory.
- 12. Remove the 7/8" knockout from the back panel of the contactor box (on the right side for 060, 090 and 120 MBH units or at the top for 180 MBH units) and insert the 1/2" strain relief bushing, provided with the accessory, into this opening. (Refer to Figure 2.)

NOTE: The clamp portion of the bushing must extend out the back of the contactor box.

- 13. Route line voltage wires 107B, 109B and 112B (wires 100, 102 and 103 on 72 KW heaters) of the heater wiring harness through the bushing installed per step 12, connect them to the terminals on contactor 10M, and tighten the bushing to secure the wires to the contactor box.
- 14. Route the control voltage wires of the heater wiring harness through the snap bushing in the support baffle and connect them to the proper terminals on terminal block 4TB per the following:

Heater	1. A 4	Termi	nal D	esigna	ation	on 4	TB (Spl	it-Sy	stem)	1. Al
(KW)	R	в	Y	0	w	x	53	G	60	66
10	32	33A	-	-	_	-	-	_	_	104
16 & 26	32	33A		-	-	-	-	-	105	104
36	32	33A	interio <u>ri</u> tari	_	Cont <u>ele</u> nsi		106	100.000	105	104
72	in the second	33W	-	-	-	-	-	-	60Y	66Y

15. Secure the wiring harness to the support angle with the two ty-raps provided with the accessory. Holes are pre-punched in the support at the locations shown in Figure 2.



# FIG. 2 - CONTACTOR BOX & HARNESS SUPPORT

- 16. Add a conduit fitting (field-supplied) to the power access opening in the rear panel of the heater cabinet per Figure 4.
- 17. Install the field wiring per the following instructions and the appropriate connection diagram on page 10.

# 060, 090 & 120 MBH UNITS

# **DUCT-MOUNTED UNITS**

Connect the power wire conduit to the fitting installed per step 16, route the power wiring into the heater control box, and connect the power and ground wires per the field wiring diagram.

Route the control wires from the thermostat and the outdoor unit through the bushing in the 7/8" hole in the rear panel of the indoor unit. (See Figure 1 for its location.) Connect these wires to terminal block 4TB per the field wiring diagram.

### FREE STANDING UNITS WITH A SUPPLY AIR PLENUM ACCESSORY

Remove the 2-1/2" knockout from the rear panel of the plenum, route the power wire conduit through this opening and connect it to the fitting installed per step 16, route the power wiring into the heater control box, and connect the power and ground wires per the field wiring diagram.

Route the control wires from the thermostat and the outdoor unit through the bushing in the 7/8" hole in the rear panel of the indoor unit. (See Figure 1 for its location.) Connect these wires to terminal block 4TB per the field wiring diagram.

# **180 MBH**

# **DUCT-MOUNTED UNITS**

Connect the power wire conduit to the fitting installed per step 16, route the power wiring into the heater control box, and connect the power and ground wires per the field wiring diagram.



Remove the 7/8" knockout for control wiring from the top panel of the indoor unit. (See Figure 1 for its location.) Add a 1/2" strain relief bushing (field supplied) to this opening, route the control wires from the thermostat and the outdoor unit through this bushing, connect them to terminal block 4TB per the field wiring diagram, and tighten the bushing to secure the control wiring to the unit.

# FREE STANDING UNITS WITH A SUPPLY AIR PLENUM ACCESSORY AND ELECTRIC HEAT UP THRU 36 KW

Remove the 2-1/2" knockout and one of the 7/8" knockouts from the rear panel of the plenum.

Route the power wire conduit through the 2-1/2" opening and connect it to the fitting installed per step

# SINGLE PACKAGE WATER COOLED AIR CONDITIONERS

- 1. Remove the electric heat accessory and heater kit 2HK04700133A from their shipping containers.
- 2. Remove the control box access panel from the heater cabinet.
- 3. Remove the access panel of the blower motor compartment, and mount the terminal block (4TB) from the heater kit in the location shown in Figure 3.



FIG. 3 - TYPICAL HEATER KIT INSTALLATION

- 4. Remove the bottom access panel of the basic unit for access to terminal block 2TB on the side of the electrical box.
- 5. Remove the 1-23/32" knockout from the top of the unit. Refer to Figure 1 for its exact location.
- 6. Remove the two screws from the "A" locations and save them for step 9.

16, route the power wiring into the heater control box, and connect the power and ground wires per the field wiring diagram.

Remove the 7/8" knockout for control wiring from the top panel of the indoor unit. (See Figure 1 for its location.) Add a 1/2" strain relief bushing (field supplied) to this opening and to the 7/8" opening in the rear of the plenum. Route the control wires from the thermostat and the outdoor unit through these bushings, connect them to terminal block 4TB per the field wiring diagram, and tighten both bushings to secure the control wiring to the unit.

18. Replace the contactor box cover removed per step 4, the indoor unit access panel removed per step 3 and the heater control box cover removed per step 2.

CAUTION: Do NOT remove the screw from location "B".

On all 060, 090 & 120 MBH units, this screw must be left in place to keep the angle support for the heater wiring harness in place while the heater accessory is being installed. A clearance hole in the bottom of the heater control box at this location allows the cabinet to fit flush against the top of the unit.

On 180 MBH unit, this screw is outside the dimensions of the heater accessory and will not interfere with its installation.

- 7. Set the heater cabinet on top of the unit as shown in Figure 1 and route the wiring harness through the knockout removed in step 5.
- 8. Position the heater so that:
  - a. The duct flanges around the unit's supply air opening fit into the heater opening.
  - b. The head of the screw at location "B" (on 060, 090 & 120 MBH units only) fits into the clearance hole in the bottom of the heater control box.
  - c. The strain relief bushing on the bottom of the heater control box fits into the 1-23/32" opening. (Knockout removed per step 5.)
  - d. The three holes in the bottom of the heater control box align with the three holes on the top of the unit the two holes at the "A" locations and the hole at location "C".
- Secure the heater to the unit at the holes aligned per step 8 (d) using the two screws removed per step 6 and one of the # 10 x 1/2" screws provided with the accessory.

#### 550.13-N10.1V

- 10. Drill three 5/32" holes through the top of the unit using the holes in the mounting flange on the opposite end of the heater as templates.
- 11. Secure the heater to the unit at these locations using the three remaining  $\# 10 \ge 1/2$ " screws provided with the accessory.
- 12. Route the control voltage wires of the heater wiring harness through the 1-23/32" knockout and connect them to the proper terminals on terminal block 4TB (installed in step 3) per the following:

Heater	т	ermina	I Desi	gnati	on on	4TB	(Single	e Pac	kage)	
(KW)	R	В	Y	0	W	x	53	G	60	66
10	33A	32	11 <u>-</u> 1	-	1 ×	<u>812</u> 4	10 <u>- 1</u> (1) (1	_	1.11.1	104
16 & 26	33A	32	_	-	_	-	_	-	105	104
36	33A	32					106	-	105	104
72	33W		-	-	-	-	-	-	60Y	66Y

13. Route the line voltage wires 107B, 109B, and 112B of the heater wiring harness through the 1-23/32" knock-out. Tape and fold back so as to prevent any electrical contact.

NOTE: For 72KW heat accessory line voltage wires are 100, 102, and 103.

- 14. Secure the wiring harness to the support angle with the two ty-raps provided with the accessory. Fold back and isolate these wires (not used with single package units). See Figure 3.
- 15. Route the wiring harness connected to 4TB (part of 2HK04700133 accessory kit) down to 2TB (follow fan motor conduit) located on the side of the unit's main electrical box, and make connections per the field wiring diagram on page 11.
- 16. Cover the wiring diagram on the elec. heat accessory with the wiring diagram provided with the heat accessory kit. (See Table 5.)

- 17. Add a conduit fitting (field-supplied) to the power access opening in the rear panel of the heater cabinet per Figure 4.
- 18. Install the field wiring per the following instructions and the diagram on page 11.

# DUCT-MOUNTED UNITS

Connect the power wire conduit to the fitting installed per step 17, route the power wiring into the heater control box, and connect the power and ground wires per the field wiring diagram.

Remove the 7/8" knockout from the rear\* of the unit for control wire access (See Figure 1 for its location.), install a field-supplied bushing in this opening, route the control wiring from the thermostat through this bushing, and connect the wiring to terminal block 4TB per the field wiring diagram.

# FREE STANDING UNITS WITH A SUPPLY AIR PLENUM ACCESSORY

Remove the 2-1/2" knockout from the rear panel of the plenum, route the power wire conduit through this opening and connect it to the fitting installed per step 17, route the power wiring into the heater control box, and connect the power and ground wires per the field wiring diagram.

Remove the 7/8" knockout from the rear\* of the unit for control wire access (See Figure 1 for its location.), install a field-supplied bushing in this opening, route the control wiring from the thermostat through this bushing, and connect the wiring to terminal block 4TB per the field wiring diagram.

19. Replace the control box access panel removed in step 2, the blower motor access panel removed in step 3, and the electrical box access panel removed in step 4.

\* from the top of 180 MBH units

# TABLE 2 - PHYSICAL DATA

	Description		Capacity (Nom. Rating)							
	Description		10Kw	16Kw	26Kw	36Kw	72Kw			
	% Nickel	Select a selection	59.2							
1 21	% Chromiu	n		dan an Arabara	16.0		State Carry			
Hostor	Coil ID-in.	u og sug site og		14.00	9/32					
Elements	Watt Densit (Watts/sq. ii	У n.)	59							
	Face Area (sq. ft.)	for hand designed that shall be	3.0							
-	Rows Deep	and the second second second second	1	2	3	4	5			
Weight	Shipping-It	DS.	63	66	71	74	120			
a section of	208/230	Quantity	3	3	3 3	6	12			
Euros*	Volts	Size-amps	45	60	60 45	60	60			
ruses	460	Quantity	3	3	3	3	6			
CONTRACTOR OF	Volts Size-amps		25	30	45	60	60			





All of these heaters will be UL listed.





# **TABLE 3** – ELECTRICAL DATA FOR SPLIT-SYSTEM UNITS

Model	Nom.	Power	F	LA	Total Unit	Max.	Min.	Max.
Basic Unit1	Heater KW2	Supply Voltage <sup>3</sup>	Heater	Blower Motor	Amp- acity, Amps	Fuse Size,4 Amps	Size,5 AWG	Length6 Feet
	10	208	20.9	5.5	36	40	8	130
1 - 2 - 3 - 3 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5	10	230	24.0	5.5	39	40	8	134
060	10	208	33.4	5.5	51	60	6	144
MBH	10	230	38.5	5.5	57	60	4	228
	00	208	54.3	5.5	77	80	3	191
	20	230	62.6	5.5	87	90	2	240
Same Bar		208	20.9	7.5	36	40	8	130
1.1	10	230	24.0	6.8	39	40	8	134
		460	12.0	3.4	20	20	12	208
	16	208	33.4	7.5	51	60	6	144
		230	38.5	6.8	57	60	4	228
090	ter Para	460	19.3	3.4	29	30	10	229
MBH	Maria Maria Maria Maria Maria	208	54.3	7.5	77	80	3	191
1	26	230	62.6	6.8	87	90	2	240
1.1		460	31.3	3.4	44	45	6	373
	36	208	75.1	7.5	104	110	2	180
5/3		230	86.7	6.8	117	125	1	223
1.1	States and States	460	43.4	34	59	60	4	440
		208	20.9	10.6	40	40	8	117
	10	230	24.0	9.6	42	45	6	196
	19 1 19 19 19 19 19 19 19 19 19 19 19 19	460	12.0	48	21	25	10	316
	No. of the second second	208	33.4	10.6	55	60	6	134
100	16	230	38.5	9.6	60	60	4	217
120,	at the second	460	19.3	4.8	30	30	10	221
180	State in the second	208	54.3	10.6	81	90	2	231
MRH	26	230	62.6	9.6	90	90	2	232
	Printer and the second second second	460	31.3	4.8	45	45	6	365
	The second second	208	75.1	10.6	107	110	2	174
1.040	36	230	86.7	9.6	120	125	1	217
Walter H	Continence Royal	460	43.4	4.8	60	60	4	433
100		208	150.1	10.6	200	200	000	234
180	72	230	173.3	9.6	228	250	0000	288
WRH		460	86.7	4.8	114	125	2	366

<sup>1</sup>Unit with an electric heat accessory will always be wired for a single power supply.

2 Refer to the HEATING CAPACITY table on page 2 for the actual KW and MBH Ratings for each heater at the different voltages.

1/2

3All voltages are for 3-phase, 60 hertz operation.

D

<sup>4</sup>Inverse time circuit breakers may be used in lieu of dual element, time delay fuses.

5 Based on three, insulated copper conductors in steel conduit; 60°C wire when the total unit ampacity is below 100 amps. 75°C wire when the total unit a

6 Based on a 3% voltage drop.

FZ

19-1/4

CONTROL BOX ACCESS PANEL

G

B

### ACCESS OPENING FOR POWER SUPPLY WIRING

10KW THRU 36KW – Add a 1-1/4" conduit fitting to the 1-23/32" hole for wire sizes up through #1 AWG. Remove the knockout ring and add a 1-1/2" conduit fitting to the 1-31/32" hole for wire sizes up through #0 AWG.

 $\frac{72KW}{1-23/32''}$  Add a 1-1/4" conduit fitting to the 1-23/32" hole for wire sizes up through #1 AWG. Remove the knockout ring and add a 2'' conduit fitting to the 2-1/2" hole for wire sizes up through #0000 AWG.

#### WIRING HARNESS LOCATION

C

3/4

This opening in the bottom of the heater control box is used for the wiring harness that connects the heater accessory to the basic unit. It is provided with a strain relief bushing for securing the wiring harness, and its location corresponds to the location of the 1-23/32" knockout in the top panel of the basic unit.

HEATER ELEMENT CHAMBER

FIG. 4 - HEATER DIMENSIONS

Nom.	MOL	and the second			Heat	er Dim	ensio	ns (In I	nches)	Stat Barries	Same in the same	martine
KW	IVIDI	Α	В	C	D	E	F	G	н	К	L	M
10	1999 B	1.242	11. S.C.	12. 2.	Sec. 3	S. S. S.	Sec.	1.4.6		in the second	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	- Withow y
16	060	25-1/8	22-1/2	13	7/8	4	1/2	5-1/4	1-11/16	1-3/4	20-1/8	16-7/8
26	a statistica and		or finding of the	printer of								
10	000		al solar	1	1			1.1.5.1	and the second	and in the	141.00	exilence.
16	090						110	E 4/0	1.1/0		00 4 14	10 1/4
26	120	28-1/2	25-1/4	14-1/4		4	1/2	5-1/2	1-1/2	1-1/2	22-1/4	19-1/4
36	180	Constant States	and a share of the	and the second second	- Property of the second	340445						
72	180	29-7/8	26-3/8	21-3/4	2-3/8	5-1/4	3/4	6-3/8	2-1/4	2-1/2	22-1/4	19-1/4
	Nom. KW 10 16 26 10 16 26 36 72	Nom. KW         MBH           10	Nom. KW         MBH         A           10	Nom. KW         MBH         A         B           10         0         25-1/8         22-1/2           26         26         25-1/8         22-1/2           10         090         16         120         28-1/2         25-1/4           36         180         27-7/8         26-3/8         26-3/8	Nom. KW         MBH         A         B         C           10         16         060         25-1/8         22-1/2         13           26         20         28-1/2         25-1/4         14-1/4           10         180         26-3/8         21-3/4         14-1/4	Nom. KW         MBH         A         B         C         D           10         16         060         25-1/8         22-1/2         13         7/8           26         10         25-1/8         22-1/2         13         7/8           10         090         16         120         28-1/2         25-1/4         14-1/4         1           36         180         29-7/8         26-3/8         21-3/4         2-3/8	Nom. KW         MBH         A         B         C         D         E           10         16         060         25-1/8         22-1/2         13         7/8         4           26         10         26         120         28-1/2         25-1/4         14-1/4         1         4           10         090         16         120         28-1/2         25-1/4         14-1/4         1         4           36         180         29-7/8         26-3/8         21-3/4         2-3/8         5-1/4	Nom. KW         MBH         A         B         C         D         E         F           10         16         060         25-1/8         22-1/2         13         7/8         4         1/2           26         10         13         7/8         4         1/2           10         090         16         120         28-1/2         25-1/4         14-1/4         1         4         1/2           36         180         29-7/8         26-3/8         21-3/4         2-3/8         5-1/4         3/4	Nom. KW         MBH         A         B         C         D         E         F         G           10         16         060         25-1/8         22-1/2         13         7/8         4         1/2         5-1/4           10         090         16         102         28-1/2         25-1/4         14-1/4         1         4         1/2         5-1/2           36         180         29-7/8         26-3/8         21-3/4         2-3/8         5-1/4         3/4         6-3/8	Nom. KW         MBH         A         B         C         D         E         F         G         H           10         16         060         25-1/8         22-1/2         13         7/8         4         1/2         5-1/4         1-11/16           10         10         090         16         120         28-1/2         25-1/4         14-1/4         1         4         1/2         5-1/2         1-11/2           36         180         29-7/8         26-3/8         21-3/4         2-3/8         5-1/4         3/4         6-3/8         2-1/4	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Nom. KW         MBH         A         B         C         D         E         F         G         H         K         L           10         16         060         25-1/8         22-1/2         13         7/8         4         1/2         5-1/4         1-11/16         1-3/4         20-1/8           26         10         090         16         090         16         10         1-11/2         1-1/2         1-1/2         22-1/8           10         16         090         16         180         28-1/2         25-1/4         14-1/4         1         4         1/2         5-1/2         1-1/2         1-1/2         22-1/4           36         180         29-7/8         26-3/8         21-3/4         2-3/8         5-1/4         3/4         6-3/8         2-1/4         2-1/2         22-1/4

# TABLE 4 - ELECTRICAL DATA FOR SINGLE PACKAGE WATER COOLED UNITS

Basic Unit	Nominal KW	Power Supply <sup>1</sup>	Ampacity, <sup>2</sup> Amps	Maximum Fuse Size <sup>3</sup> , Amps	Min. Wire Size <sup>4</sup> , AWG	Max. Wire Length <sup>s</sup> , Ft.
and the second		208	27	35	10	111
	10	240	31	40	8	176
		480	16	20	12	271
060,090,		208	42	50	6	177
120 & 180	16	240	49	60	6	175
MBH		480	25	30	10	277
and the second second	Press Aller	208	68	90	4	173
And Andrews	26	240	79	100	3	217
An interfactories	100 million de la compañía	480	40	50	8	274
090.	a state and the state of the state	208	94	110	2	201
120 & 180	36	240	. 109 *	125	2	200
MBH		480	55	60	6	312
and the second second		208	188	200	000	251
180	72	240	217	250	0000	316
MBH		480	110	125	2	395

1 All voltages are for 3 phase, 60 Hz operation.

2Units with electric heat require two power supplies. This ampacity is for the electric heater only. Refer to the basic unit instruction for the ampacity of the basic unit.

3The single element type.
4Based on three, 60°C insulated copper conductors in steel conduit.

5 Based on a 3% voltage drop.

When the heater ampacity exceeds 100 amps, minimum wire sizes are based on 75°C wire in lieu of 60°C.

# **TABLE 5 - WIRING DIAGRAMS**

Nominal Heat Section Ratings (KW)	Voltages	Split-System Air Conditioning And Heat Pump Units <sup>2</sup>	Water Cooled Single Packaged Air Conditioning Units <sup>3</sup>
10	208/230, 460	035-03951-000	035-04855-000
10 <sup>1</sup>	208/230	035-06503-000	
16	208/230, 460	035-03952-000	035-04856-000
161	208/230	035-06502-000	
26	208/230	035-03953-000	035-04857-000
26	460	035-03954-000	035-04858-000
261	208/230	035-06504-000	035-04884-000
36	208/230	035-03956-000	035-04860-000
36	460	035-03955-000	035-04859-000
72	208/230	035-04296-000	035-05573-000
72	460	035-04297-000	035-05574-000

1 Used on 5 ton units only.

<sup>2</sup>The appropriate diagram is secured to the control box cover of the electric heat accessory.

<sup>3</sup>These diagrams are provided with Electric Heat Kit 2HK04700133A. When an electric heat accessory is applied with a water-cooled unit, the appropriate diagram should be secured over the wiring diagram supplied with the electric heat accessory.

# ELECTRICAL COMPONENTS



These electric heat accessories include staging contactors, back-up contactors and two high limit controls (1LC and 2LC).

Staging contactors are energized through the system control circuit. When energized, each contactor will close two of three legs to one or two of the heating elements. This arrangement is illustrated in the wiring labels for the electric heat accessories. (See Table 5 for the correct wiring label).

WARNING: When the staging contactors are de-energized, one of the legs to each heating element is "HOT". Open the main disconnect switch before servicing the heating accessory.

Back-up contactors are not energized through the system control circuit. They will be closed as long as there is power to the electric heat control circuit and both high limit controls are closed.

The high limit controls will prevent the electric heat accessory from operating at an excessive temperature. They will open and reset automatically at the temperatures listed below.

	and the second	21	HS	2HT							
High Limit Control	Location	Opens	Closes	Opens	Closes						
1LC	Entering	140°F	90°F	135°F	85°F						
2LC	Leaving	150°F	100°F	135°F	85°F						

Refer to Physical Data, Table 2, for information on the heater elements and the accessory fuses.

START-UP

Make sure that all electrical connections are tight before closing the disconnect switch to the indoor unit.

Close the disconnect switch and check the operation of each heating stage.

Check the total unit CFM in accordance with the respective basic unit instruction as referenced on page 2. Refer to Table 6 for the static resistances of these electric heaters

# **TABLE 6** - STATIC RESISTANCE (IWG)

# CAUTION: Failure to properly adjust the supply air CFM could cause nuisance tripping of the high limit controls.

De-energize the electric heat accessory after it has been operating for several hours, and recheck all of the electrical connections for tightness.

Heater	14月1日1月1日					a del se la	Basic	Unit N	lodels		19 19 19	Bern Harr		S. Care	ā. : : :					
Accessory		(	060 MBH	1				090 MB	H	那种	120 MBH									
(Nom Bating)	Ale and ste	. L.Smith	CFM	K. Star				CFM	iner fronte i e		CFM									
(Nom. Hatting)	1600	1800	2000	2200	2400	2400	2700	3000	3300	3600	3200	3600	4000	4400	4800					
10 KW	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.04					
16 KW	0.01	0.02	0.02	0.03	0.04	0.01	0.02	0.02	0.03	0.04	0.03	0.04	0.05	0.06	0.07					
26 KW	0.02	0.03	0.04	0.05	0.08	0.03	0.04	0.05	0.06	0.07	0.06	0.07	0.09	0.11	0.13					
36 KW		—			-	0.05	0.07	0.08	0.10	0.11	0.09	0.11	0.14	0.17	0.20					
72 KW	-	<u> </u>	<u> </u>		-	- 1			-	-	1000		_		_					

Hastan	Basic Unit Models													
Accessory	Accessory 180 MBH													
(Nom Pating)	En Balanda I		CFM	hand	land the second									
(Nom, Rating)	4800	5400	6000	6600	7200									
10 KW	0.04	0.05	0.06	0.08	0.10									
16 KW	0.07	0.09	0.11	0.14	0.17									
26 KW	0.13	0.16	0.20	0.24	0.29									
36 KW	0.20	0.24	0.29	0.35	0.42									
72 KW	0.36	0.43	0.52	0.63	0.76									



Although these electric heat accessories do not require any specific maintenance, the factory recommends a semi-annual inspection of all components to see if they are functioning properly.

Check all unit filters periodically for dirt accumulation. Dirty filters will restrict air flow and could cause nuisance tripping of the high limit controls. Filters must be changed as often as necessary to assure good air flow and filtering action. 9





#### 550.13-N10.1V



FIG. 6 - FIELD WIRING (SPLIT-SYSTEM HEAT PUMP SYSTEM WITH ELECTRIC HEAT ACCESSORY)

**Central Environmental Systems** 

# POWER SUPPLY<sup>1</sup>







<sup>1</sup>Three-phase units with electric heat require two power supplies. The electric heat power supply and ground wire should be connected directly to the fuse block and ground lug in the electric heat control box. Use copper conductors only. Refer to TABLE 4 on page 8 to size power wiring, disconnect switch, and fusing.

<sup>2</sup>Power wiring, disconnect switch and fusing by field. Use copper conductors only. Refer to TABLE 4 on page 8 for proper sizes.



FIG. 7 – FIELD WIRING (SINGLE PACKAGE WATER COOLED AIR CONDITIONER WITH ELECTRIC HEAT ACCESSORY)





Supersedes: 550.13-N10.1 (683) Subject to change without notice. Printed in U.S.A. Copyright © 1987 by Central Environmental Systems — ALL RIGHTS RESERVED SHU 3M 487 .48

Codes: SBY, F, L

550.13-N10.1V

Central Environmental Systems

Post Office Box 1592

York Pennsylvania 17405-1592



# CHAMPION SERIES AIR COOLED SPLIT-SYSTEM HEAT PUMPS

Preliminary Form 515.40-N1 Supersedes: Coded (481)

481 Form 515.40-N1

035-04300

# MODELS E1CH090 AND E1CH120 OUTDOOR UNITS



# GENERAL

These Champion heat pump units are designed for outdoor installation on a roof or at ground level. Every unit is completely piped and wired at the factory and is shipped ready for immediate installation. Only the liquid and vapor lines to the indoor coil, the control wiring and the main power wiring are required to complete the installation. Each unit is dehydrated, evacuated, leak tested and pressure tested at 450 psig before being pressurized with a holding charge of refrigerant-22 for shipment and/or storage.

Every unit includes a suction line accumulator, a 4-way reversing valve (pilot operated), a filter-drier, an expansion valve, a distributor and a check valve . . . all factory-installed.

All controls (including the Yorkguard solid state logic module) are readily accessible for maintenance, adjustment and service. All power and control wiring can be routed through the bottom of the compressor compartment.

This instruction covers the installation of the outdoor unit. For information on the installation of the matching indoor unit, refer to Form 515.40-N2.

# REFERENCE

Additional information on the design, installation, operation and service of this equipment is available in the following reference forms.

Form 55.70-N1	_	General Installation
Form 55.70-N2	_	Pre-start & Post-start Check List
Form 55.70-N3	-	General Service Information
Form 55.05-NM	_	Evacuation and Charging
Form 1505.05-AD	-	Refrigerant-22 Piping

Refer to Form 515.40-RP1 for replacement parts.

The above forms may be ordered from:

**Publications Distribution Center** York Division of Borg-Warner Corp. P.O. Box 1592, York, Pa. 17405

Installer should pay particular attention to the words: NOTE, CAUTION and WARNING. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert the installer that personal injury and/or equipment damage may result if the installation procedure is not handled properly.

# **INSPECTION**

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing. See Form 50.15-NM for more information.



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## INSTALLATION

## LIMITATIONS

These units must be installed in accordance with all national and local safety codes. If no local codes apply, installation must conform with the appropriate national codes. See Table 1 for application limitations. Units are designed to meet National Safety Code Standards. If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or the customer's expense.

## TABLE 1 - APPLICATION LIMITATIONS

	Voltage Variatio	n (Min./Max.)	en inner de jes			
20	8/230	187/253				
	460	414/	506			
Air 7	Temperature on C	UTDOOR coil	,°F			
Mir	nimum	Maxii	num			
Cool	Heat	Cool	Heat			
40db	- 10db*	115db	75db			
Air	Temperature on	INDOOR Coil,	°F			
Mir	nimum	Maxir	num			
Cool	Heat	Cool	Heat			
57wb	50db**	72wb	80db			

\* Below -10°F, the logic module will lock out the compressor and allow the electric heat accessory to cycle at its standby capacity.

\*\* Operation below this temperature is permissible for a short period of time when a unit is required to heat the conditioned space up to 50°F.

## LOCATION

Use the following guidelines to select a suitable location for these units.

- 1. The outdoor unit must be installed outside the building. The outdoor fans are the propeller type and are not suitable for use with ductwork.
- The outdoor and indoor units should be installed as close together as possible and with a minimum number of bends in the refrigerant piping. Refer to "REFRIGER-ANT PIPING" for additional information.
- 3. The outdoor unit should not be installed beneath windows or between structures where normal operating sounds may be objectionable.
- WARNING: The outdoor unit should not be installed in an area where mud and/or ice could cause personal injury. Remember that condensate will drip from the underside of the unit coils during heat and defrost cycles and that this condensate will freeze when the temperature of the outdoor air is below 32° F.
- 4. All units require certain clearances for proper operation and service. Refer to General Installation Form 55.70-N1 for additional guidelines.

On either rooftop or ground level installations, rubber padding can be applied between the legs and their supports to lessen any transmission of vibration. Holes are provided in the corner legs for bolting the unit to its supports. See Figure 1 for the location and the dimensions of these bolt holes.



Model	Wei	Int Per Leg (Lbs.)         O           B         C         D           132         130         118           150         140         130	Operating Weight		
WIOGEI	A	В	C	D	(Lbs.)
CH090	210	132	130	118	590
CH120	222	150	140	130	642

# FIG. 1 – LOCATION OF BOLT HOLES AND WEIGHT DISTRIBUTION

#### **ROOF-TOP LOCATIONS**

Be careful not to damage the roof. Consult the building contractor or architect if the roof is bonded. Choose a location with adequate structural strength to support the unit.

The unit must be mounted on level supports. The supports can be channel iron beams or wooden beams treated to reduce deterioration.

Two beams are required per unit, each supporting two of the unit's four corner legs. The beams should: (1) Be positioned perpendicular to the roof joists. (2) Extend beyond the dimensions of the unit to distribute the load on the roof, (3) Be capable of supporting the concentrated loads at the corner legs. See Figure 1.

These beams can usually be set directly on the roof. Flashing is not required. *NOTE: On bonded roofs, check for special installation requirements.* 



#### GROUND LEVEL LOCATIONS

The units must be installed on a substantial base that will not settle. Any strain on the refrigerant lines may cause a refrigerant leak. York recommends a one-piece concrete slab with footers that extend below the frost line. The slab should not be tied to the building foundation because noise and vibration will telegraph.

A unit can also be supported by concrete piers. These piers should: (1) extend below the frost line, (2) be located under each of the unit's four corner legs and (3) be sized to carry the load of the corner leg it supports. See Figure 1.

A gravel bed or some other means of handling the condensate that will drop from the underside of the unit coils during the heating and defrost cycles may have to be provided.

Precautions should be taken to protect the unit from tampering and unauthorized persons from injury. Screws on access panels will prevent casual tampering. Additional safety precautions such as fences around the unit or locking devices on the panels may be advisable. Check local authorities for safety regulations.

#### **CLEARANCES**

The clearances listed on the unit dimension drawing (Fig. 5) are required for the proper service and operation of the unit.

NOTE: When the compressor requires major service, York recommends that it be removed through the top of the unit.

## RIGGING

As shown in Figure 2, 3/8"-16 weld nuts are provided in the four corners of the fan deck to accommodate fieldsupplied eyebolts.

Before installing these eyebolts, remove the top wooden skid and side studs from the unit. The bolts holding the top skid do not have to be reused.

Before rigging a unit, make sure that its weight is distributed equally on the cables so that it will lift evenly. The cables on the compressor end of the unit will have to be shorter. Refer to Table 2 for unit weights.

After the unit has been rigged into place, the eyebolts may be removed.



#### FIG. 2 - TYPICAL RIGGING

#### TABLE 2 - PHYSICAL DATA

	MODEL	CH090	CH120
Compressor <sup>1</sup>	Rating, (Tons)	7½	10
Fans (3-blade)	Quantity Diameter, (In.) Nominal CFM	2 24 7800	2 24 8400
Fan Motors <sup>2</sup>	HP RPM	½ 1100	½ 1100
Coil <sup>3</sup>	Face Area, (Sq. Ft.) Rows Deep x Rows Wide Finned Length, (In.)	16.11 3 x 32 58.0	20.14 3 × 40 58.0
Refrigerant-22 (Lbs.)	Holding Charge Operating Charge <sup>4</sup> Pumpdown Capacity <sup>5</sup>	2.0 18.0 17.0	2.0 22.0 22.7
Unit Weight (Lbs.)	Shipping Operating	692 590	760 642

<sup>1</sup>These compressors are fully hermetic and have 4 cylinders. These PSC motors are directly connected to the outdoor fans and have inherent protection, ball bearings and a 48 frame. Their

rotation is clockwise when viewing the shaft end of the motor. <sup>3</sup>Each outdoor coil has 3/8" OD copper tubes and 13 aluminum fins

<sup>4</sup> per inch. Total operating charge for outdoor unit, indoor unit and 25 feet of <sup>5</sup>Based on a 95°F ambient.

#### LEG INSTALLATION

Before setting a unit in its final location:

- 1. Unscrew the four shipping bolts that secure the bottom skid to the unit, and remove the skid.
- 2. Remove the compressor access panel from the front of the unit, and unbolt the four identical support legs from the base of the compressor compartment.
- 3. Secure these legs to the four bottom corners of the unit as shown in Figure 2. Sixteen 5/16" bolts and lockwashers (4 per leg) are shipped in a small parts bag that is attached to the compressor wiring harness. Weld nuts are factory-mounted at the proper locations.
- CAUTION: Make sure the unit is adequately supported before installing the legs.



## COMPRESSOR HOLD-DOWN NUTS

The four compressor hold-down nuts are factory-tightened against ferrules that are located inside the compressor mounting grommets.

Since the compressor has internal spring isolators, these hold-down nuts must remain tight during unit operation.

## POWER AND CONTROL WIRING

Install electrical wiring in accordance with the latest National Electrical Code (NFPA Standard No. 70) and/or local regulations. The unit should be grounded in accordance with these codes.

#### COMPRESSOR TERMINALS

Please note the following information found on the label attached to the compressor.

#### WARNING

DO NOT OPERATE WITHOUT THE PROTECTIVE COVER OVER TERMINALS. DISCONNECT ALL POWER BEFORE REMOVING THE PROTECTIVE COVER.

#### POWER WIRING

Check the voltage of the power supply against the data on the unit nameplate. Check the size of the power wire, the disconnect switch and the fuses against the data on Table 3. *NOTE:* Copper conductors must be installed between the disconnect switch and the unit.

See the unit dimension drawing in Figure 5 for the location of the power wire access opening through the base of the compressor compartment. This opening will require a fieldsupplied conduit fitting.

The field-supplied disconnect switch must be suitable for an outdoor location. Although it can be installed on the unit, do not mount it on any panel that will have to be removed for access. When installing the switch, make sure that the screws do not puncture any refrigerant line.

Refer to Figure 3 for the field wiring diagram.

After the disconnect switch has been installed, remove the yellow label from the instruction/warranty packet and secure it to the disconnect switch.

#### CONTROL WIRING

See the unit dimension drawing in Figure 5 for the location of the control wire access opening through the base of the compressor compartment. This opening will require a field-supplied 1/2" conduit fitting.

Route the necessary low voltage control wires from terminal block 2TB on the side of the unit control box through this access opening to the indoor unit and to the room thermostat. Refer to Figure 3 for the field wiring diagram.





## TABLE 3 - ELECTRICAL DATA

			Compress	or		Outdoor Fan M	Motors	(½ HP)	Unit	Max.	Min. Wire	Max. Wire	
Mode	el	Power Supply	RLA	LRA	Power Factor	Power Supply	Qty.	FLA (each)	acity, (amps)	Size, <sup>1</sup> (amps)	Size, <sup>2</sup> (AWG)	Length, <sup>3</sup> (feet)	
	25	208/230.3.60	33 @ 208V	183	0.98 @ 208V	208/230-1-60	2	3.4	49	60	6	152 @ 208V	
CH090	20	200/230-3-00	31@230V	100	0.88 @ 230V	200/200 1 00	-					179 @ 230V	
	46	460-3-60	16	91.1	0.88	460-1-60	2	2.0	25	30	10	293	
			43 @ 208V	007	0.98 @ 208V	000/000 1 00	1	2.4	01	00	4	191 @ 208V	
CH120	25	208/230-3-60	39 @ 230V	207	0.88 @ 230V	208/230-1-60	2	3.4	01	80	4	217 @ 230V	
011120	46	460-3-60	20	104	0.88	460-1-60	2	2.0	30	35	10	244	

<sup>1</sup> Dual element, time delay fuses.

<sup>2</sup> Based on three, 60° C insulated copper conductors in steel conduit.

<sup>3</sup> Based on a 3% voltage drop.

#### WIRE SIZING

Refer to the following chart to size the control wiring properly. If the wiring is undersized, voltage drop could become excessive and could cause the logic module to lock out the compressor.

Recommended Wire Size	Maximum Total Circuit Length - Ft.*
#19 Solid	130
#18 Solid	170
#18 Stranded	180
#16 Stranded	270
#14 Stranded	455
#12 Stranded	730

\*To determine the total circuit length, add the following distances:

1-Outdoor Unit to Indoor Unit .					
2-Indoor Unit to Thermostat					
3-Thermostat to Indoor Unit			•		100 Mar
4-Indoor Unit to Outdoor Unit .					
Total Circuit Length	۱.				

#### THERMOSTATS

The room thermostat should be mounted about 5 feet above the floor and located where it will be exposed to normal room air circulation. Do not locate it on an outside wall, near a supply air grille, or where it may be affected by sunlight and/or drafts. Circulation to the thermostat should not be blocked by curtains, drapes, furniture, partitions, etc.

Some installations may require a locking cover to protect the thermostat from tampering and/or damage.

Both the manual and the auto changeover thermostats have non-adjustable, voltage-type anticipators for both cooling and heating.

These 24-volt thermostats have been designed for use with the solid state heat pump logic module. NEVER substitute another thermostat.

Night and weekend <u>set-back</u> will only reduce operating cost if the heat pump system can raise the temperature in the conditioned space without using an excessive amount of resistance heat for recovery. Night and weekend <u>set-up</u> should only be considered for warm climates where the temperature in the conditioned space may rise to unacceptable levels when the system is shut down.

When the 7-day timer is in the "DAY" position, the heat pump will operate as a standard system.

When the 7-day timer switches to the "NIGHT" position, the circuit to the heat pump thermostat will be broken and the unit will not operate until the temperature in the conditioned space drops below the set point of the field-supplied night set-back thermostat or rises above the set point of the field-supplied night set-up thermostat. Although specific temperatures are shown in Figure 4, the actual set points should be determined for each individual job.

When the first stage of the night set-back thermostat calls for heat, the circuit to the heat pump thermostat will be completed and the system should operate on the heating cycle until the first stage of the night set-back thermostat is satisfied. The logic module will initiate defrost cycles when necessary and will lock out the compressor if there's a malfunction.

When the second stage of the night set-back thermostat calls for heat, the electric heat accessory will be energized at its supplemental capacity through terminal W of the heat pump thermostat until the second stage of the night setback thermostat is satisfied – providing the temperature of the outdoor air is below the balance point. If the compressor is locked out, the electric heat accessory will operate at its standby capacity.

When the 7-day timer switches back to the "DAY" position, the heat pump thermostat will be calling for two stages of heat and the electric heat accessory will be energized at its supplemental capacity — providing the temperature of the outdoor air is below the balance point. If the electric heat operates for an extended period of time during this warmup period, night set-back may not reduce the operating cost of the system.

When the night set-up thermostat calls for cooling, the circuit to the heat pump thermostat will be completed and the system should provide cooling until the night set-up thermostat is satisfied.





FIG. 4 - FIELD CONTROL WIRING FOR NIGHT SET-BACK AND SET-UP



(1) If it is necessary to place one side of the unit against a wall, add 12" to the bottom clearance dimension. (2) This dimension equals the height of the corner legs.

Additional height may be required for snow clearance.

## FIG. 5 - UNIT DIMENSIONS AND CLEARANCES YORK DIVISION BORG-WARNER



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## COMPRESSOR CRANKCASE HEATER

Every compressor is protected by a 60 watt line voltage, insert-type crankcase heater to prevent refrigerant from accumulating in the crankcase of a compressor during an "OFF" cycle. The heater will be energized whenever there's power to the unit.

CAUTION: Do not attempt to start the compressor without at least eight hours of crankcase heat or compressor damage will occur.

If a unit has just been installed or the unit disconnect switch has been open for a long period of time, move the system switch on the room thermostat to the "OFF" position before closing the unit disconnect switch. Eight hours of crankcase heat are required to drive the liquid refrigerant out of the compressor before the compressor can be started.

#### **REFRIGERANT PIPING**

#### **GENERAL GUIDELINES**

Many service problems can be avoided by taking adequate precautions to provide an internally clean and dry system and by using procedures and materials that conform with established standards.

Use hard drawn copper tubing where no appreciable amount of bending around pipes or other obstructions is necessary. Use long radius ells wherever possible with one exception – small radius ells for the traps in all vapor risers. If soft copper is used, care should be taken to avoid sharp bends which may cause a restriction.

Pack fiber glass insulation and a sealing material such as permagum around refrigerant lines where they penetrate a wall to reduce vibration and to retain some flexibility.

Support all refrigerant lines at minimum intervals with suitable hangers, brackets or clamps.

Braze all copper to copper joints with Silfos-5 or equivalent brazing material. Do not use soft solder.

Insulate all vapor lines with a minimum of 1/2" ARMA-FLEX or equal. Liquid lines exposed to direct sunlight and/or high temperatures must also be insulated.

Never solder vapor and liquid lines together. They can be taped together for convenience and support purposes, but they must be completely insulated from each other.

#### LINE SIZING

The following factors should be considered when locating the indoor and outdoor units and when sizing the refrigerant lines for a split heat pump system. Refer to Figure 7.

THE LIQUID LINE — The vertical rise should never exceed 60 feet because liquid refrigerant will lose 0.5 psi of static head for each vertical foot.



#### FIG. 7 — FIELD PIPING DIAGRAMS (Cooling/Heating Refrigerant Flow)

The total pressure loss for a field-installed liquid line should never exceed 40 psi because the liquid refrigerant could flash before it reaches the expansion valve. This flashing will not only cause erratic valve operation and poor system performance, but could also damage the expansion valve.

Total pressure loss includes the static head loss explained above plus the friction losses due to the length of the line (table 4) and number of fittings in the line.

#### TABLE 4 - LIQUID LINES

A CONTRACTOR OF THE OWNER		Type "L"	Pressure Drop <sup>4</sup>					
System Model	Refrigerant Flow Rate, <sup>1</sup> (Lbs/Min)	Copper Tubing, (In. OD)	Friction, <sup>2,3</sup> (PSI/100 Ft)	Vertical Rise (PSI/Ft)				
CH090/EH090	22.5	5/8	3.5	0.5				
CH120/EH120	30.0	5/8	5.8	0.5				

<sup>1</sup> Based on refrigerant-22 at the nominal cooling capacity of the system, a liquid temperature of 105° F and a suction temperature of 40° F. Since refrigerant flow rates will be a little lower at the nominal heating capacity of each system, liquid line friction loss should always be based on cooling operation.

 $^{2}$  A maximum of 6 psi is the recommended liquid line friction loss.

<sup>3</sup> These friction losses do not include any allowance for fittings.

<sup>4</sup> The total pressure drop of the liquid line for both friction and vertical rise must not exceed 40 PSI. If the pressure drop exceeds 40 PSI, the liquid refrigerant could flash before it reaches the expansion valve. This flashing will not only cause erratic valve operation and poor system performance, but could also damage the expansion valve.

When the indoor unit is above the outdoor unit, the friction loss through the 1-1/8" OD vapor riser will be more of a limiting factor than the loss of static head in the liquid riser. See Examples #3 and #4 for the VAPOR LINE.

YORK DIVISION BORG-WARNER

THE VAPOR LINE – A vapor line should not only be sized for a friction loss of 3 psi (2°F) but also for the proper return of oil to the compressor during both the cooling and heating cycles.

Friction loss should always be based on cooling operation because refrigerant flow rates will be greater during the cooling cycle than during the heating cycle.

Oil return will be critical during:

- 1. The cooling cycle when the outdoor unit is above the indoor unit (detail 1).
- 2. The heating cycle when the indoor unit is above the outdoor unit (detail 4).

When the indoor unit is above the outdoor unit, the size of the vapor riser must be reduced to 1-1/8" OD so that the velocity of the refrigerant will be great enough to carry oil up the riser during the heating cycle.

NOTE: A double vapor riser (two 7/8" OD lines) should be considered when:

1. The indoor unit is above the outdoor unit.

- 2. The MINIMUM TEMPERATURE CONTROL on the YORKGUARD logic module is set at -10°F, and
- 3. The temperature of the outdoor air may drop below -5°F.

If only 1-3/8" OD tubing will be used, the vapor line can be 156 feet long for a 7½-ton system and 89 feet long for a 10-ton system as shown in **Examples # 1 and # 2**. When 1-1/8" OD tubing must be used for the riser, the maximum length for the vapor line will be greatly reduced as shown in **Examples # 3 and # 4**.

#### EXAMPLES:

	#	1 – 7-1/2-Ton System 156 feet of 1-3/8" OD, type "1" copper tubing
		(156 feet x 1.6 psi/100 feet)
	#	2 - 10-Ton System 89 feet of 1-3/8" OD, type "L" copper tubing (89 feet x 2.8 psi/100 feet) 2.5 psi Fitting*
		0.74/07.0.
	#	3 - 7-1/2-1 on System         51 feet of 1-1/8" OD, type "L"copper tubing (vertical)         (51 feet x 4.7 psi/100 feet)         6 feet of 1-3/8" OD, type "L" copper tubing (horizontal)         (6 feet x 1.6 psi/100 feet)
		Maximum Vapor Line Pressure Drop = 3.0 psi
-	#	4 – 10-Ton System 29 feet of 1-1/8" OD, type "L" copper tubing (vertical)
000	0,040	(29 feet x 8.0 psi/100 feet) 2.3 psi 7 Feet of 1-3/8" OD, type "L" copper tubing (horizontal)
		(7 feet x 2.8 psi/100 feet) 0.2 psi
		Maximum Vapor Line Pressure Drop = 3.0 psi

\* Determine the pressure drop of the fittings for each installation — DO NOT use the estimated values as shown in the above examples. Although longer vapor lines are permissible, friction losses exceeding 3 psi (2°F) will reduce system capacity in both the cooling and heating cycles.

EXAMPLE: A 10-ton system with the indoor unit over the outdoor unit, a 60-foot vertical rise (1-1/8" OD), a 7-foot horizontal run (1-3/8" OD) and a 20% allowance for fittings will have the following losses:

Vapor line friction loss								6 psi (4°F)
Heating capacity loss .								6.7%
Cooling capacity loss .								7.0%

#### TABLE 5 - VAPOR LINES1,2,3

System Model	Refrigerant Flow Rate, <sup>4</sup> (Lbs/Min)	Type "L" Copper Tubing (In. OD)	Friction Loss, <sup>5,6</sup> (PSI/100 Ft)
011000/511000	225	1-1/8	4.7
CH090/EH090	22.5	1-3/8	1.6
CU120/EU120	20.0	1-1/8	8.0
CH120/EH120	30.0	1-3/8	2.8

<sup>1</sup> All horizontal vapor lines should be pitched at least 1 inch every 20 feet in the direction of the refrigerant flow to aid the return of oil to the compressor.

- <sup>2</sup> All vapor lines with a vertical rise exceeding 25 feet should be trapped every 15 or 20 feet. Small radius traps will provide drainage points for the oil which is in the riser when the circuit is deactivated. When the circuit is reactivated, the oil will be returned to the compressor more quickly and in smaller slugs.
- <sup>3</sup> Every vapor riser greater than 3 feet in height should have a small radius trap at the bottom to facilitate the return of oil to the compressor.
- <sup>4</sup> Based on refrigerant-22 at the nominal cooling capacity of the system, a suction temperature of 40° F and a liquid temperature of 105° F. Since refrigerant flow rates will be a little lower at the nominal heating capacity of each system, vapor line friction loss should always be based on cooling operation.
- <sup>5</sup> Although vapor lines should be sized for a friction loss equivalent to a 2°F change in saturation temperature (or approximately 3 psi), sizing the lines for the proper return of oil is more important.
- <sup>6</sup> These friction losses do not include any allowance for fittings. Only use a 1-1/8" riser when the indoor unit is above the outdoor unit.

#### SERVICE VALVES

These outdoor units have both vapor and liquid line service valves.

Both valves are shipped from the factory front-seated and closed with the valve stem in the maximum clockwise position.

These service values are the back-seating type and have a 1/4" male flare access port for evacuating and charging the system.

Shrader access valves are provided on the compressor suction and discharge lines for pressure checking the system.

All access ports are sealed with a removable cap. Never remove a cap unless the valve is fully back-seated with its valve stem in the maximum counter-clockwise position because the refrigerant charge will be lost.



#### **INSTALLATION**

Since these units are shipped with a holding charge of refrigerant-22, they can be checked for a refrigerant leak by opening the access port on the liquid line service valve as follows:

- 1. Open the valve by turning the stem to its maximum counter-clockwise position.
- 2. Remove the cap from the access port.
- 3. Turn the stem in (or clockwise) between 1/4 and 1/2 turn to open the access port.

As soon as some internal pressure is relieved, close the access port. DO NOT release the entire holding charge.

#### TABLE 6 - REFRIGERANT LINE CHARGE<sup>1</sup>

Refrigerant Line <sup>2</sup>	Line Size, OD (In.)	Refrigerant Charge (Lb/Ft)
Liquid	5/8	0.113
Manag	1-1/8	0.012
vapor	1-3/8	0.013

<sup>1</sup> Charges are based on 40°F suction temperature and a 105°F liquid temperature.

<sup>2</sup> Type "L" copper tubing.

Use these line charges to adjust the system operating charge when the refrigerant lines are more or less than the 25 feet listed in Table 2.

NOTE: The copper disc on the liquid connection will prevent any internal pressure from being relieved through the main port of the liquid line stop valve.

If the unit has already lost its holding charge, it should be leak tested per Form 55.05-NM and the necessary repairs should be made. If the unit has maintained its holding charge, you can assume that it has no leaks and proceed with the installation.

CAUTION: When making a brazed connection, use a piece of asbestos as a shield between the joint and the unit to protect the exterior of the unit. Wrap a wet rag around all tubing inside the unit for additional protection.

Dry nitrogen should always be supplied through a connection while it is being brazed or unbrazed because the temperature required to make or break a brazed joint is sufficiently high to cause oxidation of the copper unless an inert atmosphere is provided. The flow of nitrogen should be continued until the joint has cooled.

WARNING: The dry nitrogen must always be supplied through a pressure regulating valve.

Before installing the liquid line between the outdoor and indoor units, remove the copper disc from the liquid connection on the outdoor unit per the following procedure:

- 1. Make sure that the liquid service valve on the unit is front-seated and closed. The valve stem should be turned to its maximum clockwise position.
- 2. Drill a small hole through the disc before unbrazing it to permit a flow of dry nitrogen through the connection while it is being unbrazed.

WARNING: This hole is also required to prevent the internal pressure from building up as the disc is being unbrazed and from blowing the disc off.

> This warning applies to any disc being removed from a service valve, coil connection, etc.

- 3. Remove the cap from the 1/4" access port on the liquid line stop valve.
- 4. Connect a supply of dry nitrogen to this access port.
- 5. Unbraze the copper disc from the liquid connection while maintaining a minimum flow of dry nitrogen through the connection.

#### After the disc has been removed,

1. Burnish the external surfaces of the liquid connection on the outdoor unit and the end of the field-supplied piping being used for the liquid line.

NOTE: Clean surfaces are essential for a well brazed connection.

- 2. Carefully clean the internal surfaces of the above. Any particles left on these surfaces may lead to a future system malfunction.
  - NOTE: Use only copper tubing that has been especially cleaned and dehydrated for refrigerant use. If the tubing has been open for an extended period of time, it should be cleaned before being used.

The liquid line connections can now be brazed while maintaining a minimum flow of dry nitrogen through the piping.

NOTE: A filter-drier is factory-mounted in the outdoor unit for the heating cycle and in the indoor unit for the cooling cycle.

> Do NOT install another filter-drier in the fieldsupplied liquid line because refrigerant will flow in both directions on a heat pump system.



Although the holding charge of the indoor unit will be lost, remove the sealing caps or discs from both its liquid and vapor connections per the following procedure:

- 1. Drill a small hole through both the liquid disc and the vapor disc to relieve the coil's holding charge. If the holding charge has already been lost, the coil should be leak-tested per Form 55.05-NM and the necessary repairs should be made.
- 2. Move the dry nitrogen supply from the access port on the liquid line service valve of the outdoor unit to the hole through the vapor disc on the indoor unit.
- 3. Unbraze the coil's liquid line disc while maintaining a flow of dry nitrogen across the connection and through the hole in the liquid line disc.
- 4. After the disc has been removed, burnish the external surfaces and clean the internal surfaces as outlined above.
- 5. Move the dry nitrogen supply back to the access port on the liquid line service valve.
- 6. Braze the liquid line to the liquid connection on the indoor unit while maintaining a minimum flow of dry nitrogen through the liquid line, the indoor coil and the hole in the vapor disc.
- 7. Unbraze the disc on the vapor connection of the indoor unit while maintaining the flow of dry nitroger.
- 8. After the disc has been removed, burnish the external surfaces and clean the internal surfaces as outlined above.

The vapor piping can now be brazed to the vapor connection on the indoor unit while maintaining a minimum flow of dry nitrogen.

Before brazing the vapor line to the outdoor unit, remove the copper disc from its vapor connection per the following procedure:

- 1. Make sure that the vapor line service valve on the outdoor unit is front-seated and closed with its valve stem in the maximum clockwise position.
- 2. Drill a small hole through the disc before unbrazing it to permit a flow of dry nitrogen through the connection while it's being unbrazed.
- 3. Move the dry nitrogen supply to the access port on the vapor line service valve of the outdoor unit.
- 4. Unbraze the disc on the vapor line connection of the outdoor unit while maintaining a minimum flow of dry nitrogen through the access port of the vapor line service valve and the hole in the vapor disc.

5. After the disc has been removed, burnish the external surfaces and clean the internal surfaces of the vapor connection and the vapor piping.

The vapor line can now be brazed to the vapor connection on the outdoor unit while maintaining the flow of dry nitrogen.

After the liquid and vapor lines have been installed, the system should be evacuated and charged.

## EVACUATING AND CHARGING

Detailed procedures given in Instruction 55.05-NM should be followed to assure a properly operating and trouble free system.

Make sure that the liquid and vapor line service valves are front-seated and closed. Connect a vacuum pump through a charging manifold to the access ports on both of these valves.

NOTE: The vacuum pump connections should be short and no smaller than 3/8" O.D.

The refrigerant lines and the indoor coil can now be evacuated without disturbing the outdoor coils or the compressor.

After proper evacuation and dehydration, charge the required weight of refrigerant through the access port on the liquid line service valve.

CAUTION: Do not charge liquid refrigerant through the compressor suction connection.

If all of the refrigerant cannot be added through the liquid line, open the liquid and vapor line service valves fully. Turn the stem of both service valves clockwise 1/4 turn to open their access ports.

Start the system on cooling (after 8 hours of crankcase heat), and charge the rest of the refrigerant through the access port on the vapor line service valve.

Open the liquid and vapor line service valves fully to close their access ports after the system has been charged.

CAUTION: Never operate the compressor while under a deep vacuum.

> DO NOT ATTEMPT TO START THE COMPRESSOR WITHOUT AT LEAST 8 HOURS OF CRANKCASE HEAT OR COMPRESSOR DAMAGE WILL OCCUR.



#### FIG. 8 - REFRIGERANT FLOW DIAGRAM

#### **BALANCE POINT SETTING**

The balance point of a heat pump is the lowest temperature at which the refrigeration system can heat the building without any supplemental resistance heat.

The balance point is dependent upon -

- 1. The outdoor design temperature,
- 2. The building heat loss at the outdoor design temperature, and
- 3. The heating capacity of the system at the outdoor design temperature.

Refer to Form 515.40-AD2 to determine balance point.

After the balance point has been determined, locate the jumper wire which is factory-mounted on the 35 degree terminal. See Figure 9. If this is not the correct setting, move the wire to the terminal that is equal to or higher than the balance point.

(Example) If balance point is determined to be  $29^{\circ}$ F, the jumper wire should be placed on terminal 31. This determines the outdoor temperatures at which the supplemental heat can be energized (in this case  $31^{\circ}$ F). For low operating cost, the supplemental heaters should not be energized when the heat pump can supply the required heat.

#### Yorkguard<sub>TM</sub> LOGIC MODULE

This solid state logic module is the control center of the CHAMPION SPLIT SYSTEM HEAT PUMP. It monitors the demand signal from the room thermostat, examines the input from the four sensors (OUTDOOR, DISCHARGE, DEFROST, LIQUID) and determines if the heat pump and/or the electric heat accessory should operate.

A The OUTDOOR TERMINALS are connected to a sensor that is located under the control box but above the base of the compressor compartment. From this protected location, the sensor will monitor the temperature of the outdoor air.

When the outdoor temperature drops below -10°F,

- The MINIMUM TEMPERATURE CONTROL will lock out the compressor to prevent operation at high compression ratios and low efficiencies. The minimum temperature can be set at -10, 0, 10 or 20°F by moving the jumper to the proper terminal.
- (2) The STANDBY HEATER CONTROL will allow the second stage of the room thermostat to cycle the electric heat accessory at its standby capacity.

When the outdoor temperature drops below the setting (3) of the BALANCE POINT TERMINAL, the logic module will allow the second stage of the room thermostat to cycle the electric heat accessory at its supplemental capacity. The balance point can be set at 43, 39, 35, 31, 27 or 23°F by moving the jumper to the proper terminal. Electric heat will be locked out when the outdoor temperature is above the balance point.

- B The DISCHARGE TERMINALS are connected to a sensor that is externally clamped to the compressor discharge line and well insulated to minimize the influence of ambient temperature.
- 4 275°F, the DISCHARGE TEMPERATURE CONTROL will shut down the compressor.
- 5 If the unit's high pressure switch opens at 398 PSIG, the DISCHARGE PRESSURE CONTROL will shut down the compressor.

6) Whenever the compressor is shut down by a safety control, the COMPRESSOR LOCKOUT CONTROL will prevent it from restarting.

7) The circuit to terminal 9 on the logic module must be opened before the COMPRESSOR LOCKOUT RESET will allow the compressor to restart. This can be done at the thermostat or the unit.



C The DEFROST TERMINALS are connected to a pressure differential switch that is mounted on the rear panel of the compressor compartment. This switch has two ports -

- One port is open to the atmospheric pressure within the compressor compartment.
- The second port has an interconnecting tube that is open to the negative pressure between the outdoor coil and the outdoor fans.

If any frost forms on the coil, a greater pressure drop across the coil will increase the negative pressure between the coil and the fans. If the pressure differential between the switch's two ports reaches 0.55 IWG (CH090) or 0.50 IWG (CH120), the switch will close and the DEFROST CYCLE TIMER will start to measure time.

If the pressure differential switch remains closed for 12 seconds (or for an accumulation of 12 seconds more than it's been open), the DEMAND DEFROST CYCLE will initiate a defrost cycle. Although gusty winds may cause the pressure differential switch to close temporarily, the 12-second requirement will prevent unnecessary defrost operation.

Two other conditions must also be satisfied before a defrost cycle can be initiated.

• The temperature of the liquid line must be less than 39°F while the timer is measuring 12 seconds of accumulated time before the DEFROST ACTUATION

 cumulated time before the DEFROST ACTUATION LIQUID TEMPERATURE CONTROL will permit a defrost cycle, and

• Five minutes must elapse between the termination of one defrost cycle before the REPEAT DEFROST LOCKOUT will permit another. If the heat pump tries to defrost in less than five minutes, the COM-PRESSOR LOCKOUT CONTROL will lock out the compressor to prevent excessive defrost operation when snow or debris is blocking the outdoor coil or

D The LIQUID SENSOR TERMINALS are connected to a sensor that is externally clamped to one of the refrigerant connections on the outdoor coil. This sensor monitors the temperature of the liquid refrigerant:

when the defrost switch is malfunctioning.

- leaving the outdoor coil during the cooling and defrost cycles, and
- entering the outdoor coil during the heating cycle.

- (12) The DEFROST TERMINATION CONTROL will terminate a defrost cycle when the liquid line temperature rises above 75°F.
- 13 The DEFROST TERMINATION OVER-RIDE TIMER will terminate a defrost cycle ten minutes after initiation even if gusty winds prevent the liquid line temperature from rising above 75°F.
- (1) The DEFROST ACTUATION LIQUID TEMPERA-TURE CONTROL will not permit a defrost cycle unless the temperature of the liquid line is below 39°F.

Whenever the compressor shuts down (due to a satisfied thermostat, a power failure, etc.), the COMPRES-

(4) SOR ANTI-CYCLE TIMER will prevent it from restarting for five minutes to prevent short cycling and to allow time for system pressures to equalize.

A service analyzer is available to start-up and troubleshoot these Champion split system heat pumps. The analyzer has an electrical connector that can be 15 plugged into the TEN-PIN TERMINAL on the logic module. A unit plug connector must be removed from this terminal before the analyzer can be connected.



 A SERVICE TIMER OVER-RIDE can be plugged into the logic module to bypass the COMPRESSOR ANTI-CYCLE TIMER. This will eliminate the 5-minute compressor start delay when a service man is troubleshooting a unit.

When the system switch on the room thermostat is in the emergency position, the BALANCE POINT OVER-RIDE will allow the first stage of the room thermostat to cycle the electric heat accessory at its standby capacity even if the temperature of the outdoor air is above the balance point.

 The emergency heat light on the room thermostat will
 be energized at half brilliance through the MALFUNC-TION LIGHT CONTROL when a system malfunction occurs. The emergency heat light will be energized at full brilliance through the thermostat sub-base when the system switch on the room thermostat is in the emergency heat position.

## **OPERATION**

During the cooling cycle, operation will be the same as any conventional air conditioning system. Figure 8 illustrates the flow of refrigerant through the system when the reversing valve solenoid is energized.

During the heating cycle, compressor discharge gas will be diverted to the indoor coil and the outdoor coil will become the evaporator. Figure 8 illustrates the flow of refrigerant through the system when the reversing valve solenoid is deenergized.

CAUTION: Reversing valves and check valves are precise mechanical devices and will not tolerate any mechanical abuse such as hammering. If a refrigerant system isn't properly cleaned after a compressor burn-out, scale may build up at these devices and prevent them from operating properly.

#### SYSTEM SEQUENCE OF OPERATION

The following sequences of operation are based on using manual changeover thermostat 2TH11701324. Refer to Figure 6 for the unit wiring diagram.

#### **COOLING OPERATION**

- When the system switch of the room thermostat is in 1. the "COOL" position, relay 2R will be energized through terminal 0 of the room thermostat and the reversing valve solenoid will be energized through contact 2R-2 to put the system in the cooling mode.
- 2. If the fan switch of the room thermostat is in the "ON" position, supply air blower motor contactor 10M of the indoor unit will be energized through the fan switch to provide continuous blower operation. If the fan switch is in "AUTO" position, contactor 10M will be energized through TC1 and the fan switch to provide intermittent blower operation.
- 3. Power must be supplied to terminal 1 of the logic module for five minutes before the compressor can operate.
- 4. When TC1 of the room thermostat closes on a demand for cooling, a circuit will be made through the logic module to energize compressor contactor 1M and to start the compressor. Outdoor fan contactor 2M will be energized through contacts 1R-1 and 1M. Both outdoor fan motors will operate if the ambient temperature is above 65°F. Thermostat 1TH will lock out fan motor #1 when the ambient temperature is below 65°F.
- 5. Although the thermostat will cycle the system to satisfy the cooling requirement of the conditioned space, the 5-minute anti-cycle timer of the logic module will prevent the system from short cycling. This timer will also provide a 5-minute delay after a power interruption.

- If the discharge pressure reaches 398 psig or the discharge temperature reaches 275°F, the logic module will lock out the compressor. The emergency light on the thermostat will be energized (at half brilliance) to indicate that a malfunction has occurred.
- If the control that caused the lockout has automati-7. cally reset, the unit can be restarted by:
  - Turning the system switch of the room thermostat a. to the "OFF" position and back to the "COOL-ING" position. The compressor will restart providing it has been off for at least 5 minutes.
  - Increasing the set point of the room thermostat b. above the temperature in the conditioned space and then returning it to its original setting. The compressor will restart providing it has been off at least 5 minutes
  - Opening and closing the disconnect switch for the main power supply to the outdoor unit. Since this method will reset the logic module, the compressor will not start for 5 minutes.

#### HEATING OPERATION

- 1. When the system switch of the room thermostat is in the "HEAT" position, the reversing valve solenoid will be de-energized and the system will be in the heating mode.
- If the fan switch of the room thermostat is in the "ON" 2. position, supply air blower motor contactor 10M of the indoor unit will be energized through the fan switch to provide continuous blower operation. If the fan switch is in "AUTO" position, contactor 10M will be energized through TH1 and the fan switch to provide intermittent blower operation.
- 3. Power must be supplied to terminal 1 of the logic module for 5 minutes before the compressor can operate.
- 4. When TH1 of the room thermostat closes on a demand for first-stage heat, a circuit will be made through the logic module to energize compressor contactor 1M and to start the compressor. Outdoor fan contactor 2M will be energized through contacts 1R-1 and 1M. Both outdoor fan motors will operate. At ambient temperatures below 65°F, fan motor #1 will be energized through contact 2R-1.
- 5. Although the thermostat will cycle the system to satisfy the heating requirement of the conditioned space, the 5-minute anti-cycle timer of the logic module will prevent the system from short cycling. This timer will also provide a 5-minute delay after a power interruption.



- 0
- 6. If the discharge pressure reaches 398 psig or the discharge temperature reaches 275°F, the logic module will lock out the compressor. The emergency light on the thermostat will be energized (at half brilliance) to indicate that a malfunction has occurred.
- 7. If the control that caused the lockout has automatically reset, the unit can be restarted by:
  - (1) Turning the system switch of the room thermostat to the "OFF" position and back to the "HEAT-ING" position. The compressor will restart providing it has been off for at least 5 minutes.
  - (2) Decreasing the set point of the room thermostat below the temperature in the conditioned space and then returning it to its original setting. The compressor will restart providing it has been off for at least 5 minutes.
  - (3) Opening and closing the disconnect switch for the main power supply to the outdoor unit. Since this method will reset the logic module, the compressor will not start for 5 minutes.
- 8. When TH2 of the room thermostat closes on a demand for second-stage heat and the temperature of the outdoor air is below the balance point, the electric heat accessory will be energized at its supplemental capacity by means of a circuit through the logic module, terminals 60 and 66, and heater contactors 12M and 14M.
- 9. If the temperature of the outdoor air is above the balance point, the logic module will not allow supplemental heat.

#### DEFROST CYCLE

If condensate freezes on the outdoor coil during heating operation,

- 1. The pressure drop across the outdoor coil will increase, defrost switch DS will close and the defrost cycle timer of the logic module will start to measure time.
- If the defrost switch remains closed for 12 seconds (or for an accumulation of 12 seconds more than it's been open) and the temperature of the liquid refrigerant remains below 39°F, defrost relay 1R will be energized through a circuit in the logic module.
- 3. Contact 1R-1 will open to de-energize contactor 2M and both outdoor fan motors.
- 4. Contact 1R-2 will close to energize the reversing valve solenoid, and the system will switch to the cooling cycle.

5. Contact 1R-3 will close and contact 1R-4 will open to energize the electric heat accessory at its defrost capacity to prevent the distribution of cold air in the conditioned space during the defrost cycle.

The logic module will de-energize defrost relay 1R to terminate a defrost cycle when:

- 1. The temperature of the liquid refrigerant exceeds 75°F, or
- 2. The defrost cycle has lasted 10 minutes.

If a lockout occurs during the defrost cycle, defrost relay 1R will be de-energized to allow the system to start on the normal heating cycle when the system restarts following the lockout.

If the system tries to defrost within 5 minutes after completing a defrost cycle, YORKGUARD will lock out the system.

#### OPERATION BELOW THE SETTING OF THE MINIMUM OUTDOOR TEMPERATURE CONTROL ON THE LOGIC MODULE

When the temperature of the outdoor air drops below the set point of the MINIMUM TEMPERATURE CONTROL,

- 1. The logic module will lock out the compressor.
- 2. Second-stage heat TH2 of the room thermostat will cycle the electric heat accessory at its stand-by capacity.
- 3. The supply air blower motor of the indoor unit will cycle with first-stage heat TH1 of the room thermostat if the fan switch is in the "AUTO" position.

Although the system can operate at outdoor temperatures down to  $-10^{\circ}$ F, the set point of the minimum temperature control on the logic module can be increased to 0, +10 or +20°F by repositioning the jumper wire on the logic module.

#### EMERGENCY HEAT OPERATION

When the system switch on the room thermostat is placed in the emergency heat position,

- 1. The emergency heat light on the room thermostat will be energized at full brilliance.
- 2. The compressor will be locked out.
- 3. First-stage heat TH1 of the room thermostat will cycle the electric heat accessory at its standby capacity.
- 4. First-stage heat TH1 of the room thermostat will also cycle the supply air blower motor of the indoor unit if the fan switch is in the "AUTO" position.

## START-UP

#### **CRANKCASE HEATER**

The crankcase heater must be energized at least 8 hours before starting the compressor. To energize the crankcase heater, the main disconnect switch must be closed. During this 8 hour period, the system switch on the room thermostat must be open to prevent the compressor from starting.

CAUTION: DO NOT ATTEMPT TO START THE COMPRESSOR WITHOUT AT LEAST 8 HOURS OF CRANKCASE HEAT. COMPRESSOR DAMAGE WILL OCCUR.

Make sure that the bottom of the compressor shell is warm to the touch to prove crankcase heater operation.

#### PRE-START CHECK

Before starting the unit, complete the following check list:

- 1. Have sufficient clearances been provided?
- 2. Has all foreign matter been removed from the interior of the unit (tools, construction or shipping materials, etc.)?
- 3. Have the outdoor fans been rotated manually to check for free rotation?
- 4. Are all wiring connections tight?
- 5. Does the available power supply agree with the nameplate data on the unit?
- 6. Have the fuses, disconnect switch and power wire been sized properly?
- 7. Have the jumpers for the BALANCE POINT TEMPERA-TURE and the MINIMUM OUTDOOR TEMPERATURE been moved to the proper terminals on the logic module?
- 8. Are all four compressor hold-down nuts tightly secured?
- 9. Are any refrigerant lines touching each other or any sheet metal surface? Rubbing due to vibration could cause a refrigerant leak.

- 10. Are there any visible signs of a refrigerant leak, such as oil residue?
- 11. Is any electrical wire laying against a hot refrigerant line? Keep in mind that this unit has a reverse cycle and that different lines will be hot during the "HEAT" and "COOL" cycles. Only two lines will remain cool for all cycles – the line between the compressor and the accumulator and the line between the accumulator and the reversing valve.

#### **INITIAL START-UP**

- 1. Supply power to the unit through the disconnect switch at least 8 hours prior to starting the compressor.
- 2. Move the system switch on the room thermostat to the "COOL" position, and lower its set point to energize both the compressor and the reversing valve. Cool air will be supplied to the conditioned space.
- Check the compressor amperage. It should not exceed the RLA rating printed on the unit data plate or in Table 3 unless the ambient temperature is above 105°F.
- 4. Move the system switch on the room thermostat to the "HEAT" position, and increase the set point of the room thermostat until heating is required. The compressor will run, but the reversing valve will be de-energized. Warm air will be supplied to the conditioned space.
- 5. Check the operation of the indoor unit per Form 515.40-N2.
- 6. Check the entire system for refrigerant leaks.
- 7. Check for any abnormal noises and/or vibrations, and make the necessary adjustments to correct (e.g. fan blade touching shroud, refrigerant lines hitting on sheet metal, etc.)
- 8. After the unit has been operating for several minutes, shut off the main power supply at the disconnect switch and inspect all factory wiring connections and bolted surfaces for tightness.

## SAFETY FEATURES

- 1. All outdoor fan motors have inherent protection with automatic reset.
- 2. Every compressor is internally protected against excessive current and temperature by a line break motor protector that is mounted inside the compressor housing and is connected between each winding and the common terminal.

This motor protector will interrupt power to the compressor if any of the following overload conditions occur:

- a. primary single phasing
- b. locked rotor
- c. compressor overload
- d. insufficient motor cooling

This type of motor protection works even with the contactor welded closed.

The compressor initially uses "white oil". If oil must be added in the field, Suniso 3GS or equivalent may be used. These compressors DO NOT contain an internal Pressure Relief valve.

 Every compressor is protected by a 60 watt line voltage, insert-type crankcase heater to prevent refrigerant from accumulating in the crankcase of a compressor during an "OFF" cycle. The heater will be energized whenever there's power to the unit.

CAUTION: Do not attempt to start the compressor without at least eight hours of crankcase heat or compressor damage will occur.

- 4. Both outdoor fan motors and the secondary of the control transformer are grounded.
- 5. The YORKGUARD logic module will lock out the compressor whenever its discharge temperature exceeds 275°F or its discharge pressure exceeds 398 psig. This lock-out will prevent the compressor from short cycling when the system is low on charge or experiencing some other problem.
- 6. A fusible plug on the top of the suction line accumulator serves as a high temperature/high pressure relief device.

#### MAINTENANCE

#### CLEANING

Do not allow dirt to accumulate on the outdoor coil. Clean the coil with a brush or vacuum cleaner as often as necessary to assure good system performance and efficient operation. If the coil is extremely dirty, it may be necessary to use an industrial grade detergent and a hose to clean the fin surface.

#### LUBRICATION

The outdoor fan motors are equipped with factory lubricated and sealed ball bearings, requiring no maintenance.

#### **REPLACEMENT PARTS**

Contact your local York Distribution Center for replacement compressors, fan motors, controls, etc.

#### SECURE OWNER'S APPROVAL

WHEN THE SYSTEM IS FUNCTIONING PROPERLY, SECURE THE OWNER'S APPROVAL. SHOW HIM THE LOCATION OF ALL DISCONNECT SWITCHES AND THE THERMOSTAT. TEACH HIM HOW TO START AND STOP THE UNIT, HOW TO ADJUST TEMPERATURE SETTINGS WITHIN THE LIMITATIONS OF THE SYSTEM, HOW THE DEFROST CYCLE IS CONTROLLED AND HOW THE ANTI-CYCLE TIMER OPERATES.

#### NOTICE TO OWNER

If a lockout occurs, check the indoor filters and the outdoor coil before calling a serviceman. If the filters are dirty, clean or replace them. If there is an accumulation of snow, leaves or debris blocking the outdoor air coil, remove the blockage. Reset the thermostat and wait 5 minutes. If the unit doesn't start, call a serviceman.





BORG WARNER® Borg-Warner Central Environmental Systems Inc. P.O. Box 1592 York, PA 17405, U.S.A.

# MAINT. & OPERATION

RESTROOM RENOVATIONS

BLDGS. M-201, M-121, M-319, M-418, M-403 & PT-5 (B-3855)

CAMP LEJEUNE, N. C.



OPERATION AND MAINTENANCE MANUAL

REPAIR INTERIOR/EXTERIOR BUILDING M-201 CONSTRUCT HEADS IN M-201, M-121, M-319, M-418, M-403 AND PT-5 MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

CONTRACT NUMBER: N62470-88-C-3855

SUBMITTED BY: HUMPHREY MECHANICAL, INC. 2421A N. MARINE BLVD. JACKSONVILLE, NC 28546 PHONE: 919-455-1418 FAX: 919-455-2215





REPAIR INTERIOR/EXTERIOR BUILDING M-201, CONSTRUCT HEADS IN M-201, M-121, M-319, M-418, M-403 AND PT-5 MCB, CAMP LEJEUNE, NC N62470-86-C-9516

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REPAIR INTERIOR/EXTERIOR BUILDING M-201, CONSTRUCT HEADS IN M-201, M-121, M-319, M-418, M-403 AND PT-5 MCB, CAMP LEJEUNE, NC N62470-86-C-9516

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BATH EXHAUST FANS

L'ONGLEY SUPPLY COMPANY P. D. BOX 3809 WILMINGTON, NC 28406 PHONE: 1-800-672-0444

WATER HEATERS





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BACK Flow Preventer





## **TAB PLACEMENT HERE**

## **DESCRIPTION:**

38TG042

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# 38TG Air Conditioning Unit

# Installation and Start-Up Instructions

#### SAFETY CONSIDERATION

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency or your distributor or branch for information or assistance. The qualified installer or agency must use factory authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and NEC (National Electrical Code) for special installation requirements.

## A WARNING

Before installing or servicing system, always turn off main power to system. There may be more than one disconnect switch. Turn off accessory heater power if applicable. Electrical shock can cause personal injury or death.

#### Step 1—Check Equipment and Jobsite

UNPACK UNIT-Move to final location. Remove carton taking care not to damage unit.

INSPECT EQUIPMENT for damage prior to installation. File claim with shipping company if shipment is damaged or incomplete. Locate unit rating plate on unit corner panel (see Fig. 2). It contains information needed to properly install unit. Check rating plate to be sure unit matches job specifications.

Step 2—Install on a Solid, Level Mounting Pad—If conditions or local codes require the unit be attached to pad, tiedown bolts should be used and fastened thru knockouts provided in unit base pan. Refer to unit mounting pattern in Fig. 2 and Table 1 to determine basepan size and knockout hole location.

When installing, allow sufficient space for airflow clearance, wiring, refrigerant piping and service. Allow 30-in. (762mm) clearance to service end of unit and 48 ins. (1219mm) above unit. For proper airflow, a 6-in. (152mm) clearance on one side of unit and 12 ins. (305mm) on all remaining sides must be maintained. Maintain a distance of 24 ins. (610mm) between air conditioners. Position so snow or ice from roof or eaves cannot fall directly on unit.

On rooftop applications, locate unit at least 6 ins. (152mm) above roof surface. Where possible, place unit above a load-bearing wall.

Arrange supporting members to adequately support unit and minimize transmission of vibration to building. Consult local codes governing rooftop applications.



Fig. 1—Model 38TG

Step 3—Replace Indoor AccuRater Piston, if Required— Check indoor coil piston to see if it matches the required piston shown on unit rating plate Fig. 2. If it does not match, replace indoor coil piston with piston shipped with this unit. The piston shipped with outdoor unit is correct for any approved indoor coil combination.

#### A CAUTION

DO NOT BURY MORE THAN 3 FT (.91m) OF REFRIGERANT TUBING IN GROUND. If any section of tubing is buried, there must be a 6-in. (152mm) vertical rise to the valve connections on the outdoor unit. If more than the recommended length is buried, refrigerant may migrate to cooler buried section during extended periods of unit shutdown, causing refrigerant slugging and possibly compressor damage at start-up.

Step 4—Make Piping Connections—Outdoor units may be connected to indoor sections using accessory tubing package or field-supplied tubing of refrigerant grade, correct size, and condition. The liquid- and vapor-tube diameters can be determined by using Table 2. For tubing requirements beyond 50 ft. (15.24m), obtain information from your local distributor.

If either refrigerant tubing or indoor coil is exposed to atmospheric conditions for longer than 5 minutes, it must be evacuated to 1000 microns to eliminate contamination and moisture in the system.

Run refrigerant tubes as directly as possible, avoiding unnecessary turns and bends. Suspend refrigerant tubes so they do not damage insulation on vapor tube and do not

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Catalog No. 563-950

Printed in U.S.A.

Form 38TG-3SI Pg 1

3-90

Replaces: 38TG-2SI



Fig. 2—Unit Reference Drawing

Table 1—Basepan Dimensions

and the second					C		D		E	
UNIT	A	A		В				(mm)	(IN.)	(mm)
CITE	(FT/IN.)	(mm)	(FT/IN.)	(mm)	(IN.)	(mm)	(IN.)	(mm)	(intely	1707
SILE	(1 1/1/4-)		41 40 41011	E71 E	9.3/16"	207.3	4-1/8"	103.4	7-1/8"	179.7
014-036	2'-2-3/16"	665.1	1'-10-1/2	571.5	0-0/10	007.0	E!!	127.0	9-11/16"	245.0
042.060	2'-9"	837.5	2'-6"	762.0	8-3/16"	207.3	0	121.0	011110	

transmit vibration to structure. Also, when passing refrigerant tubes through wall, seal opening so vibration is not transmitted to structure. Leave some slack in refrigerant tubes between structure and unit to absorb vibration.

OUTDOOR UNITS CONNECTED TO FACTORY APPROVED INDOOR UNITS—Outdoor units contain correct system refrigerant charge for operation with indoor unit of the same size when connected by 25 ft (7.62m) of field-supplied or factory accessory tubing. Check refrigerant charge for maximum efficiency (see Refrigerant Charging).

CONNECT REFRIGERANT TUBING to fittings on outdoor unit vapor and liquid service valves (see Fig. 2).

SWEAT CONNECTION-Use refrigerant grade tubing.

## A CAUTION

A brazing shield MUST be used when tubing sets are being brazed to the service valves to prevent damage to the unit surface.

## A CAUTION

To avoid valve damage while brazing, service valves MUST be wrapped with a heat-sinking material such as a wet cloth.

Service valves are closed from factory and ready for brazing. After wrapping the service valve with a wet cloth, the tubing set can be brazed to the service valve using either silver bearing or non-silver bearing brazing material. Consult local code requirements. Refrigerant tubing and indoor coil are now ready for leak testing. This check should include all field and factory joints.

Step 5—Make Electrical connections—Be sure field wiring complies with local and national fire, safety and electrical codes, and voltage to system is within limits shown on unit rating plate. Contact local power company for correction of improper voltage. See unit rating plate for recommended circuit protection device (see Fig. 2).

**NOTE:** Operation of unit on improper line voltage constitutes abuse and could affect unit reliability. See unit rating plate. Do not install unit in system where voltage or phase imbalance (3 phase) may fluctuate above or below permissible limits.



2

NOTE: Use copper wire only between disconnect switch and unit.

INSTALL BRANCH CIRCUIT DISCONNECT PER NEC of adequate size to handle unit starting current, but not larger than max. fuse size shown on unit rating plate. Locate disconnect within sight from and readily accessible from unit, per Section 440-14 of NEC (National Electrical Code).

ROUTE GROUND AND POWER WIRES—Remove access panel and control box cover to gain access to unit wiring. Extend wires from disconnect through power wiring hole provided (see Fig. 2) and into unit control box. Size wires per NEC, but not smaller than min. wire size shown on unit rating plate.

CONNECT GROUND AND POWER WIRES—Connect ground wire to ground connection in control box for safety. Connect power wiring to contactor as shown in Fig. 3 and Fig. 4.

CONNECT CONTROL WIRING—Route 24-v control wires through control wiring grommet and connect to brown & blue pigtails supplied in unit splice box (see Fig. 5).

→ Use furnace or fan coil transformer as 24-v supply for system as shown in Fig. 5, or use accessory transformer. Most systems require minimum 40VA; except 60VA is required for 050 and 060 size units or units installed with liquid line solenoid valve.

Step 6—Compressor Crankcase Heat—A crankcase heater is required if the refrigerant tubing is longer than 50 ft (15.24m).

**NOTE:** The Seasonal Energy Efficiency Ratio (SEER) is obtained with the crankcase heat de-energized. To deenergize the crankcase heater, disconnect the black crankcase heater wires at the contactor. After disconnecting, make sure wires are isolated from all other electrical connections and components to prevent electrical shorting.

Step 7—Install Electrical Accessories, if any. Refer to the individual instructions packaged with the kits or accessories when installing.

- → Time Delay Relay for Blower (TDR.90)—The time delay switch is in the low voltage control circuit. When thermostat is satisfied, compressor is turned off and blower runs for 90 seconds to remove residual cooling from indoor coil. The blower delay feature provides improved performance. There are various ways to achieve the time delay feature:
  - a. By using a thermostat which has a built-in time delay.
  - b. Fan coil unit/electric heater packages which have builtin delay.
  - c. Furnaces which have built-in TDR.

#### Table 2—Refrigerant Connections and Recommended Liquid and Vapor Tube Diameters

	LIQUID		VAPOR	
	CONNECT. DIAM	REC. TUBE DIAM	CONNECT. DIAM	REC. TUBE
014-024	3/8	1/4	5/8	5/8
030	3/8	1/4	3/4	3/4
036	3/8	3/8	3/4	3/4
042	3/8	3/8	7/8	7/8
048-060	3/8	3/8	7/8	1-1/8

NOTES: 1. Tube diameters are for lengths up to 50 ft for tube set over 50 ft, consult long tube information.

 Use only 3/8-in. diameter liquid tube on cap-tube indoor coil systems. d. If none of the above have built-in TDR, then you must use a separate TDR to achieve the desired performance.

See your local distributor or dealer for specific component information, as shown in latest PDD.

**NOTE:** In most cases, only one of the above should be used to achieve TDR function. More than one of the methods listed above in a system may cause a degradation in performance.

#### Step 8—Start-up

- 1. When equipped with a crankcase heater, energize heater a minimum of 24 hours before starting unit. To energize heater only, set thermostat at OFF position and close electrical disconnect to outdoor unit.
- 2. Fully Backseat (open) liquid and vapor tube service valves.
- 3. Unit is shipped with valve stem(s) frontseated, and caps installed. Replace stem caps after system is opened to refrigerant flow (backseated). Replace caps finger tight and tighten additional 1/6 turn with wrench.
- 4. Close electrical disconnects to energize system.
- 5. Set room thermostat at desired temperature. Be sure set point is below indoor ambient temperature.
- 6. Set room thermostat at COOL and fan switch at FAN or Auto, as desired. Operate unit for 15 minutes. Check system refrigerant charge. See Refrigerant Charging below.

**Step 9—Checking Charge**—Factory charge is shown on unit rating plate (see Fig. 2).







(Three Phase)

## A WARNING

Service valve gauge ports are not equipped with shrader valves. To prevent personal injury, make sure gauge manifold is connected to the valve gauge ports before moving valves off fully backseated position. Wear safety glasses and gloves when handling refrigerant.

## A CAUTION

Compressor damage may occur if system is overcharged.





Adjust charge by following procedure shown on Superheat Charging Tables located on unit information plate.

Step 10—Leave User Manual With Homeowner—Explain system operation and maintenance procedures outlined in users manual.



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NOTES: 1. Refer to unit wiring label for wire colors: C to G and C to Y connections.

 N.E.C. Class 2, 24V circuit, min. 40VA required; 60VA required for 050 and 060 size units or units installed with liquid line solenoid valve.

#### → Fig. 5—24-Volt Control Circuit Connections

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# Split-System Residential Air Conditioners and Heat Pumps

## Service Manual (TECH 2000 Models)

#### INTRODUCTION

This service manual enables a service technician to service, repair, and maintain a family of similar air conditioners and heat pumps. It covers standard single speed products only. For variable speed products, refer to the respective service manuals.

## A WARNING

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may cause personal injury, death or property damage. Consult a qualified installer, service agency or your distributor or branch for information or assistance. The qualified installer or agency must use factory authorized kits or accessories when modifying this product.

#### SAFETY CONSIDERATIONS

Service and repair of these units should be attempted only by trained service technicians familiar with Carrier standard service instructions and training material.

All equipment should be installed in accordance with accepted practices, unit Installation Instruction, and in compliance with all national and local codes.

Power should be turned off when servicing or repairing electrical components. Extreme caution should be observed when troubleshooting electrical components with power on. Observe all warning notices posted on equipment.

Refrigeration system contains refrigerant under pressure. Extreme caution should be observed when handling refrigerants. Wear safety glasses and gloves to prevent personal injury. During normal system operation, some components are hot and can cause burns. Rotating fan blades can cause personal injury. Appropriate safety considerations are posted throughout this manual where potentially dangerous techniques are addressed.

	Page
Unit Identification .	
Cabinet	
<ul> <li>REMOVING TO</li> </ul>	PCOVER
<ul> <li>REMOVING FA</li> </ul>	N MOTOR ASSEMBLY
<ul> <li>REMOVING CC</li> </ul>	NTROL BOX
<ul> <li>INFORMATION</li> </ul>	I PLATE
Electrical	
<ul> <li>ALUMINUM W</li> </ul>	IRE
<ul> <li>CONTACTORS</li> </ul>	
• CAPACITORS	
• TIME GUARD	II
<ul> <li>CRANKCASE H</li> </ul>	EATER
<ul> <li>TIME DELAY I</li> </ul>	<b>ELAY</b>
<ul> <li>PRESSURE SW</li> </ul>	ITCHES
<ul> <li>DEFROST THE</li> </ul>	RMOSTATS

- DEFROST CONTROL BOARD
- FAN MOTORS
- SERVICE SENTRY CONTROL BOARD
- OUTDOOR THERMOSTATS
- BYPASS SOLENOID
- COMPRESSOR PLUG

#### 

- MECHANICAL FAILURES
- ELECTRICAL FAILURES
- SYSTEM CLEAN-UP AFTER BURN-OUT
- COMPRESSOR REMOVAL AND REPLACEMENT

#### 

- FEATURES
- TROUBLE SHOOTING
- DISCHARGE THERMOSTAT

## Refrigeration System ......14-26

- REFRIGERATION CYCLE
- LEAK DETECTING
- BRAZING
- SERVICE VALVES
- ACCURATER COMPONENTS
- REVERSING VALVE
- THERMOSTATIC EXPANSION VALVES (GENERAL)
- THERMOSTATIC EXPANSION VALVE (BI-FLOW)
- COIL REMOVAL
- LIQUID LINE STRAINER
- ACCUMULATOR
- CONTAMINANT REMOVAL
- SYSTEM CHARGING (for all approved combinations)
- CHECKING CHARGE
- CARE & MAINTENANCE

#### UNIT IDENTIFICATION

(Product Number Stamped On Unit Rating Plate)

The Unit Product Number has 12 positions containing groups of numbers and letters that indicate specific information about the unit. Listed below is the breakdown of the 12 positions.

Positions 1 & 2-Type of Product

- EXAMPLE: 38-Split System Air Conditioner or Heat Pumps.
  - 40—Fan Coil

Position 3—Letter T—Condensing Unit Y—Heat Pump

Position 4-Model Letter

- G M H R
  - K

Positions 5, 6 & 7—Nominal Cooling Capacity in Thousands BTUH

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 Replaces: 38T,Y-1SM

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 5a
 5a



EXAMPLE: 036 = 36,000 BTUH or 3 Ton Nominal Capacity

Position 8—Electrical Characteristics such as: 3-230, 208-230 1 Phase 5-230, 208-230 3 Phase 6-460. 3 Phase

Position 9-Unit Changes

New units begin with 0-zero and with each change which does not affect price, configuration, size or interchangeability the number is increased by 1 such as 1, 2, 3 etc.

Position 10-Shipment Code How unit was originally packaged

#### Positions 11 & 12 EXAMPLE: DL-Deluxe.

## SERIAL NUMBER IDENTIFICATION

The Unit Serial Number has 10 positions containing groups of numbers and a letter that indicates specific information about the unit. Listed below is the breakdown of the 10 positions.

Positions 1 & 2—Week of Manufacture EXAMPLE: 01—First week of a year 52—Last week of a year

Positions 3 & 4—Year of Manufacture EXAMPLE: 90—1990

Position 5—Manufacturing Plant Location EXAMPLE: A—Indianapolis E—Collierville

Positions 6 through 10-Serial Number

Cabinet—Certain maintenance routines and repairs require removal of cabinet panels. All condensing units and heat pump models of this series have same basic design with only minor differences (see Fig. 1.)

#### **REMOVING TOP COVER**

- 1. Turn off all power to outdoor and indoor unit.
- 2. Remove screws holding top cover to coil grill and corner posts.
- 3. Remove access panel.
- 4. Remove information plate.
- 5. Disconnect fan motor wires, cut wire ties and remove from control box. Refer to unit wiring label.
- 6. Lift top cover from unit.
- 7. Reverse sequence for reassembly.

## REMOVING FAN MOTOR ASSEMBLY

- 1. Perform steps 1 through 6 above.
- 2. Remove nuts holding fan motor to top cover.
- 3. Remove motor and fan blade assembly.
- 4. Reverse sequence for reassembly.
- 5. Prior to applying power, check that fan rotates freely.

#### REMOVING CONTROL BOX

- 1. Turn off all power to outdoor and indoor unit.
- 2. Remove screws from access panel and remove panel.
- 3. Remove screws holding information plate.
- 4. Remove screws holding control box to corner posts.
- 5. Remove control box.
- 6. Reverse sequence for reassembly.

#### INFORMATION PLATE

The information plate is secured to the front of the control box and provides a cover for it (see Fig. 2). This plate also





provides a surface to attach the wiring schematic, superheat charging tables and instructions and sundry warning labels and thereby derives its name—information plate. The plate has two tabs on the top edge that are bent down at slightly more than 90 F. When the information plate is removed, these tabs can be inserted into two mating slots in the bottom front edge of the control box and the plate hangs dow forming an upper front panel (see Fig. 3). This is convenient where access to the controls is required while the unit is operating, and the front panel on its side does not completely cover the opening because the unit is elevated. The information plate on the small size casing completely covers the opening below the control box (see Fig. 4).



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Fig. 3—Information Plate Removed

**Electrical**—Exercise extreme caution when working on any electrical components. Shut off all power to system prior to troubleshooting. Some troubleshooting techniques require power to remain on. In these instances, exercise extreme caution to avoid danger of electrical shock. ONLY TRAINED SERVICE PERSONNEL SHOULD PER-FORM ELECTRICAL TROUBLESHOOTING.

Troubleshooting charts for condensing and heat pump units are provided at the back of this manual. They enable the service technician to use a systematic approach to locating the cause and correcting system malfunctions.

#### ALUMINUM WIRE

## A WARNING

Aluminum wire may be used in the branch circuit (i.e. the circuit between the main and unit disconnect), but only copper wire may be used between the unit disconnect and the unit on Carrier systems.

Whenever aluminum wire is used in the branch circuit wiring with this unit, adhere to the following recommendations: Connections must be made in accordance with the National Electrical Code, using connectors approved for aluminum wire. The connectors must be UL approved (marked Al/Cu with the UL symbol) for the application and wire size. The wire size selected must have a current capacity not less than that of the copper wire specified, and must not create a voltage drop between the service panel and the unit in excess of 2% of the unit rated voltage. In preparing the wire, just before installing the connector, all aluminum wire must be "brush-scratched" and coated with a corrosion inhibiter such as Pentrox A. When it is suspected that the connection will be exposed to moisture, it is very important to cover the entire connection completely to prevent an electrochemical action that will cause the connection to fail very quickly. Do not reduce the effective size of wire, such as cutting off strands so that the wire will fit a connector. Proper size connectors should be used.

Check all electrical connections (both factory and field) for tightness. This should also be done after the unit has



#### Fig. 4—Information Plate Installed Below Control Box

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reached operating temperatures, especially if aluminum conductors are used.

#### CONTACTORS

The contactor (see Fig. 5) provides a means of applying power to unit using low voltage (24-v) from transformer in order to power the contactor coil. Depending on unit model, you may encounter single-, double- or triple-pole contactors to break power. One side of the line may be electrically energized, extreme caution must be exercised when troubleshooting.

The contactor coil for these residential models of condensing units and heat pumps is powered by 24-vac. If contactor does not operate:

- 1. With power off, check whether contacts are free to move. Check for severe burning or arcing on contact points.
- 2. With power off, use ohmmeter to check for continuity of coil. Disconnect leads before checking. A lowresistance reading is normal. Do not look for a specific value as different part numbers used will have different resistance values.



Fig. 5—Contactor

3
- 3. Reconnect leads and apply low-voltage power to contactor coil. This may be done by leaving high-voltage power to outdoor unit off, and turning thermostat to heat or cool. Check voltage at coil with voltmeter. Reading should be between 20-30 volts. Contactor should pull in if voltage is correct and coil is good. If contactor does not pull in, change contactor.
- 4. With high-voltage power off and contacts pulled in, check for continuity across contacts with ohmmeter. A very low or zero resistance should be read. Higher readings could indicate burned or pitted contacts which may cause future failures.

#### CAPACITORS

(See Fig. 6.)

#### A CAUTION

Capacitors can store electrical energy when power is off. Electrical shock can result if you touch the capacitor terminals and discharge this stored energy. Exercise extreme caution when working near capacitors. With power off, discharge stored energy by shorting across the capacitor terminals with a 15,000-ohm, 2-watt resistor.

**NOTE:** If bleed resistor is wired across start capacitor, it must be disconnected to avoid erroneous readings when ohmmeter is applied across capacitor.

Capacitors are used as a phase shifting device to aid in starting certain single-phase motors. Check capacitors as follows:

#### A CAUTION

Always check capacitors with power off. Attempting to troubleshoot a capacitor with power on can be dangerous. Defective capacitors may explode when power is applied. Insulating fluid inside is combustible and may ignite, causing burns.

- 1. After power is off, discharge capacitors as outlined above. Disconnect capacitor from circuit. Put ohmmeter on R x 10k scale. Use ohmmeter, check each terminal to ground (use capacitor case). Discard any capacitor which measures 1/2 scale deflection or less. Place ohmmeter leads across capacitor and place on R x 10k scale. Meter should jump to a low resistance value and slowly climb to higher value. Failure of meter to do this indicates an open capacitor. If resistance stays at zero or a low value, capacitor is internally shorted.
- 2. Capacitance testers are available which will read value



of capacitor. If value is not within  $\pm 10\%$  value stated on capacitor, it should be changed. If capacitor is not open or shorted, the capacitance value is calculated by measuring voltage across capacitor and current it draws.

#### A WARNING

Exercise extreme caution when taking readings while power is on. Electrical shock can cause personal injury or death.

Use following formula to calculate capacitance:

Capacitance (mfd) =

2650 x amps volts

3. Remove any capacitor that shows signs of bulging, dents or leaking. Do not apply power to a defective capacitor as it may explode.

Start Capacitors and PTC Devices—Sometimes, under adverse conditions, a standard run capacitor in a system is inadequate to start compressor. In these instances, a startassist device is used to provide an extra starting boost to compressor motor. The first device is called a PTC (positive temperature coefficient) or thermistor (see Fig. 7). It is a resistor wired in parallel with run capacitor. As current flows through it at start-up, it heats up. As it heats up, its resistance increases greatly, until it effectively lowers current through it to an extremely low value. This, in effect, removes it from the circuit.

After system shutdown, resistor cools and resistance value returns to normal, until next time system starts. If indoor coil does not have a bleed-type expansion device, it may be necessary to remove start thermistor and replace with accessory start capacitor and relay. Thermistor device is adequate for most conditions, however, in systems wher off cycle is short, device cannot cool fully and becomes les effective as a start device. It is an easy device to troubleshoot. Turn off all power to system.



Fig. 7—PTC Devices

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Check thermistor with ohmmeter as described below. Shut off all power to unit. Remove PTC from unit. Wait at least 10 minutes for PTC to cool to ambient temperature.

Measure resistance of PTC with ohmmeter. Resistance of 25-ohm PTC is measured between center tab and end tab with jumper across 2 end terminals.

The cold resistance (RT) of any PTC device should be approximately 100-180% of device ohm rating.

12.5-ohm PTC = 12.5-22.5 ohm resistance beige color 25-ohm PTC = 25-45 ohm resistance - blue color

If PTC resistance is appreciably lower or more than 200% higher than rating, device is defective.

If thermistor is good and compressor does not start, disconect thermistor from starting circuit. Give compressor a temporary capacitance boost (see below). Run compressor for 10 minutes, shut off, allow system pressure to equalize. Reconnect start thermistor. Try restarting compressor

Fig. 6—Capacitors



Fig. 8—Capacitance Boosting

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without boost capacitor. If after 2 attempts, compressor does not start, remove thermistor. Add an accessory start capacitor relay package.

<u>Temporary Capacitance Boost</u>—There are times when a temporary capacitance boost is needed to get compressor started (see Fig. 8). *Do not* under any circumstances attach temporary boost capacitor directly across compressor terminals. Serious personal injury can result. Exercise extreme caution with this procedure when high-voltage power is on. If compressor motor does not start, it may be due to lowline voltage, improper pressure equalization or weak run capacitor. Check each possibility, attempt capacitance boosting *before* adding auxiliary start capacitor and relay.

Turn off power. Check compressor for ground or open. If it is not, proceed. Obtain a start capacitor approved by compressor manufacturer. Connect wires with insulated probes to each terminal. Touch probes to each side of run capacitor. Energize and start compressor, pull probes away after about 3 seconds. *Discharge start capacitor*. Run compressor about 10 minutes. Stop and allow to sit idle about 5 minutes. Check system pressure equalization. Attempt to restart without capacitance boost. If compressor does not start after several attempts, add proper auxiliary start capacitor and relay.

If PTC thermistor device is inadequate as start device, a start capacitor and relay may be added to system to insure positive start. Capacitor is wired in parallel with run capacitor through normally closed set of contacts on a device called start relay. The relay coil is wired across start and common terminals of compressor. The added capacitance gets the compressor started. As compressor comes up to speed, voltage across start and common terminals increases to a value high enough to cause start relay to energize. This opens normally closed contacts and removes start capacitor from circuit. In actual practice, this occurs in a fraction of a second.

**NOTE:** If bleed resistor is wired across start capacitor, it must be disconnected to avoid erroneous readings when ohmmeter is applied across capacitor.

To check start relay and capacitor, first turn off all power to unit. Discharge start and run capacitors as outlined earlier. Most start capacitors will have a 15,000-ohm, 2-watt bleed resistor. Disconnect these devices from system. Start capacitor can be inspected visually. It is designed for short duration or intermittent duty. If left in circuit for prolonged period it blows through a specially designed bleed hole. If it appears blown, check for welded contacts in start relay. Start capacitor can be checked by ohmmeter method discussed earlier.

Start relay is checked with ohmmeter. Check for continuity across coil of relay. You should encounter a high resistance. Since relay contacts are normally closed, you should read low resistance across them.



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Fig. 9—Time Guard II Device

Both PTC device and capacitor relay start system are standard equipment on some of these units. They are also available as accessories and may be field installed.

TIME GUARD II-(See Figs. 9, 10 & 11)

Solid state Time Guard II device protects unit compressor by preventing short cycling. After a system shutdown, Time Guard II provides for a  $5 \pm 2$ -minute delay before compressor restarts. On normal start-up, 5-minute delay occurs before thermostat closes. After thermostat closes, Time Guard II device provides a 3-second delay to prevent contactor chattering.



Fig. 10—Time Guard II Sequence

Time Guard II device is simple to troubleshoot. Only a voltmeter capable of reading 24-v is needed. Device is in control circuit, therefore, troubleshooting is safe with control power (24-v) on and high-voltage power off.

With high-voltage power off, attach voltmeter leads across T1 and T3, set thermostat so that Y terminal is energized. Make sure all protective devices in series with Y terminal are closed. Voltmeter should read 24-v across T1 and T3. With 24-v still applied, move voltmeter lead from T1 terminal to T2 terminal. After  $5 \pm 2$  minutes, voltmeter should read 24-v, indicating control is functioning normally. If no time delay is encountered, or device never times out, change control.

#### **CRANKCASE HEATER**

Crankcase heater is a device for keeping compressor oil warm. By keeping oil warm, refrigerant does not migrate to and condense in compressor shell. This prevents flooded starts which can damage compressor.

Crankcase heaters come in 2 basic types, wraparound (bellyband) type that is wrapped externally around compressor shell, and insertion type that is inserted into compressor oil well in shell of compressor. Both types are in this family of units.

 $\rightarrow$  On units that have a single pole contactor, the crankcase



Fig. 11—Time Guard II Control Wiring

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#### Fig. 12—Wiring for Single Pole Contactor

heater is wired parallel with the contactor contacts (see Fig. 12) and in series with the compressor. When the contacts are open a circuit is completed from the line side of the contactor, through the crankcase heater, through the run windings of the compressor, to the other side of the line. When the contacts are closed, there is no circuit through the crankcase heater because both leads are connected to the same side of the line. This allows the heater to **operate** when the system **is not** calling for heating/cooling. The heater **does not operate** when the system **is** calling for heating/ cooling. On units with 2 or 3 pole contactors, the crankcase heater is connected to the line side of the contactor and is not controlled by the contactor contacts.

The crankcase heater is powered by *high*-voltage power of unit. Use extreme caution troubleshooting this device with power on. Easiest method of troubleshooting is to apply voltmeter across crankcase heater leads to see if heater voltage is on. Do not touch heater. Carefully feel area around crankcase heater. If warm, crankcase heater is probably functioning. Do not rely on this method as absolute evidence heater is functioning. If compressor has been running, area will still be warm.

With power off, and heater leads disconnected, check across leads with ohmmeter. Do not look for a specific resistance reading. Check for resistance or an open circuit. Change heater if an open circuit is detected. Some crankcase heaters in this series of units are equipped with a crankcase heater switch installed in series with heater. This energy saving device shuts off power to heater when temperatures are high enough that heater is not needed. Be sure this switch is functioning normally before condemning crankcase heater.

#### FAN DELAY RELAY

The fan delay relay (FDR) is a solid state controlled recycle delay timer, which keeps the indoor blower operating for 90 seconds after thermostat is satisfied. This delay enables the blower operation to remove the residual cooling in the coil after compressor shutdown, thereby improving the efficiency of the system. The sequence of operation is that on closure of the wall thermostat, at the end of a fixed "ON" delay of 1 second, the fan relay is energized. When the thermostat is satisfied, an "OFF" delay is initiated. When the fixed delay of 90  $\pm$  20 seconds is completed, the fan relay is deenergized and fan motor stops. If the wall thermostat closes during this delay the FDR is reset and the fan relay remains energized. This FDR is a 24 volt device that operates within a range of 15 to 30 volts and draws about .5 amps.

If the blower runs continuously instead of cycling off when the fan switch is set on "AUTO," the fan delay relay is probably defective and must be replaced.

#### PRESSURE SWITCHES

Pressure switches are protective devices wired into control circuit (low voltage). They shutoff compressor if abnormally high or low pressures are present in refrigeration circuit. Depending on unit model, you may find a low- or highpressure switch, or both, in system.

Low Pressure Switch—Located on suction line of condensing unit only, protects against low suction pressures caused by such events as loss of charge, low airflow across indoor coil, dirty filters, etc. It opens on a pressure drop at about 30 psi. If system pressure is above this, switch should be closed. To check switch, turn off all power to unit, disconnect leads on switch, apply ohmmeter leads across switch. You should have continuity on a good switch. Because these switches are attached to refrigeration system under pressure, it is not advisable to remove this device for troubleshooting unless you are reasonably certain that a problem exists. If switch must be removed, bleed all system charge so that pressure gauge reads 0 psi.

#### A CAUTION

Wear safety glasses and gloves when working with refrigerants.

Apply heat with a torch to solder joint and remove switch. Wear safety glasses when using torch. Have quenching cloth available. Oil vapor in line may ignite when switch is removed.

Braze in 1/4-in. flare fitting and screw on replacement pressure switch.

<u>High Pressure Switch</u>—Located on discharge line, protects against high discharge pressures caused by such events as overcharge, condenser fan motor failure, system restriction, etc. It opens on pressure rise at about 435 psi. If system pressures go above this setting during abnormal conditions switch opens. *Do not* attempt to simulate these system abnormalities, as high pressures pose a serious safety hazard. High pressure switch is also checked with an ohmmeter similar to checking low pressure switch. If system pressure is below 435 psi, switch shows continuity. It is replaced in same manner as low pressure switch. Observe all safety precautions.



Liquid Line Pressure Switch-Located on liquid line of heat pump only, functions similar to conventional low pressure switch. Because heat pumps experience very low suction pressures during normal system operation, a conventional low pressure switch cannot be installed on suction line. Switch is installed in liquid line instead and acts as loss-ofcharge protector. The liquid line is the low side of the system in heating mode. It operates identically to low pressure switch except it opens at 5 psi. Troubleshooting and removing this switch is identical to procedures used on other switches. Observe same safety precautions.

#### DEFROST THERMOSTATS

Defrost thermostat signals heat pump that conditions are right for defrost or that conditions have changed to terminate defrost. It is a thermally actuated switch clamped to outdoor coil to sense its temperature. Normal temperature range is: closed at  $30 \pm 3$  F, open at  $80 \pm 5$  F.

The defrost thermostat must be located on the liquid side of the outdoor coil on the bottom circuit and as close to the coil as possible.

Since defrost thermostat is the heart of the defrost system. its troubleshooting procedure is described below.

#### DEFROST CONTROL BOARD

Solid state defrost control used on heat pumps replaces electromechanical timer and defrost relay found on older defrost systems. Defrost control board can be field set to check need for defrost every 30, 50 or 90 minutes of operating time, by connecting the jumper (labeled W1, on the circuit board) to the spade terminal for the defrost time desired. The board is set at factory for 90 minutes. The defrost period is field selectable, depending upon geographic areas and defrost demands. Control board has additional feature that allows unit to restart in defrost cycle if room thermostat is satisfied during defrost.

Troubleshooting defrost control involves a series of simple steps that indicate whether board is defective.

NOTE: Procedure allows the service technician to check control board and defrost thermostat for defects. First, troubleshoot to make sure unit operates properly in heating and cooling modes. This ensures operational problems are not attributed to the defrost control board. Additional steps follow:





- 1. Turn thermostat to OFF. Disconnect all power to outdoor unit.
- 2. Remove control box cover for access to electrical components and defrost control board.
- 3. Disconnect defrost thermostat leads from control board, connect to ohmmeter. Thermostat leads are the heavy gauge black insulated wires connected to DFT and R terminals on control board. Resistance reading may be 0 (indicating closed defrost thermostat) or infinity ( $\infty$  for open thermostat) depending on outdoor temperature.
- 4. Jumper between DFT and R terminals on control board as shown in Fig. 13.
- 5. Disconnect outdoor fan motor lead. Tape lead to prevent grounding.
- 6. Restart unit in heating, allowing frost to accumulate on outdoor coil.
- 7. After a few minutes in heating, liquid line temperature at defrost thermostat should drop below closing set point of defrost thermostat of approximately 30 F. Using ohmmeter, check resistance across defrost thermostat leads. Resistance of 0 indicates defrost thermostat is closed and operating properly.
- 8. Remove protective cover from TP1 and TP2 speed-up terminals. Insert jumper wire into protective cover, reinsert protective cover on speed-up terminals. This



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Fig. 14—Inserting Jumper Wire



Fig. 15—Checking Between R and W<sub>2</sub>

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reduces to 1/60, the timing sequence of original time (see Fig. 14). Since Fig. 14 shows timing cycle set at 30 minutes, unit initiates defrost within approximately 30 seconds; if setting is at 50 minutes, within 50 seconds; 90 minutes, within 90 seconds. When you hear the reversing valve change position, remove protective cover/jumper, otherwise control will terminate normal 10-minute defrost cycle in approximately 10 seconds.

#### A CAUTION

Do not use screwdriver or other means to short speedup pins. If pins are accidentally grounded, damage to the control board will occur.

- 9. Unit is now operating in defrost mode. Using voltmeter, check between R and W2 as shown in Fig. 15. Reading on voltmeter should indicate zero volts. This step ensures defrost relay contacts have closed, energizing supplemental heat ( $W_2$ ) and reversing valve solenoid (O).
- 10. Unit should remain in defrost no longer than 10 minutes. Actual time in defrost depends on how quickly speed-up jumper is removed. If it takes 3 seconds to remove speed-up jumper after unit has switched to defrost, only 7 minutes of defrost cycle remains.
- 11. After a few minutes in defrost (cooling) operation, liquid line should be warm enough to have caused defrost thermostat contacts to open. Check resistance across defrost thermostat. Ohmmeter should read infinite resistance, indicating defrost thermostat has opened at approximately 80 F.
- 12. Shut off unit power and reconnect fan lead.
- 13. Remove jumper wire from speed-up terminal protective cover and reinsert cover on speed-up terminals. Failure to remove jumper causes unit to speed up operating cycles continuously.
- 14. Remove jumper between DFT and R terminals. Reconnect defrost thermostat leads.
- 15. Replace control box cover. Restore power to unit.

If defrost thermostat does not check out following above steps or incorrect calibration is suspected, check for a defective thermostat as follows:

- 1. Follow steps 1-5 above.
- 2. Using thermocouple temperature measuring device, route sensor or probe underneath coil (or other convenient location). Attach to liquid line near defrost thermostat. Insulate for more accurate reading.
- 3. Restart unit in heating.
- 4. Within a few minutes, liquid line temperature drops



Fig. 16—Fan Position

within a range causing defrost thermostat contacts to close. Temperature range is from 33 F to 27 F. Notice temperature at which ohmmeter reading goes from  $\infty$  to 0 ohms. Thermostat contacts close at this point.

- 5. Remove protective cover from TP1 and TP2 speed-up terminals, insert jumper wire into protective cover, reinsert protective cover on the speed-up terminals.
- 6. Unit changes over to defrost within 90 seconds (depending on timing cycle setting). Liquid line temperature rises to range where defrost thermostat contacts open. Temperature range is from 75 F to 85 F. Resistance goes from 0 to  $\infty$  when contacts open.
- 7. If either opening or closing temperature does not fall within above ranges, or thermostat sticks in one position, replace thermostat to ensure proper defrost operation.

#### FAN MOTORS

Fan motor rotates the fan blade that draws air through outdoor coil to perform heat exchange. Motors are totally enclosed to increase reliability. This also eliminates need for rain shield. For the correct position of the fan blade assembly see Fig. 16.

#### **A** CAUTION

Turn off all power to unit before servicing or replacing fan motor. Be sure unit main power switch is turned off. Failure to do so may result in electric shock, death or injury from rotating fan blade.

Fan Motor Bearings—The bearings are permanently lubricated, therefore no oil ports are provided.

Fan motors should present no problem in troubleshooting.

For suspected electrical failures, check for loose or faulty electrical connections, or defective fan motor capacitor. Fan motor is equipped with thermal overload device in motor windings which may open under adverse operating conditions. Allow time for motor to cool so device can reset. Further checking of motor can be done with an ohmmeter. Set scale on R x 1 position, check for continuity between 3 leads. Replace motors that show an open circuit in any of the windings. Place one lead of ohmmeter on each motor lead. At same time, place other ohmmeter lead on motor case (ground). Replace any motor that shows resistance to ground. Obviously any motor that shows signs of arcing, burning or overheating should be suspect and replaced.

#### SERVICE SENTRY CONTROL BOARD

**NOTE:** If the proper night setback thermostat is not used, the Service Sentry control will work, but there will be no light indication on thermostat.

The Service Sentry control provides immediate warning when outdoor heat pump requires servicing. It turns on indoor thermostat light if compressor doesn't operate for either heating or cooling. This enables owner to obtain timely heat pump service during heating season, reducing supplementary electric heat costs, and during cooling season, reducing period of heat discomfort.

The Service Sentry is an accessory device. Service Sentry locks out compressor under certain adverse operating conditions. System is manually reset by shutting it off at thermostat subbase, then turning it back on. If adverse condition is corrected, system restarts.

One example of an adverse condition would be if system is located in a desert climate where high operating temperatures may cause system to shutdown on the high pressure switch, or on the compressor internal overload.







Fig. 18—Wiring Connections for Service Sentry and Time Guard II

Connect Service Sentry to outdoor unit control circuit terminal board (see Fig. 17 and wiring diagram on unit). An extra control wire is required between L terminals on outdoor unit, indoor unit and thermostat subbase.

Connect all field line power wires to unit in usual manner. Route one field line power supply wire through metallic loop on bottom of Service Sentry then to normal unit connection. However, units with RLA of less than 14 amps will require 2 passes through the metallic loop.

Refer to Figs. 17 & 18 for wiring connections when Service Sentry and solid state Time Guard II accessories are used.

**NOTE:** The wire from the "X" terminal on the Service Sentry to "L" on the outdoor terminal board, indoor terminal board, and thermostat subbase is field supplied and wired.

Service Sentry Requires 2 Inputs:

- 1. It must sense a 24-v input from thermostat. As thermostat calls for heating or cooling, it supplies 24-v to Service Sentry device.
- 2. A current transformer (or induction loop) similar to a clamp-on ammeter senses current draw in the compressor lead. Induction loop must sense a minimum current draw when thermostat is calling for heating or cooling.

#### NOTES:

- 1. On a single-phase compressor, induction loop senses current in common leg.
- 2. On a 3-phase compressor, induction loop senses current in any one of the phases.

#### A WARNING

If Service Sentry needs replacing, shut off all power to unit before attempting removal. Electrical shock can cause personal injury or death. Troubleshooting Service Sentry device is easy. With thermostat calling for heating or cooling and compressor running, indoor thermostat light should be off. If on, check for wiring errors or replace the Service Sentry.

To check for correct operation, shut off circuit breaker or disconnect switch to outdoor unit *while it is running*. Signal light on thermostat should light. If this does not occur, check for wiring errors or replace the Service Sentry.

#### **OUTDOOR THERMOSTAT(S)**

The outdoor thermostat(s) is/are located in a sheet metal box which is positioned under the right side of the control box and mounted to the right corner panel. The sensing bulb(s) remain in this supplied sheet metal box. Outdoor thermostat brings on stages of electric heat as outdoor temperature and heat pump output drops. Setting at which thermostat closes is variable, depending on design of system. It is set at time of installation and should not be changed without good reason. Up to 2 outdoor thermostats may be installed. Some systems may not have any thermostat. An outdoor thermostat can also be used to lockout compressor operation in condensing unit at low ambients, when not equipped with motormaster.

Although these devices are installed in control circuit (24-v), turn off all power to unit before attempting to troubleshoot thermostat.

Use a standard ohmmeter to check for continuity through thermostat. If you suspect thermostat is out of calibration, use calibrated electronic thermometer to determine correct outdoor temperature. Turn thermostat dial knob until switch closes. Observe this using ohmmeter across switch. Read temperature setting when switch closes. It should be close to reading observed using electronic thermometer. Any setting within  $\pm$  5 degrees is acceptable.



Fig. 19—Bypass Solenoid (Cooling Mode)



#### BYPASS SOLENOID

The bypass solenoid kit can be used as a metering device on all split system heat pumps in the cooling mode. When the heat pump is operating in the cooling mode, the refrigerant flows through the piston orifice (see Fig. 19). When operating in the heating mode, the refrigerant is bypassed around the piston (see Fig. 20). When the heat pump switches to the defrost mode, the solenoid coil is energized and a bypass port is opened so that the refrigerant in addition to flowing through the piston orifice, also flows through the bypass port which enhances the defrosting of the outdoor coil (see Fig. 21).

The bypass kit does not include a piston in the piston body, therefore the piston shipped with the outdoor unit must be installed. The correct piston size is listed on the outdoor unit rating plate. To assure proper operation, the kit must be installed in the liquid line at the indoor coil, with the arrow inscribed on the body pointing toward the indoor coil. The solenoid coil must be above the AccuRater body, which must be installed in the horizontal position.

Because the current draw of the solenoid coil is only .25 amps, an isolation relay is not needed to prevent damage to the low voltage anticipator circuit. Troubleshoot the coil by disconnecting the coil wires and checking across them with an ohmeter—if infinity is indicated, the coil has an open winding and must be replaced.

#### COMPRESSOR PLUG

The compressor electrical plug provides a quick tight connection to the compressor terminals. The plug completely covers the compressor terminals and the mating female terminals are completely encapsulated in the plug. Therefore, the terminals are isolated from any moisture, so corrosion and resultant pitted or burned terminals are eliminated. The plug is oriented to the relief slot in the terminal box, so that the cover cannot be secured if wires are not positioned in slot, assuring correct electrical connection at the compressor. The plug can be removed by simultaneously pulling while "rocking" the plug. However, these plugs are specialized and vary in terminal orientation in the plug and therefore can be used on only the specific compressor or group as shown in Figs. 22 and 23. You will notice that for the compressors in Fig. 22, the triangle formed by the fusite terminals points down and the plug is likewise oriented. The fusite terminals and plug terminal orientation shown in Fig. 23 are with the triangle formed by the terminals pointing toward the top. The configuration around the fusite terminals is the outline of the terminal covers used on the specific compressors and the slot through which the wires of the plug are routed is oriented on the bottom or slightly t the left or right. The correct plug can be connected easily to the compressor terminals and plug wires routed easily through the slot in the terminal cover. Therefore, if a compressor from the compressors represented in Fig. 22 is sub-



Fig. 22—Compressor Plug



Fig. 23—Compressor Plug

stituted for a compressor represented in Fig. 23 a new plug must be installed. If the plug is not changed, proper connection and routing of the plug wires through the terminal cover will be impossible.

#### LOW VOLTAGE TERMINALS

The low voltage terminal designations and their description/ function are used on all split system condensers and heat pumps.

- G- Energizes blower circuit.
- E- Energizes emergency heat relay.
- W2-First stage, supplemental heat energized through defrost relay.
- L- Energizes light on thermostat.
- W3-Second or third stage supplemental heat.
- R- 24 volt power from transformer.
- Y- Energizes contactor for first stage cooling or first stage heating for heat pumps.
- 0- Energizes reversing valve on heat pumps.
- C- Common side of transformer.

Reciprocating Compressor-The compressor is the heart of the refrigeration system. It pumps refrigerant through the system. If it malfunctions, the whole system suffers.



The compressor is an electrical (as well as mechanical) device. Extreme caution should be exercised when working near compressors. Power should be shut off, if possible, for most troubleshooting techniques. Refrigerants in system present other safety hazards. Always wear safety glasses and gloves when handling refrigerants.

Compressor failures are classified in 2 broad failure catego-

ries, mechanical and electrical. Both types are discussed below.

#### MECHANICAL FAILURES

Compressor is a mechanical pump driven by an electric motor contained in a welded or hermetic shell. In a mechanical failure, motor or electrical circuit appears normal, but compressor does not function normally.

#### A CAUTION

Exercise extreme caution when reading compressor currents, as high-voltage power is on. Correct any of the problems described below before installing and running a replacement compressor. Wear safety glasses and gloves when handling refrigerants.

Locked Rotor-In this type of failure, compressor motor and all starting components are normal. When compressor attempts to start, it draws locked rotor current and cycles off on the internal protection. Locked rotor current is measured by applying a clamp-on ammeter around common lead of the compressor on a single-phase compressor, or any one of the leads on a 3-phase compressor. Then measure current drawn when it attempts to start. LRA (locked rotor amp) value is stamped on compressor nameplate.

If compressor draws locked rotor amps, and all other external sources of problems have been eliminated, compressor must be changed. Because compressor is a sealed unit, it is impossible to determine exact mechanical failure. However, complete system should be checked for abnormalities such as incorrect refrigerant charge, restrictions, insufficient airflow across indoor or outdoor coil, etc., which could be contributing to the failure.

Runs, Doesn't Pump-In this type of failure, compressor motor runs and turns compressor, but compressor does not pump the refrigerant. A clamp-on ammeter on common leg of a single-phase compressor, or any one lead of a 3-phase compressor, shows a very low current draw, much lower than RLA (rated load amps) value stamped on compressor nameplate. Because no refrigerant is being pumped, there is no return gas to cool compressor motor. It eventually overheats and shuts off on its internal protection.

Runs-Doesn't Pump, High-To-Low Side Leak-This failure is similar to previous one except compressor is pumping. Usually, an internal problem such as blown head gasket or broken internal discharge line causes compressor to pump hot discharge gas back into its own shell rather than through system.

Using pressure gauges on service valves shows high suction and low discharge pressure readings. Motor currents are lower than normal. Because hot gas is being discharged into shell, the shell becomes hot. The hot gas causes compressor motor to cycle off on its internal protection.

Runs and Pumps, Low Capacity-This failure type is difficult to pinpoint because extent of damage varies. Compressor is a pump with internal valves that enable compressor to pump properly. The cylinder has a set of suction and discharge valves. Any of these parts may become damaged or broken causing loss in pumping capacity. Severity of damage determines amount of capacity loss. Use pressure gauges to find any abnormal system pressures if system charge and other conditions are normal.

An owner may complain that a unit is not handling the building's heating or cooling load. The compressor current draw may be abnormally low or high. Although this type of failure does occur, all other possible causes of capacity loss must be eliminated before condemning compressor.

Noisy Compressor-May be caused by a variety of internal problems such as loosened hardware, broken mounting springs, etc. May also be caused by system problems. Overcharging a compressor causes operating noise, particularly at start-up. Certain single-cylinder compressors are noisy at start-up and may operate noisily. Too much oil in compressor may cause noise. Normally this problem is encountered only after a replacement compressor has been added, without purging oil from previous compressor. As new compressor pumps, excess oil in system returns and adds to volume already present, causing noise.

Compressor Leaks-Sometimes a leak is detected at weld seam around girth of compressor, or a fitting that joins compressor shell. Many of these leaks can be repaired and the compressor saved if correct procedure is followed. Turn off all power to unit. Remove all refrigerant from system so that gauge pressure is 0 psi. Use safety glasses and gloves when handling refrigerants. Clean area around leak to bare metal. Apply flux and repair joint with silver solder. Do not use low-temperature solder such as 50-50. Clean off excess flux, check for leaks, and apply paint over repaired area to prevent corrosion. Do not use this method to repair a compressor leak due to severe corrosion. Never attempt to repair a compressor leaking at electric terminals. This type of failure requires compressor replacement.

### ELECTRICAL FAILURES

The compressor mechanical pump is driven by an electric motor within hermetic shell. In electrical failures, compressor does not run although external electrical and mechanical

systems appear normal. Compressor must be checked electrically for abnormalities.

Before troubleshooting compressor motor, review this description of compressor motor terminal identification.

Single-Phase Motors-See Fig. 24. To determine terminals C, S, and R: Turn off all unit power. Short the run (and start) capacitor to prevent shock. Remove all wires from motor terminals. Using an ohmmeter on 0-10 ohm scale, read resistance between all pairs of terminals. Determine 2 terminals that provide greatest resistance reading. Through elimination, remaining terminal must be common (C). Greatest resistance between common (C) and another terminal indicates start winding because it has more turns. This terminal is start (S). Remaining terminal will be run winding (R).



Fig. 24—Determining Internal Connections

NOTE: If there is an internal line break protector, it must be closed.

Three-Phase Motors-Resistance readings between all 3 sets of windings should be the same.

All compressors are equipped with internal motor protection. If motor becomes hot for any reason, protector opens. Compressor should always be allowed to cool and protector to close before troubleshooting. Always turn off all power to unit and disconnect leads at compressor terminals befor taking readings.

Most common motor failures are due to either an open, grounded or short circuit. Directions below are specifically for single-phase units, however, they also apply to 3-phase compressors. When a single-phase compressor fails to start or run, 3 tests can help determine the problem. First, all possible external causes should be eliminated, such as overloads, improper voltage, pressure equalization, defective capacitor(s), relays, wiring, etc. If compressor has internal line break overload, be certain it is closed.

Open Circuit-To determine if any winding has a break in the internal wires and current is unable to pass through: Be sure all power is off. Discharge all capacitors. Remove wires from terminals C, S and R. Use an ohmmeter on 0-1000 ohm scale to check resistance from C-R, C-S and R-S. Because winding resistances are usually less than 10 ohms, each reading appears to be approximately zero ohm. If resistance remains at 1000 ohms, an open or break exists and compressor should be replaced.

## A CAUTION

Be sure internal line break overload is not temporarily open.

Ground Circuit-To determine if a wire has broken or come in direct contact with shell, causing a direct show ground: Be sure all power is off. Discharge all capacit Remove wires from terminals C, S and R. On hermetic com pressors, allow crankcase heaters to remain on for severa

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hours before checking motor to ensure windings are not saturated with refrigerant. Use an ohmmeter on R  $\times$  10,000 ohm scale. A megohmmeter may be used in place of ohmmeter (follow manufacturer's instructions). Place one meter probe on ground or on compressor shell. Make a good metal-to-metal contact. Place other probe on terminals C, S and R in sequence. Note meter scale. If reading of zero or low resistance is obtained, motor is grounded. Replace compressor.

A compressor of one-ton capacity or less is probably grounded if resistance is below one million ohms. On larger size single-phase compressors, resistance to ground should not be less than 1000 ohms per volt of operating voltage.

#### Example:

 $230-1-60...230 \ge 1000 = 230,000$  ohms minimum.

<u>Short Circuit</u>—To determine if any wires within windings have broken through their insulation and made contact with other wires, thereby shorting all or part of the winding(s): First, be sure the following conditions are met:

- 1. Correct motor winding resistances must be known before testing, either from previous readings or from manufacturer's specifications.
- 2. Temperature of windings must be as specified, usually about 70 F.
- 3. Resistance measuring instrument must have an accuracy within  $\pm$  5%-10%. This requires an accurate ohmmeter such as a Wheatstone bridge or null balance-type instrument.
- 4. Motor must be dry or free from direct contact with liquid refrigerant.



<u>Make This Critical Test</u>—(Not advisable unless above conditions are met.) Be sure all power is off. Discharge all capacitors. Remove wires from terminals C, S and R. Place instrument probes together, determine probe and lead wire resistance. Check resistance readings from C-R, C-S and R-S. Subtract instrument probe and lead resistance from each reading. If any reading is within  $\pm 20\%$  of known resistance, motor is probably normal. Usually a considerable difference in reading is noted if a turn-to-turn short is present.

SYSTEM CLEAN-UP AFTER BURNOUT

#### **A** CAUTION

Turn off all power to unit before proceeding. Wear safety glasses and gloves when handling refrigerants. Acids formed as a result of motor burnout can cause burns.

NOTE: To analyze level of suspected contamination from compressor burnout, use Total Test.<sup>™</sup> See your DISTRIBU-TOR/BRANCH.

Some compressor electrical failures can cause motor to burn. When this occurs, by-products of burn, which include sludge, carbon and acids contaminate system. If burnout is severe enough, system must be cleaned before replacement compressor is installed. The 2 types of motor burnout can be classified as mild or severe.

In *mild* burnout, there is little or no odor detectable. Compressor oil is clear or slightly discolored. An acid test of compressor oil will be negative. This type of failure is treated the same as mechanical failure. Liquid line strainer should be removed and liquid line filter drier installed.

In a *severe* burnout, there is a strong, pungent, rotten egg odor. Compressor oil is very dark. Evidence of burning may be present in tubing connected to compressor. An acid test of compressor oil will be positive. Complete system must be reverse flushed with refrigerant. AccuRater<sup>TM</sup> or TXV must be cleaned or replaced. In a heat pump, accumulator and reversing valve are replaced. These components are also removed and bypassed during reverse flushing procedure. Remove and discard liquid line strainer. After system is reassembled, install liquid and suction line filter driers, run system for 2 hours. Discard both driers, install new liquid line drier only.

#### COMPRESSOR REMOVAL AND REPLACEMENT

Once it is determined that compressor has failed and the reason established, compressor must be changed.

#### A CAUTION

Wear safety glasses and gloves when handling refrigerants and when using brazing torch.

- 1. Shut off all power to unit.
- 2. Remove all refrigerant from system until pressure gauge reads 0 psi.
- 3. Disconnect electrical leads from compressor. Disconnect or remove crankcase heater and remove compressor holddown bolts
- 4. Cut compressor from system with tubing cutters. Do not use brazing torch for compressor removal. Oil vapor may ignite when compressor is disconnected.
- 5. Scratch matching marks on stubs in old compressor. Make corresponding marks on replacement compressor.
- 6. Use torch to remove stubs from old compressor and to reinstall them in replacement compressor.
- 7. Use copper couplings to tie compressor back into system.
- 8. Evacuate system, recharge, check for normal system operation.

→ Scroll Compressor—The scroll compressor pumps refrigerant through the system by the interaction of a stationary and an orbiting scroll (see Fig. 25). Because of the nearly continuous suction and discharge pressure, the low pulsations make the use of an external muffler generally unnecessary. Since the scroll compressor has no dynamic suction or discharge valves, vibration is minimal sound levels are low and it is very tolerant of stresses caused by debris, liquid slugging and flooded starts. The need for an accumulator or a crankcase heater is eliminated. Due to the design of the scroll compressor, the internal compression components always start unloaded (equalized pressures) thereby eliminating the need for start assist devices, such as a PTC thermistor or a start capacitor and relay. The white oil (Sontex 200LT) used in the scroll is compatible with 38GS oil, which can be used if additional oil is required.

#### TROUBLESHOOTING

Troubleshooting mechanical or electrical problems in a scroll compressor is the same as for a reciprocating compressor, except that a pumpdown procedure should never be used to determine if the scroll compressor is pumping. For scroll compressors, the compressor current must be compared with performance curves (pressures and voltages) and deviations greater than +/-15% may indicate a faulty compressor. If a pumpdown procedure were used, the scroll compressor is capable of pumping into a vacuum very quickly which could cause fusite arcing and compressor failure.





The open passage is sealed off as gas is drawn into the spiral.



By the time the gas arrives at the center port, discharge pressure has been reached.

As the spiral continues to orbit, the gas is compressed into an increasingly smaller pocket.



Actually, during operation, all six gas passages are in various stages of compression at all times, resulting in nearly continuous suction and discharge.

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Fig. 25—Scroll Compressor Refrigerant Flow

#### DISCHARGE THERMOSTAT

The scroll compressor has a discharge thermostat that a reciprocating compressor does not have. This thermostat is mounted in a well in the top of the compressor shell to sense if the discharge temperature reaches 280 F and shutdown the compressor to prevent damage to the compressor. When the temperature of the thermostat reaches 130 F, power is restored to the compressor. To determine if the thermostat is operating properly, disconnect the wire to the thermostat. Starting with the thermostat temperature at 130 F, increase the temperature slowly to 280 (+/-9) F. If the contact opens, as indicated by an infinity reading on an ohmmeter, before the temperature reaches 280 F, the thermostat must be replaced.

<u>Replacing Discharge Thermostat</u>—See Fig. 26. To replace the discharge thermostat, refer to the installation instructions packaged with the replacement Discharge Thermostat Kit.

#### **Refrigeration System** REFRIGERATION CYCLE

In a refrigerant system, refrigerant moves heat from one place to another. It is useful to understand flow of refrigerant in a system. In a *straight cooling* system, compressed hot gas leaves compressor and enters condensing coil. As gas passes through condenser coil it rejects heat and condenses into liquid. The liquid leaves condensing unit through liquid line and enters metering device at indoor coil.



As it passes through metering device, it becomes a gasliquid mixture. As it passes through indoor coil, it absorbs heat and refrigerant is again changed to gas. The gas is returned to compressor, where it is compressed to a hot gas, and cycle repeats.

In a *heat pump*, the basic cycle is the same. See Fig. 27. Reversing valve in system decides which coil, indoor or outdoor, becomes evaporator or condenser. In heating mode, indoor coil is condenser. It rejects heat into the home after heat is absorbed by outdoor evaporator coil. Thus, home is heated.

In cooling cycle, indoor coil becomes evaporator. It absorbs heat from home and rejects it out-of-doors through outdoor condenser coil. Thus, home is cooled.

A unique feature of the heat pump is that metering devices are designed to meter refrigerant in one direction of flow, and allow refrigerant to pass unhindered in other direction. If indoor metering device is metering refrigerant, outdoor device bypasses refrigerant and vice versa. This allows both coils to serve a dual function.

LEAK DETECTING

#### CAUTION

Always wear safety glasses and gloves when handling refrigerants.

New installations should be checked for leaks prior to complete charging.

If a system has lost all or most of its charge, system must be pressurized again, up to approximately 150 lb minimum. This can be done by adding refrigerant, using normal charging procedures. Or it may be pressurized with nitrogen (less expensive than refrigerant). Nitrogen also leaks faster than R-22 and is not absorbed by refrigeration oil. Nitrogen cannot, however, be detected by a leak detector (See Fig. 28).

#### A CAUTION

Due to the high pressure of nitrogen, it should never be used without a pressure regulator on the tank.

On the other hand, leaks in a system pressurized with refrigerant can be spotted with a leak detector which detects extremely small refrigerant leaks. This discussion assumes that system is pressurized with either all refrigerant or a mixture of nitrogen and refrigerant.





If system has been operating for some time, make first check for a leak visually. Since refrigerant carries a small quantity of oil, traces of oil at any joint or connection is an indication the refrigerant is leaking at that point.

A simple and inexpensive method of testing for leaks is to use soap bubbles. Any solution of water and soap may be used.

Soap solution is applied to all joints and connections in system. A small pinhole leak is located by tracing bubbles in soap solution around leak.

Use electronic leak detector to check for leaks. This unquestionably is the most efficient and easiest method for checking for leaks. There are various types of electronic leak detectors. Generally speaking, they are all portable, most are lightweight, and consist of a box with several switches and a probe or sniffer. Detector is turned on and probe is passed around all fittings and connections in system. Leak is detected by either a movement of a pointer on detector dial, by a buzzing sound or a light.

In all instances, when a leak is found, system charge must be bled down and leak repaired before final charging and operation. After leak is repaired, evacuate system, and recharge with correct refrigerant charge.

#### BRAZING

When brazing is required in the refrigeration system certain basics should be remembered. The following are a few of the basic rules.

- 1. Clean joints make the best joints, which can be achieved by:
  - a.) Removing all oxidation from surfaces to a shiny finish before brazing.
  - b.) Removing all flux residue with brush and water while material is still hot.
- 2. Use "sil-fos" or "fos-copper" for copper to copper only. No flux is required.
- 3. Silver solder is used on copper to brass, copper to steel or copper to copper. Flux is required when using silver solder.
- 4. Fluxes should be used carefully. Avoid excessive application and do not allow fluxes to enter into the system.
- 5. Proper brazing temperature of copper is when it is heated to a dull red color.

This section on brazing is not intended to teach a technician how to braze. There are books and classes which teach and refine brazing technique. The above basic points are listed only as a reminder.



Fig. 28—Leak Detector

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#### SERVICE VALVES

(See Fig. 29.) Service valves provide a means for holding original factory charge in outdoor unit prior to hookup to indoor coil. They also contain gauge ports for measuring system pressures, and provide shutoff convenience for certain types of repairs.

The service valves in the condensing unit or outdoor unit on a heat pump come from the factory front seated. This means that the refrigerant charge is isolated from the line set connection ports, or AccuRater. After connecting the sweat adapter to the liquid service valve of a heat pump, the valves are ready for brazing. The interconnecting tubing (line set) can be brazed to the service valves using either silver bearing or non-silver bearing brazing material. Consult local codes. Before brazing the line set to the valves, the belled ends of the sweat connections on the service valves must be cleaned so that no brass plating remains on either the inside or outside of the bell joint. To prevent damage to the valve and/or "O" ring, use a wet cloth or other accepted heat sink material on the valve before brazing. To prevent damage to the unit corner post, use a metal barrier between brazing area and unit.

After the brazing operation and the refrigerant tubing and evaporator coil have been purged or evacuated, the valve



stem can be turned counterclockwise until it backseats, which releases refrigerant into tubing and evaporator coil. System can now be operated.

The service valves must be backseated (turned counterclockwise until seated) before the service port caps can be removed and hoses of gauge manifold connected. In this position, refrigerant has access from and through outdoor and indoor unit.

The service valve stem cap is tightened to  $20 \pm 2$  ft/lbs torque and the service port caps to  $9 \pm 2$  ft/lbs torque. The seating surface of the valve stem and service ports have a knife set edge against which the caps are tightened to attain a metal to metal seal. If accessory pressure switches are used, the service valve must be cracked. Then, the knife set stem cap becomes the primary seal.

The service valve cannot be field repaired, therefore only a complete valve or valve stem and service port caps are available for replacement.

If the service valve is to be replaced, a metal barrier must be inserted between the valve and the unit, to prevent damaging the unit exterior from the heat of the brazing operations.

#### A CAUTION

Wear safety glasses and gloves when handling refrigerants.

<u>Pumpdown Procedure</u>—Service valves provide a convenient shutoff valve useful for certain refrigeration system repairs. System may be pumped down to make repairs on low side without losing complete refrigerant charge.

- 1. Attach pressure gauge to suction service valve gauge port.
- 2. Frontseat liquid line valve.
- Start unit in cooling mode. Run until suction pressure reaches 5 psig (35 kPa).
- 4. Shut unit off. Frontseat suction valve.
- 5. Vent remaining pressure to atmosphere.

NOTE: All outdoor unit coils will hold only factory-supplied amount of refrigerant. Excess refrigerant such as in long line applications, may cause unit to relieve pressure through internal pressure relief valve (indicated by sudden rise of suction pressure) before suction pressure reaches 5 psig (35 kPa). If this occurs, shut off unit immediately, frontseat suction valve, and vent remaining pressure to atmosphere.

#### ACCURATER™ (BYPASS TYPE) COMPONENTS

AccuRater piston, see Fig. 30, has a refrigerant metering hole through it. Retainer forms a stop for piston in refrigerant bypass mode, and a sealing surface for liquid line flare connection. To check, clean or replace piston:

- 1. Shut off power to unit.
- 2. Pump unit down using Pumpdown Procedure described in this Service Manual.
- 3. Loosen flare nut and remove liquid line flare connection from AccuRater.
- 4. Pull retainer out of body, being careful not to scratch flare sealing surface. If retainer does not pull out easily, carefully use locking pliers to remove it.
- 5. Slide piston out by inserting a small soft wire, with small kinks, through metering hole. Do not damage metering hole, sealing surface around piston cones or fluted portion of piston.



#### Fig. 29—Service Valves

- 6. Clean piston refrigerant metering hole.
- 7. Install a new retainer O-ring or retainer assembly before reassembling bypass-type AccuRater.
- 8. Tighten flare nut on stub-out tube to AccuRater.

#### REVERSING VALVE

In heat pumps, changeover between heating and cooling modes is accomplished with a valve that reverses flow of refrigerant in system. See Fig. 31. This reversing valve device is easy to troubleshoot and replace. The reversing valve solenoid can be checked with power off with an ohmmeter. Check for continuity and shorting to ground. With control circuit (24-v) power on, check for correct voltage at solenoid coil. Check for burned or overheated solenoid.

With unit operating, other items can be checked, such frost or condensate water on refrigerant lines.

The sound made by a reversing valve, as it begins or ends defrost, is a loud whooshing noise, as reversing valve reverses, and pressures in system equalize. An experienced service person detects this sound and uses it as a valuable troubleshooting tool.

Using a remote measuring device, check inlet and outlet line temperatures. *Do not* touch lines. If reversing valve is operating normally, inlet and outlet temperatures on appropriate lines should be close. Any difference would be due to heat loss or gain across valve body. Temperatures are best checked with a remote reading electronic-type thermometer with multiple probes. Route thermocouple leads to inside of coil area through service valve mounting plate area underneath coil. Figs. 32 and 33 show test points (TP) on revers-



Fig. 30—AccuRater™ Components



Fig. 31-Reversing Valve

ing valve for recording temperatures. Insulate points for more accurate reading.

If valve is defective: Shut off all power to unit. Remove all charge from system.

Remove solenoid coil from valve body. Remove valve by cutting it from system with tubing cutter. Repair person should cut in such a way that stubs can be easily rebrazed back into system. Do not use hacksaw. This introduces chips into system that cause failure. After defective valve is removed, wrap it in wet rag and carefully unbraze stubs. Save stubs for future use. Because defective valve is not overheated, it can be analyzed for cause of failure when it is returned.

Braze new valve onto used stubs. Keep stubs oriented correctly. Scratch corresponding matching marks on old valve and stubs, and new valve body, to aid in lining up new valve properly. When brazing stubs into valve, protect valve body with wet rag to prevent overheating.

Use slip couplings to install new valve with stubs back into system. Even if stubs are long, wrap valve with a wet rag to prevent overheating.

After valve is brazed in, check for leaks. Evacuate and charge system. Operate system in both modes several times to be sure valve functions properly.

#### THERMOSTATIC EXPANSION VALVES (GENERAL)

The types of thermostatic expansion valves most commonly used in condensing unit and heat pump systems are as follows:

RPB (Rapid Pressure Balance)—Has a special bleed port that allows rapid bleed-through of pressure after system shutdown until pressure equalization occurs within approximately 1 to 2 minutes.

30% Bleed Port—Has small bleed port that allows slow bleed through after system shutdown until pressure equalization occurs within approximately 5 to 10 minutes.

Hard Shut-Off—Has no bleed port and allows no bleed through after system shut down. No pressure equalization occurs. Because of unequalized system pressures, a start capacitor and relay must be installed to start the compressor.

#### THERMOSTATIC EXPANSION VALVE (BI-FLOW)

The standard thermostatic expansion valve is a metering







Fig. 33—Reversing Valve (Heating Mode, Solenoid De-Energized)

device that is used in condensing and heat pump systems to adjust to changing load conditions by maintaining a pre-set superheat temperature at the outlet of the evaporator coil. The volume of refrigerant metered through the valve seat is dependent upon:

- 1. Superheat temperature sensed by cap tube sensing bulb on suction tube at outlet of evaporator coil. As long as this bulb and cap tube contains some liquid refrigerant, this temperature is converted into suction pressure pushing downward on the diaphragm, which tends to open the valve via the pushrods.
- 2. The suction pressure at the outlet of the evaporator coil is transferred via the external equalizer tube to the underside of the diaphragm.
- 3. The needle valve on the pin carrier is spring loaded, which also exerts pressure on the underside of the diaphragm via the pushrods, which tends to close the valve. Therefore, bulb pressure equals evaporator pressure (at outlet of coil) plus spring pressure. If the load increases the temperature increases at the bulb, which increases the pressure on the topside of the diaphragm which pushes the pin carrier away from the seat, opening the valve and increasing the flow of refrigerant. The increased refrigerant flow causes increased leaving evaporator pressure which is transferred via the equalizer tube to the underside of the diaphragm which with the pin carrier spring pressure tends to close the valve and the refrigerant flow is effectively stabilized to the load demand with negligible change in superheat. The bi-flow thermostatic expansion valve is used on split system heat pumps. In the cooling mode, the TXV operates the same as a standard TXV as previously explained. See Fig. 34. However, when the system is

switched to the heating mode of operation, the refrigerant flow is reversed. The bi-flow TXV has an additional internal check valve and external tubing (see Fig. 35). These additions allow the refrigerant to by-pass the TXV when refrigerant flow is reversed, with only a 1 to 2 psig pressure drop through the device. When the heat pump switches to the defrost mode, the refrigerant flows through a completely open (unthrottled) TXV, the bulb is sensing the residual heat of the outlet tube of the coil that had been operating in the heating mode (about 85 F and 155 psig). This temporary unthrottled valve decreases the indoor pressure drop which in turn increases the refrigerant flow rate, decreases overall defrost time, and enhances defrost efficiency.

#### COIL REMOVAL

Coils on this family of units are easy to remove if required for compressor removal, or to replace coil. Shut off all power to unit. Remove refrigerant from system through service valves.

#### A CAUTION

Wear safety glasses and gloves when handling refrigerants.

- 1. Remove top cover (See Removing Top Cover).
- 2. Remove access panel.
- 3. Remove information plate.
- 4. Remove control box.
- 5. Remove coil grill.
- 6. Remove right corner post.

#### A CAUTION

Avoid possibility of fire and personal injury by cutting tubing.

- 7. Use midget tubing cutter to cut liquid and vapor lines at both sides of coil. Cut in convenient location for easy reassembly with copper slip couplings.
- 8. Remove the screw holding left tube sheet to base pan flange.

- 9. Lift coil vertically from basepan, place aside carefully.
- 10. Reverse procedure to reinstall coil.

#### LIQUID LINE STRAINER

The liquid line strainer is brazed into the liquid line between where it exits the condenser coil and is routed in the base pan to the liquid service valve. The strainer catches any debris that may be in the system. If it becomes plugged system operation and pressure becomes abnormal and the compressor may become hot and cycle off on the overloads or pressure relief.

If the strainer must be replaced, shut off all power to the unit and purge all refrigerant from the system. Use only midget tubing cutter and cut tubing as close to strainer as possible. If tubing is too short to braze in replacement strainer, braze a coupling and necessary additional tubing on existing tubing. Strainer cannot be installed backward because one end has a male and the other end a female connection and an arrow is embossed on the strainer body. The arrow and the male fitting points towards the service valve. Before brazing, insert a metal barrier between brazing area and the unit to prevent damage to unit. Evacuate and charge unit with refrigerant. Start unit and check for normal system operation.

#### ACCUMULATOR

The accumulator is a device always found in heat pumps and in some condensing unit models. Under some light load conditions on indoor coils (on outdoor coil with heat pump in heating mode), some liquid refrigerant is present in suction gas returning to compressor. The accumulator stores liquid, allows it to boil off into a vapor so it can be safely returned to compressor. Since compressor is designed to pump refrigerant in its gaseous state, introduction of liquid into it could cause severe damage or total failure of compressor.

The accumulator is a passive device which seldom needs replacing. Occasionally its internal oil return orifice or bleed hole may become plugged. Some oil is contained in refrigerant returning to compressor. It cannot boil off in accumulator with liquid refrigerant. The bleed hole allows a small amount of oil and refrigerant to enter the return line where velocity of refrigerant returns it to compressor. If bleed hole plugs, oil is trapped in accumulator, and compressor will eventually fail from lack of lubrication. If bleed hole is

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Fig. 34—TXV in Cooling Mode





Fig. 35—TXV in Heating Mode

plugged, accumulator must be changed. Bleed hole is so tiny, cleaning efforts usually are not successful. The accumlator has a fusible element located in the bottom end bell (see Fig. 36). This fusible element will melt at 430 F and vent the refrigerant if this temperature is reached either internal or external to the system. If fuse melts, the accumulator must be replaced.

#### To Change Accumulator

- 1. Shut off all power to unit.
- 2. Remove all refrigerant from system.

**NOTE:** Coil may be removed for access to accumulator. Refer to appropriate sections of Service Manual for instructions.

#### A CAUTION

Wear safety glasses and gloves when working on refrigerants and when using brazing torch.

- 3. When accumulator is exposed, remove it from system with tubing cutter.
- 4. Scratch matching marks on tubing stubs and old accumulator. Scratch matching marks on new accumulator.
- 5. Unbraze stubs from old accumulator and braze into new accumulator.
- 6. Thoroughly rinse any flux residue from joints and paint with corrosion-resistant coating such as zinc-rich paint.
- 7. Reinstall accumulator into system with copper slip couplings.
- 8. Evacuate and charge system.

Pour and measure oil quantity (if any) from old accumulator. If more than 20% of oil charge is trapped in accumulator, add oil to compressor to make up for this loss.



CONTAMINANT REMOVAL

#### Purging

Whenever a system is exposed to atmospheric conditions for a short period of time (less than 5 minutes) such as during part replacement, it is necessary to purge the system to remove any contaminants which may have entered the system. The theory behind purging is to use a high velocity charge of refrigerant vapor to blow contaminants from the system. About 1/2 to 1 pound of the same refrigerant used in the system is used to flow from the refrigerant cylinder into the unit through the liquid service valve, through the system and out of the system through the vapor service valve, carrying any contaminants with it. If exposure is more than 5 minutes, the system must be evacuated.

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#### Evacuation

Proper evacuation of a unit will remove non-condensibles and assure a tight dry system before charging. The two methods used to evacuate a system is the deep vacuum method and the triple evacuation method.

#### Deep Vacuum Method

The deep vacuum method requires a vacuum pump capable of pulling a vacuum of 1000 microns and a vacuum gauge capable of accurately measuring this vacuum depth. The deep vacuum method is the most positive way of assuring a system is free of air and liquid water.

#### **Triple Evacuation Method**

The triple evacuation method can be used where the vacuum pump is capable of pumping down to only 28-ins. of mercury



Fig. 36—Accumulator

vacuum, and the system does not contain any liquid water. The procedure is to pump the system down to 28ins. of mercury vacuum and allow pump to continue to operate for additional 15 minutes. Then the service valves are closed and the vacuum pump is shut off. A refrigerant cylinder is then connected to the system and opened until system pressure is 2 psig, and close the service valve. Allow system to stand for one hour, during which time the dry refrigerant will be able to diffuse throughout the system, absorbing moisture. This procedure is repeated 3 times after which the system will be free of any contaminants and water vapor.

#### SYSTEM CHARGING

For all approved combinations, system must be charged correctly for normal system operation and reliable operation of components.

#### **A** CAUTION

Always wear safety glasses and gloves when handling refrigerants.

If system has lost all charge, weigh in charge using dial-acharge or digital scale.

If system has some charge, the Heating Check Charts publication should be referred to in order to calculate the correct amount of refrigerant to be added. Refrigerant should be added when the system is running. System charge should be fine-tuned by using the superheat or subcooling method, whichever is appropriate. These methods are covered later in this manual.

**NOTE:** Heat pump check charts are for checking charge and performance and for adding a *small* amount of charge. During heating mode, correct method of charging is the weight method. In heating mode, check should be made approximately 15 minutes after a defrost, with unit running with a clean coil. In cooling cycle, system should run at least 10 minutes for temperatures and pressures to stabilize. All charts assume there are no system abnormalities and indoor coil airflows are correct. If system abnormalities exist, correct them before checking system charge.

#### CHECKING CHARGE

Superheat charging is the process of charging refrigerant into a system until the temperature (superheat) of the suction gas entering the compressor reaches a prescribed value. Small variations of charge affect suction gas superheat temperatures greatly. Therefore, this method of charging is very accurate. This method can be used only on split system condensing units and heat pumps (operating in the cooling mode), with fixed restrictor type metering devices such as; AccuRater, cap tube, etc. For units using a thermostatic expansion valve, the subcooling method must be used. Heat pumps must be operating in the cooling mode. To charge by superheat, a serviceman will need an accurate superheat thermocouple or thermistor type thermometer (do not use mercury or small dial type thermometers as they are not adequate for this type of measurement), a sling psychrometer and a gauge manifold. Then using the following procedure:

#### Superheat Charging Method

- 1. Operate unit a minimum of 10 minutes before checking charge.
- 2. Measure vapor pressure by attaching a gauge to vapor valve service port.
- 3. Measure vapor line temperature by attaching a service thermometer to unit vapor line near vapor valve. On a

heat pump, attach to the suction tube between the accumulator and the compressor. Insulate thermometer for accurate readings.

- 4. Measure outdoor air dry-bulb temperature with a second thermometer.
- 5. Measure indoor air (entering indoor coil) wet-bulb temperature with a sling psychrometer.
- 6. Locate outdoor temperature and evaporator entering air wet-bulb temperature in Table 1. At this intersection note the superheat.
- 7. Locate superheat temperature located in previous step and vapor pressure in Table 2. At this intersection note vapor line temperature.
- 8. If unit has a higher vapor line temperature than charted temperature, add refrigerant until charted temperature is reached.
- 9. If unit has a lower vapor line temperature than charted temperature, bleed refrigerant until charted temperature is reached.
- If outdoor air temperature or pressure at vapor valve changes, charge to new vapor line temperature indicated on chart.
- 11. This procedure is valid, independent of indoor air quantity.

#### Subcooling Charging Method

- 1. Operate unit a minimum of 15 minutes before checking charge.
- 2. Measure liquid service valve pressure by attaching an accurate gauge to the service port.
- 3. Measure the liquid line temperature by attaching an accurate thermistor type or electronic thermometer to the liquid line near the outdoor coil.
- 4. Refer to Table 3 to find required subcooling temperature for unit. Find the point at which the required subcooling temperature intersects the measured liquid service valve pressure on Table 4.
- 5. To obtain the required subcooling temperature at a specific liquid line pressure, add refrigerant if liquid line temperature is higher than indicated or remove refrigerant if temperature is lower. Allow a tolerance of  $\pm 3$  F.

#### CARE AND MAINTENANCE

To assure high performance and minimize possible equipment malfunction, it is essential that maintenance be performed periodically on this equipment. The frequency with which maintenance is performed is dependent on such factors as hours of operation, geographic location and local environmental conditions.

#### A WARNING

Disconnect all electrical power to unit before performing any maintenance or service on outdoor unit. Remember also to disconnect power supply to air handler as this unit supplies low-voltage power to the outdoor unit.

The minimum maintenance that should be performed on this equipment is as follows:

1. Check outdoor coil for cleanliness each month during the heating (heat pump only) or cooling season and clean as necessary, but clean at least once each heating (heat pump only) and cooling season.



- 2. Check fan motor and blade for cleanliness each heating and cooling season and clean as necessary.
- 3. Check electrical connections for tightness and controls for proper operation each heating (heat pump only) or cooling season and service as necessary.

#### **A** CAUTION

Because of possible damage to the equipment or personal injury, maintenance should be performed by qualified persons only.

<u>Coil Cleaning</u>—Remove top cover. Refer to section "Removing Top Cover" of this manual.

#### A CAUTION

Coil fin damage can result in higher operating costs or compressor damage. Do not use flame, high-pressure water, steam, volatile or corrosive cleaners on fins or tubing.

Clean coil using vacuum cleaner and its crevice tool. Move crevice tool *vertically*, close to area being cleaned, making sure tool touches only the dirt on the fins and not the fins. To prevent fin damage, do not scrub fins with tool or move tool horizontally against fins.

If oil deposits are present, spray coil with ordinary household detergent. Wait 10 minutes, proceed to next step.

Outdoor Temp (F)	Cares of	INDOOR COIL ENTERING AIR TEMP (F WB)												
	50	52	54	56	58	60	62	64	66	68	70	72	74	76
55	9	12	14	17	20	23	26	29	32	35	37	40	42	45
60	7	10	12	15	18	21	24	27	30	33	35	38	40	43
65	-	6	10	13	16	19	21	24	27	30	33	36	38	41
70	-		7	10	13	16	19	21	24	27	30	33	36	39
75	-			6	9	12	15	18	21	24	28	31	34	37
80		-			5	8	12	15	18	21	25	28	31	35
85	-		_			-	8	11	15	19	22	26	30	33
90				_	-	-	5	9	13	16	20	24	27	31
95	-	-		-	-		_	6	10	14	18	22	25	29
100	-		-	-	-	-	_	-	8	12	15	20	23	27
105	-	-	-		-	-	-	-	5	9	13	17	22	26
110	-	-	-	_	-	-	-	-	_	6	11	15	20	25
115	-		_	-	-	-	-	-	_	_	8	14	18	23

#### Table 1—Superheat Charging Table

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-Do not attempt to charge system under these conditions or refrigerant slugging may occur.

#### Table 2—Required Vapor Temperature (F)

Superheat	VAPOR PRESSURE AT SERVICE PORT (psig)												
Temp (F)	61.5	64.2	67.1	70.0	73.0	76.0	79.2	82.4	85.7				
0	35	37	39	41	43	45	47	49	51				
2	37	39	41	43	45	47	49	51	53				
4	39	41	43	45	47	49	51	53	55				
6	41	43	45	47	49	51	53	55	57				
8	43	45	47	49	51	53	55	57	59				
10	45	47	49	51	53	55	57	59	61				
12	47	49	51	53	55	57	59	61	63				
14	49	51	53	55	57	59	61	63	65				
16	51	53	55	57	59	61	63	65	67				
18	53	55	57	59	61	63	65	67	69				
20	55	57	59	61	63	65	67	69	71				
22	57	59	61	63	65	67	69	71	73				
24	59	61	63	65	67	69	71	73	75				
26	61	63	65	67	69	71	73	75	77				
28	63	65	67	69	71	73	75	77	70				
30	65	67	69	71	73	75	77	70	81				
32	67	69	71	73	75	77	79	81	82				
34	69	71	73	75	77	79	81	83	95				
36	71	73	75	77	79	81	83	85	97				
38	73	75	77	79	81	83	85	87	0/				
40	75	77	79	81	82	05	07	07	09				

Table 3—Subcooling a	t Liquid Servic	e Value
----------------------	-----------------	---------

ing in National	38 8. SE SEF	TG .0 ER RIES		38TH 9.0 SEER SERIES		38 10 SE SEF	TK 0.0 ER RIES	38TM 11.0 SEER SERIES	38TR 12.0 SEER SERIES	38SQ- 200 10.0 SEER SERIES		38YG 8.0 SEER SERIES		38 9 SE SEF	YH .0 ER NES	38 10 SE	YK D.0 ER RIES	38YR 12.0 SEER SERIES
SIZE	300	310	300	310	320	300	310	300	300	300	300	310	320	300	310	300	310	300
014	14	14	14	14	14	6	6	-	-	-	7	7	7	-	-	-	-	-
018	17	17	14	14	14	7	7	8		-	18	18	18	16	16	11	11	9
024	13	13	17	17	17	8	8	12	11	13	18	18	18	16	16	11	11	11
030	15	15	9	10	10	6	6	9	10	11	13	13	13	20	20	10	10	9
036	13	12	16	16	16	12	12	13	12	8	18	18	18	14	14	10	10	9
042	13	13	16	19	19	12	12	11	15	11	13	11	11	18	18	15	15	11
048	15	14	18	14	18	14	14	10	11	11	22	17	15	19	14	13	13	10
060	19	22	18	18	18	14	14		12	-	23	23	23	13	13	14	14	12

#### Table 4

Pressure (PSIG)	Re	Required Subcooling Temperature (°F)									
at Service Fitting	0	5	10	15	20	25					
134	76	71	66	61	56	51					
141	79	74	69	64	59	54					
148	82	77	72	67	62	57					
156	85	80	75	70	65	60					
163	88	83	78	73	68	63					
171	91	86	81	76	71	66					
179	94	89	84	79	74	69					
187	97	92	87	82	77	72					
196	100	95	90	85	80	75					
205	103	98	93	88	83	78					
214	106	101	96	91	86	81					
223	109	104	99	94	89	84					
233	112	107	102	97	92	87					
243	115	110	105	100	95	90					
253	118	113	108	103	98	93					
264	121	116	111	106	101	96					
274	124	119	114	109	104	99					
285	127	122	117	112	107	102					
297	130	125	120	115	110	105					
309	133	128	123	118	113	108					
321	136	131	126	121	116	111					
331	139	134	129	124	119	114					
346	142	137	132	127	122	117					
359	145	140	135	130	125	120					

Using garden hose, spray coil vertically downward with constant stream of water at moderate pressure. Keep nozzle at a 15 to 20 degree angle, about 3-ins. (76 mm) from coil face and 18-ins. (457 mm) from tube. Spray so debris is washed out of coil and basepan.

Restore power to unit.

#### Cleaning Outdoor Fan Motor and Blade

- 1. Remove fan motor and blade. Refer to section "Removing Fan Motor Assembly" of this manual. Be careful not to bend or dent fan blade.
- Clean motor and blade with soft brush or cloth. Be careful not to disturb balance weights on fan blade.
- 3. Check fan blade setscrew for tightness.
- 4. Reinstall fan motor and blade to top cover and check for alignment.
- 5. Reinstall top cover and position blade as per Fig. 15.
- 6. Reconnect electrical power and check fan for proper operation.

#### **Electrical Controls and Wiring**

Disconnect power to both the outdoor and indoor units. Check all electrical connections for tightness. Tighten all screws on electrical connections. If any connections appear to be burned or smokey, disassemble the connection, clean all parts and stripped wires and reassemble. Use a new connector if old one is burned or corroded and crimp tightly. Reconnect electrical power to the indoor and outdoor units and observe unit through one complete operating cycle.

If there are any discrepancies in the operating cycle, troubleshoot, find the cause and correct.

#### **Refrigerant Circuit**

Check the refrigerant charge using the superheat or subcooling method, whichever is applicable, and if low on charge, check unit for leaks using an electronic leak detector. If leak(s) is/are found, purge or isolate charge (pumpdown) if applicable, make necessary repairs; evacuate and re-charge and operate unit through entire cycle.

#### **Final Check Out**

After the unit has been operating, the following items should be checked.

- 1. Check that the unit operational noise is not excessive due to vibration of component, tubing, panels, etc., and if present, isolate problem and correct.
- 2. Check to be sure caps are installed on service valves and that they are tight.
- 3. Check to be sure tools and loose parts and debris are removed from the unit.
- 4. Check to be sure all panels and screws are in place and tight.

#### **Desert & Seacoast Locations**

Special consideration must be given to the installation and maintenance of condensing units and heat pumps installed in seacoast or desert locations. This is because salt impregnated sand (seacoast) and alkali impregnated sand (desert) adheres to the aluminum fins of the coil and can cause premature coil failure due to corrosion from salt, alkali and moisture.

Preventative measures can be effected during installations, such as:

1. Locating the unit on side of structure opposite the prevailing winds.

22

2. Elevating the unit to height where drifting sand cannot pile up against coil. Four inch high mounting feet or an 18-in. high mounting rack are available as accessories and can be used to elevate the unit.

Maintenance:

- 1. Frequent inspection of coil and base pan especially after storms and/or high winds and,
- 2. Cleaning coil by flushing out sand from between coil fins and out of base pan as frequently as inspection determines necessary.
- 3. In "off season," covering with cover that allows air to circulate through but prevents sand from sifting in (such as canvas material). *Do not use plastic;* plastic will hold moisture.



#### HEAT PUMP TROUBLESHOOTING CHART—HEATING CYCLE

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A90206

#### AIR CONDITIONER TROUBLESHOOTING CHART



A90208

HEAT PUMP TROUBLESHOOTING CHART—COOLING CYCLE



A90207

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**38T Air Conditioning Units** 

# Wiring Diagrams Size 014-060

Index

Model	V-Ph-Hz	Label Diagram (On Unit)	Fig. No.
38TG-01430	208/230-1-60	315856-401	1
38TG-01830	and the state of the state of the state of the		
38TG-02430 38TG-03030		and the second second	
38TG-03630	and the second second second	e Summer Street Street	
38TG-03631		and the second state of the second state	
38TG-04230	The second states and		
38TG-04231			
38TG-04831		I have been a served and the server of	
38TH-01430	and the second	and the second	
38TH-01430DL	244 A		
38TH-01830			
38TH-01030DL 38TH-02430	a set the second second second second		
38TH-02430DL		a separate second second	
38TH-03030			
38TH-03030DL	and the second second second		
381H-03031 28TH-02021 DI		and the second second second second second	
38TH-03030	Construction of the second second second second		
38TH-03630DL	Contraction of the second		
38TH-04231		and the second second second second	
38TH-04231DL			
38TH-04233 DI	and the second		
38TH-04830		California de la settera	
38TH-04830DL			
38TH-04831	San Meller Land State	and the second and the second second	
38TH-04831DL	A ALL A CALL AND A CALL AND A CALL	a figure contraction of the figure	
38TH-04832		Same and the second second	
38TK-01830	and the second	en suit attrian something the	
38TK-01830DL	Carbon manufactor and the factor of	A DESCRIPTION OF A DESC	
38TK-02430		a state of the second	
381K-02430DL 38TK-03030			
38TK-03030DL		The second second states and	
38TK-03031	and the second second second		
38TK-03031DL		and the second second second	
38TK-03032		and the contract of the second	
38TK-03630		and the second second second	
38TK-03630DL			
38TK-03631		and the second se	
38TK-03631DL	Carlos and an and	and the second	
381 K-03632 387 K-03632		a construction of the second second	
38TK-04230	man and in the or link groups are the		
38TK-04230DL	And I want to the state of the second state of the		
38TK-04231			
38TK-04231DL	and the second	in the second second second second second	
38TK-04830 38TK-04830	the same and the second second second second		
38TK-04831	and the state of the second state of the	The second second second second	
38TK-04831DL	and the second		
38TM-01830DL			
38TM-02430DL			
38TM-03030DL		a second the second second	
38TM-04230DL	An and the second s	the second of the second s	
38TM-04830DL	and a second	and the stranger of the state of the state of the	一一, 中有一, 用"可以以"
38TMX02430			
381MX03030			
38TMX04230			
38TR-02430	the second s	and the second se	
38TR-03030		Salar State State State	
38TR-03630	and the second	and the second	
38TR-04230 38TR-04830	and the survey would be a set of the	and the manufacture of the second states and	
28TC.060	209/220 1 60	212024 404	0
38TG-06031	208/230-1-60	313934-401	2
38TH-06030		in the special strange and the	
38TH-06030DL		A State of the second second	
38TK-06030	all the state of the state of the	Contraction of the second s	
3818-00030 01		Server description of the local server in the server of th	

Book 1 4 Tab 3a 2a

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

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Nadal	V-Ph-Hz	Label Diagram (On Unit)	Fig. No.	and a second
Model	208/230-3-60		1	
38TG-03050	460-3-60	313927-401	3	
38TG-03650	400-0-00	CIOCET 401		( )
38TG-03651	Alternative second and the second			
38TG-03660		and the set of the second state		3
38TG-03661		a second s		
38TG-04250	and an address of the second descent and the second s	and the second state of the second state and		
38TG-04251	the second se			
38TG-04252	to the state of the			
38TG-04260		and the second second second second second second		
38TG-04261		A REAL PROPERTY OF A REAL PROPERTY OF		
38TG-04262				
38TG-04851	and states where the second states are second	and the second se		
38TG-04861				
38TG-06050	A Street and the second states of the second states and			
38TG-06051	and the second	A second state and second states		
38TG-06060				
38TG-06061		The second second second		
38TH-03050DL		the second second second second second		
38TH-03650DL	- silver and the second state of the second state of the			
38TH-03660DL	a second s	and the state of the second data and the second		
38TH-04251DL	and the second distribution of the second	and the second sec		
38TH-04253DL	and the second state of th			
38TH-04261DL	A ST PATRICK CONTRACTOR OF A S	Wenter and the second second second second		
38TH-04263DL				
38TH-04850DL				
38TH-04851DL	and the second			
38TH-04852DL	The second s	and the second		
38TH-04860DL		and the second		
38TH-04861DL		The first sector in		
38TH-04862DL	and the second	March 1998 Area Aller State		
38TH-06050DL				
38TH-06060DL		04 4750 401	4	
38TG-02070	220/240-1-50	314/58-401	4	
38TG-02570				
3876-03080	220-3-50	312314-401	5	
38TG-03090	380/415-3-50	and the second se	and the second se	
38TC-03580				
38TC-03500	The second			
20TC 040	the second s		the Region property of the second	
3870.04001	the second s	and the second	and the second se	
2010.05090		the second s	Charles and the second state	
2010-050-00		in the second second second second second		
2010.000.00			and the state of the	Start.
3010.000.00		and the second sec		and the second s
3010-00080				

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SCHEMATIC DIAGRAM



A90089





Fig. 2-208/230 Volts, 1 Phase, 60 Hertz Units





A90091

Fig. 3—208/230 Volts, 3 Phase, 60 Hertz Units 460 Volts, 3 Phase, 60 Hertz Units

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Fig. 4-220/240 Volts, 1 Phase, 50 Hertz Units

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Fig. 5—220 Volts, 3 Phase, 50 Hertz Units 380/415 Volts, 3 Phase, 50 Hertz Units



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## "SPLIT SYSTEM" AIR CONDITIONER

018-060 SERIES 0, 1, 2





CATALOG NO. 38.126 (8-89) SUPERSEDES CATALOG NO. 38.107 (10-88)

Litho in U.S.A.

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## "SPLIT SYSTEM" AIR CONDITIONER





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## "SPLIT SYSTEM" AIR CONDITIONER

018-060 SERIES 0, 1, 2

**38TG** 







**"SPLIT SYSTEM"** AIR CONDITIONER



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018-060 SERIES 0, 1, 2







## "SPLIT SYSTEM" AIR CONDITIONER

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**38TG** 018-060 SERIES 0, 1, 2









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# "SPLIT SYSTEM" AIR CONDITIONER

018-060 SERIES 0, 1, 2









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### **"SPLIT SYSTEM"** AIR CONDITIONER

















**38TG** 018-060 SERIES 0, 1, 2

















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018-060 SERIES 0, 1, 2

T	Т	and the second	38TG014300	38TG018300	38TG020700	38TG024300	38TG025700
EM		PART DESCRIPTION	208/230-1-60	208/230-1-60	220/240-1-50	208/230-1-60	220/240-1-50
		CASING GROUP					
1		PAN, BASE (NOTE 1)	312204-702137	<b>→</b>	→	→	→ 1
2		COVER, TOP (NOTE 1)	312210-702137	→	<b>→</b>	-	-
3	+	PANEL, SERVICE (NOTE 2)	312229-701138	→ /	<b>→</b>	→	+
4		POST, CORNER (NOTE 2)	312223-701138	→	<b>→</b>	. →	
5		PANEL, ACCESS (NOTE 1)	312226-752	-	→	→	
6		GRILLE, INLET (FORMED) (NOTE 1)	312257-701		and the second →		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
7		LOGO,CARRIER	312250-402	→	→	<b>→</b>	→ <u>+</u>
8		CLIP.SPEED	(2)AS88PD001	(2) →	(2) →	(2) →	(2) →
9		SCREW, CERAMIC(EXTERIOR PANELS)	(16)AL82AT216	(16) →	(17) →	(16) →	(17) →
0		SCREW, CERAMIC (ACCESS DOOR)	(4)AL83AT217	(4) →	(4) →	(4) →	(4) →
1 1	NI	PAINT, TOUCH-UP(AMER.STERLING)	313974-751	→	<b>→</b>	→	1 (1) <sup>(1)</sup> (1) → (1)
2 1	NI	PAINT, TOUCH-UP(MOUTAIN MIST)	313974-752	→	→	<b>→</b>	-
3 1	NI	PAINT, TOUCH-UP(KONA GRAY) COIL	313974-755	→	<b>→</b>		-
-	-	NOTE 1: USE TOUCH-UP PAINT 3139	74-751 (AMERICAN STER	LING)			
10.5	1.1	NOTE 2: USE TOUCH-UP PAINT 3139	74-752 (MOUNTAIN MIST	")	Sec. La Carlos		and the second second
		COMPRESSOR GROUP					
4		COMPRESSOR ASSEMBLY	P031-1321	P031-1823	P051-2131	P031-2722	P051-2731
5		BOLT.SHOULDER	(4)P041-5301	(4) →	(4) →	(4) →	(4) →
6		GROMMET, RUBBER	(4)P041-5102	(4) →	(4) →	(4). →	(4) →
17		HEATER, CRANKCASE	X	X	P041-4423	X	P041-4423
18		BLANKET, SOUND SHIELD	X	X	312908-401	X	312908-401
8A		PLUG.COMPRESSOR	312906-411	-	<b>→</b>	→ · · · · · · · · · · · · · · · · · · ·	→
19 1	NI	OIL.COMPRESSOR	SUN-3GS	→	<b>→</b>	→	→
		ELECTRICAL GROUP				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
20		COMPLETE CONTROL BOX ASSEMBLY	312321-701	312321-704	312319-701	312321-706	312319-702
21		BOX.CONTROL	312235-401	-	312235-402	312235-401	312235-402
22	-	CONTACTOR	HN51KC024	→	HN52KC051	HN51KC024	HN52KC051
23		CAPACITOR, DUAL	P291-2057	P291-2553	P291-3553	P291-3553	P291-4553
24		CAPACITOR, SINGLE	X	X	X	X	X
25		CAPACITOR, START	X	X	X	X	X
26		STRAP, DUAL CAPACITOR	72070CP7	→	303993-102	. →	
27	1	STRAP, SINGLE CAPACITOR	X	X	X	X	X
28		STRAP, START CAPACITOR	X	X	X	X	X
29		THERMISTOR, START	X	X	X	X	X
30		RELAY,START	X	X	X	X	X
32	100	SWITCH, LOW PRESSURE (NOTE 3)	X	X	X	X	X
33	2.1	SWITCH, HIGH PRESSURE (NOTE 3)	X	X	HK02YA447	X	HK02YA447
34		LUG,GROUND	HY90AZ009	→	HY90AZ027	HY90AZ009	HY90AZ027
35		SCREW, CERAMIC (CONTROL BOX)	(6)AL83AT216	(6) →	(6) →	(6) →	(6) →
26	-	BELAY TIME DELAY	X	X	X	X	X











	T	and the second se	38TG014300	38TG018300	38TG020700	38TG024300	38TG025700
EM	F	PART DESCRIPTION	208/230-1-60	208/230-1-60	220/240-1-50	208/230-1-00	220/240-1-50
	1	ACCESSORY GROUP (CONT'D)			INTERATION	1110747104	UU07AT101
51 N	1 1	THERMOSTAT WITH SUB—BASE	HH07AT184	-	HH0/A1191	HHU/AT 164	nnuratist
	1	SINGLE STAGE HTG/CLG—MANUAL			10000000	100747474	UU07AT164
2 N	1 1	THERMOSTAT	HH07AT174		HH0/A1164	HHU/ATT/4	HHU/AT 104
		SINGLE STAGE HTG/CLG—AUTOMATIC	and the second of		and the second s		1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -
3 N	1	THERMOSTAT SUB-BASE FOR AUTO.	HH93AZ176	→	•	-	
	11	THERMOSTAT HH07AT174 AND 164				010000 751	
4 N	11	KIT, SOUND BLANKET (TEC. AB&AW-E)	312990-751	→	X	312990-751	<u> </u>
AN	11	KIT, SOUND SHIELD (TEC. AW-F)	X	X	X	X	X
5 N	11	KIT, SOUND, BLANKET (CARLYLE ''J'')	X	X	X	X	X
6 N	11	KIT, SOUND BLANKET (TEC. AV)	X	X	X	X	X
7 N	11	KIT.SOUND BLANKET(COPE.CRN&CRP	X	X	X	X	X
8 N	1	KIT, HIGH PRESSURE SWITCH	313969-752	→ <sup>1</sup>	→	→	
-		INCLUDES:		A State State			
9 N		SWITCH, HIGH PRESSURE	HK02ZA430	→	<b>→</b>	-	→
	it	VALVE.CHECK	EC36SZ062	→	<b>→</b>	→	→
1 N	it	GASKET FLARE	DD24FA051	→	· →	<b>→</b>	→
2 N		KIT COMPR. START-PTC 25 OHM	313967-751	→	X	313967-751	X
-	+	INCLUDES:	Contraction of the second				
3 N		THERMISTOR START	HC95XX011	→	X	HC95XX011	X
		KIT COMPR START-PTC 12 5 OHM	X	X	X	X	X
- 11	<u>+</u>	INCLUDES:	and the second	and the second and	a she ta the gap to be a	A CARLES AND	
5 N		THEEMISTOR START	X	X	X	X	X
6 1		KIT HARD START	313965-751	313965-752	313965-762	313965-752	313965-763
		INCLUDES:		A CONTRACTOR OF A			A REPORT
7 1		RELAV START	HN61HB496	HN61HB495	HN61HB491	HN61HB495	HN61HB510
0 1		CAPACITOR START	P281-8806	→	→	→	<b>→</b>
		STRAP CAPACITOR	312256-302		→	→ -	<b>→</b>
9 1		KIT CDANKCASE HEATED(230V-1)	313904-751	→	X	313904-751	X
		INCLUDES.	010004101				
			HT328H246	·	X	HT32BH246	X
			Y	X	X	X	X
52 1		NOLUDES	<u>^</u>	<b>*</b>			
		INGLUDES.	Y	X	X	X	X
53 P		HEATER, GRANNCASE	× ×	X	X	X	X
54 r		KIT, GRANKGASE HEATEN (400V-3)	^	~			and the second second
		INGLUDES:	Y	Y	X	X	X
35 1		HEATER, CRANKCASE	A 20TU000011	^	^ 	→	→
36 1	NI	KII, SUPPOKI FEET (NUTE 4)	3011900011			7	
-		INCLUDES:	210247 201	-			
87 1	NI	HP MOUNTING FEET	312247-301	-	-		→
88 1	NI	HING,GASKET	313915-201	215174.752		315174-753	→
89 1	NI	KIT-TXV(RAPID PRESSURE BALANCE	3151/4-/51	3131/4-/32	-	315174-760	→
90 1	NI	KIT—TXV (HARD SHUTOFF)	3151/4-/58	3151/4-759	7	313114-100	



# 38TG

018-060 SERIES 0, 1, 2

	A state of the sta	38TG030300	38TG030500	38TG030800	38TG030900	38TG035800	38TG035900 380/400-3-50
TEM	PART DESCRIPTION	208/230-1-60	208/230-3-00	220-3-30	3007-100-3-30	1000	
	CASING GROUP			010000 700107			-
1	PAN, BASE (NOTE 1)	312204-702137	-	312206-702137			
2	COVER, TOP (NOTE 1)	312210-702137	→	312212-702137	-	-	
3	PANEL, SERVICE (NOTE 2)	312229-703138	→	312230-701138			
4	POST, CORNER (NOTE 2)	312223-703138	-	312223-707138	-		
5	PANEL, ACCESS (NOTE 1)	312226-754	→	312226-758			
6	GRILLE, INLET (FORMED) (NOTE 1)	312257-703	<b>→</b>	312258-701		-	
7	LOGO,CARRIER	312250-402	→	→			
8	CLIP,SPEED	(2)AS88PD001	(2) →	(2) →	(2) →	(2) →	(2) →
9	SCREW, CERAMIC(EXTERIOR PANELS)	(16)AL82AT216	(16) →	(20) →	(20) →	(20) →	(20) →
10	SCREW, CERAMIC (ACCESS DOOR)	(4)AL83AT217	(4) →	(4) →	(4) →	(4) →	(4) →
11 N	I PAINT.TOUCH-UP(AMER.STERLING)	313974-751	→	→	→	-	
12 N	I PAINT, TOUCH-UP(MOUTAIN MIST)	313974-752	→	<b>→</b>	→	+	-
13 N	1 PAINT, TOUCH-UP(KONA GRAY) COIL	313974-755	→	->	→	-	→ →
	NOTE 1: USE TOUCH-UP PAINT 3	13974-751 (AMERICAN	STERLING)		and the second second	Same and the second	
	NOTE 2: USE TOUCH-UP PAINT 3	13974-752 (MOUNTAIN	MIST)		Accession		
	COMPRESSOR GROUP						
14	COMPRESSOR ASSEMBLY	P031-3122	P031-3053	P031-4251	P031-4271	P031-4652	P031-4672
15	BOLT, SHOULDER	(4)P041-5301	(4) →	(4) →	(4) →	(4) →	(4) →
16	GROMMET, RUBBER	(4)P041-5102	(4) →	(4) →	(4) →	(4) →	(4) →
17	HEATER CRANKCASE	X	X	P041-4423	P041-4441	P041-4423	P041-4441
18	BLANKET SOUND SHIELD	X	X	38EC500564	→	→	+
18A	PLUG COMPRESSOR	312906-411	→	X	X	X	X
19 1	II OIL COMPRESSOR	SUN-3GS	-		→	→	→
10 11	ELECTRICAL GROUP						
20	COMPLETE CONTROL BOX ASSEMBLY	312321-707	312323-701	312320-701	→	→	→
21	BOX CONTROL	312235-401	-	312236-402	<b>→</b>	→	→
22	CONTACTOR	HN51KC024	HN52KC051	HN53CB024	· →	→	→
23	CAPACITOR DUAL	P291-4553	X	X	X	X	X
24	CAPACITOR SINGLE	X	P291-0503	→	<b>→</b>	<b>→</b>	→
25	CAPACITOR START	X	X	X	X	X	X
26	STRAP DUAL CAPACITOR	303993-102	X	X	X	X	X
27	STRAP SINGLE CAPACITOR	X	312329-301	→	→ ******	→	-
28	STRAP START CAPACITOR	X	X	X	X	X	X
29	THERMISTOR START	X	X	X	X	X	X
30	RELAY START	X	X	X	X	X	X
32	SWITCH LOW PRESSURE (NOTE 3)	HK027B028	X	X	X	X	X
33	SWITCH HIGH PRESSURE (NOTE 3)	X	X	HK02YA447 ?????	→		-
34		HY90A7009	->	HY90AZ027	→	→	→
35	SCREW CERAMIC (CONTROL BOX)	(6)AL83AT216	(6) →	(6) →	(6) →	(6) →	(6) →
26	DELAV TIME DELAV	X	X	HN67PA024	-	-	→
301	NOTE 2: LICE L DE AND LIDE WIT	H BODY COLIDI INC DEOR	DA052			NAMES - SUBJECTS - AND -	





	1. Section	and the second second second	38TG030300	38TG030500	38TG030800	38TG030900	38TG035800	38TG035900
ITEM		PART DESCRIPTION	208/230-1-60	208/230-3-60	220-3-50	380/400-3-50	220-3-50	380/400-3-50
		FAN AND MOTOR GROUP						
37		MOTOR,FAN	HC33GE230	HC34GE231	HC40GE230	HC40GE460	HC40GE230	HC40GE460
38		BLADE, FAN	LA01RA015	→	LA01RA025	→	→	→
39	1.4	NUT, ACORN	(4)306789-103	(4) →	(4) →	(4) →	(4) →	(4) →
40		FAN, ORIFICE	312292-401	→ .	312292-402	→	→	+
41		RACEWAY, WIRE	312248-301	-	312248-302	→	→	-
		COIL AND PIPING GROUP						
42	1.0	COIL,CONDENSER	313914-762	→	313914-764	→	→	·
43		VALVE, SERVICE (LIQUID) 3/8"	312268-401	. →	<b>→</b>	→	→	→
44		VALVE, SERVICE (SUCTION) 5/8"	X	X	X	X	X	X
44	12	VALVE, SERVICE (SUCTION) 3/4"	312266-401	→	-	→	→	-
44	-	VALVE, SERVICE (SUCTION) 7/8"	X	X	X	X	X	X
45		PISTON, ACCU-RATER	38CQ660067	38CQ660070	38C0660063	-	38C0660070	-
46		ACCUMULATOR	X	X	X	X	X	X
47		CUSHION, ACCUMULATOR	X	X	X	X	X	X
48		STRAINER	KH11NH069	→	→ · · · ·	→	→ ·····	-
49		PAD,COIL	(3)311397-201	(3) →	(3) →	(3) →.	(3) →	(3) →
50		CAP, PARKER SVC VALVE 3/8"	313971-201	→	→	→	→	-
51	1	CAP, PARKER SVC VLV 5/8,3/4,7/8	313972-201	-	→	→	→	-
52		CAP, PARKER VALVE PORT	313970-201	→	→	-	→	→ <i>i</i>
		ACCESSORY GROUP						
53	NI	KIT,COMPR.(TIME GUARD 2)	313966-751	→	X	X	X	X
		INCLUDES:	a service and the		A Contraction of the second	Carlos and C		and the second se
54	NI	RELAY,ELECTRIC	HN67PA024	→	X	X	X	X
55	NI	KIT, TIME DELAY RELAY	38TH900001	-	X	X	X	X
		INCLUDES:						
56	NI	RELAY, TIME DELAY	HN67SK045	→	X	X	X	X
57	NI	KIT, LOW PRESSURE SWITCH	313968-751	-		→	→	-
		INCLUDES:		a state was designed		A CONTRACTOR		A STATISTICS
58	NI	SWITCH, LOW PRESSURE	HK02ZB027	→	→	-+	→	
59	NI	VALVE, CHECK	EC36SZ062	→	→ ******	<b>→</b>	-	<b>→</b>
60	NI	GASKET, FLARE	DD24FA051	-		<b>→</b>	→	<b>→</b>
60A	NI	MOTOR MASTER (208/230 VOLT)	32LT660004	→	<b>→</b>	X	32LT660004	X
60B	NI	MOTOR MASTER (460 VOLT)	X	X	X	32LT660005	X	32LT660005











		38TG036300	38TG036310	3816036500	3810030000	3010040010	0010040310
TEM	PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-3-60	460-3-60	220-3-50	380/400-3-50
	CASING GROUP						
1	PAN, BASE (NOTE 1)	312204-702137	÷	<b>→</b>	→	312206-702137	-
2	COVER. TOP (NOTE 1)	312210-702137	→	<b>→</b>	→	312212-702137	→
3	PANEL, SERVICE (NOTE 2)	312229-705138	→	→	→	312230-701138	→
4	POST.CORNER (NOTE 2)	312223-705138	→	<b>→</b>	→	312223-707138	->
5	PANEL, ACCESS (NOTE 1)	312226-756	→	→	→	312226-758	-
6	GRILLE, INLET (FORMED) (NOTE 1)	312257-701	· •	· . →	→ ·:	312258-701	en beget die of 🕂 jaar de ja
7	LOGO,CARRIER	312250-402	→	<b>→</b>	→	-	-
8	CLIP.SPEED	(2)AS88PD001	(2) →	(2) →	(2) →	(2) →	(2) →
9	SCREW.CERAMIC(EXTERIOR PANELS)	(18)AL82AT216	(18) →	(18) →	(20) →	(20) →	(20) →
10	SCREW.CERAMIC (ACCESS DOOR)	(4)AL83AT217	(4) →	(4) →	(4) →	(4) →	(4) →
11 N	I PAINT TOUCH-UP(AMER.STERLING)	313974-751	→	-	→	<b>→</b>	. →
12 N	NI PAINT.TOUCH-UP(MOUTAIN MIST)	313974-752	→	<b>→</b>	→	→ ×	→ 100 (100 + 100 00)
13 N	I PAINT. TOUCH-UP(KONA GRAY) COIL	313974-755	→	→	<b>→</b>	→	→
	NOTE 1: USE TOUCH-UP PAIN	T 313974-751 (AMERICAN	STERLING)				
Carton Carton	NOTE 2: USE TOUCH-UP PAIN	IT 313974-752 (MOUNTAIN	MIST)	a film and a start of the second	with the state of	N. Branch Martin	- Martin Contractor
-	COMPRESSOR GROUP						
14	COMPRESSOR ASSEMBLY	JD4260AA	P031-3921	JY4260AA	JH4260AA	P021-5551	P021-5571
15	BOLT.SHOULDER	(4)P041-5301	(4) →	(4) →	(4) →	(4) →	(4) →
16	GROMMET, RUBBER	(4)P041-5102	(4)P041-5107	(4)P041-5102	(4) →	(4)P041-5103	(4) →
17	HEATER CRANKCASE	X	X	X	X	P041-4423	P041-4441
18	BLANKET SOUND SHIELD	X	X	X	X	313931-401	→ 
RA	PLUG COMPRESSOR	312906-418	→	→	X	X	tr X
8B N	NI KIT-DISCHARGE THERMOSTAT	X	X	X	X	P041-4901	→ (1)
19 N	NI OIL COMPRESSOR	SUN-3GS	→	→	→	<b>→</b>	
10 11	ELECTRICAL GROUP						
20	COMPLETE CONTROL BOX ASSEMBLY	312321-708	312321-709	312323-703	→	312320-701	-
21	BOX.CONTROL	312235-401	→	<b>→</b>	→ <sup>→</sup>	312236-402	-
22	CONTACTOR	HN51KC024	-	HN52KC051	→	HN53CD024	-
23	CAPACITOR, DUAL	P291-4553	P291-4054	X	X	X	X
24	CAPACITOR, SINGLE	X	X	P291-0503	→	-	-
25	CAPACITOR.START	X	X	X	X	X	X
26	STRAP.DUAL CAPACITOR	303993-102	→	X	X	X	X
27	STRAP.SINGLE CAPACITOR	X	X	312329-301	<b>→</b>	→	→ ···
28	STRAP, START CAPACITOR	X	X	X	X	X	X
29	THERMISTOR.START	HC95XX008	→	X	X	X	X
30	RELAY.START	X	X	X	X	X	X
32	SWITCH.LOW PRESSURE (NOTE 3)	HK02ZB028	X	X	X	X	X
33	SWITCH, HIGH PRESSURE (NOTE 3)	X	X	X	X	X	X
34	LUG.GROUND	HY90AZ009	→	-	-	HY90AZ027	→
35	SCREW, CERAMIC (CONTROL BOX)	(6)AL83AT216	(6) →	(6) →	(6) →	(6) →	(6) →
	DELAY TIME DELAY	X	X	X	X	HN67PA024	





1			38TG036300	38TG036310	38TG036500	38TG036600	38TG040810	38TG040910
TEM	dia	PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-3-60	460-3-60	220-3-50	380/400-3-50
		FAN AND MOTOR GROUP		the state of the second second	State of the second			
37		MOTOR FAN	HC33GE230	· →	HC34GE231	HC34GE460	HC40GE230	HC40GE460
38	-	BLADE FAN	LA01RA015	→	-	→	LA01RA025	<b>→</b>
39	-	NUT ACOBN	(4)306789-103	(4) →	(4) →	(4) →	(4) →	(4) →
40		FAN ORIFICE	312292-401	→ →	→	→	312292-402	-
41		BACEWAY WIRE	312248-301	->	→	→	312248-302	→
		COIL AND PIPING GROUP		and the state of the				
42		COIL CONDENSER	313914-763	→	→	→	313914-765	→
43		VALVE SERVICE (LIQUID) 3/8"	312268-401	→	→	→	<b>→</b>	+
44		VALVE SERVICE (SUCTION) 5/8"	X	X	X	X	X	X
44		VALVE SERVICE (SUCTION) 3/4"	312266-401	→	→	→	Χ.	X
44		VALVE SERVICE (SUCTION) 7/8"	X	X	X	X	312267-401	→
45		PISTON ACCU-BATER	38C0660076	38C0660073	38C0660076	→	38CQ660080	<b>→</b>
46		ACCUMULATOR	X	X	X	X	X	X
47		CUSHION ACCUMULATOR	X	X	X	X	X	X
48	-	STRAINER	KH11NH069	→	→	→	→	→
49		PAD.COIL	(3)311397-201	(3) →	(3) →	(3) →	(3) →	(3) →
50		CAP PARKER SVC VALVE 3/8"	313971-201	→	→	→	→	→
51		CAP PARKER SVC VLV 5/8.3/4.7/8	313972-201	→	→	→	→	→
52		CAP PARKER VALVE PORT	313970-201	→	→	→	→	→
UL I		ACCESSORY GROUP		Section and the sector				
53	NI	KIT. COMPR. (TIME GUARD 2)	313966-751	→	-		<b>→</b>	→
		INCLUDES:		A history and the second	in the second second	and the share and the		
54	NI	RELAY, ELECTRIC	HN67PA024			→	<b>→</b>	→
55	NI	KIT TIME DELAY RELAY	38TH900001	→	→	→	X	X
		INCLUDES:			1000	a second and a second and a second and a second		
56	NI	BELAY TIME DELAY	HN67SK045	→	→	→	X	X
57	NI	KIT LOW PRESSURE SWITCH	313968-751	→	-	→	→	→
		INCLUDES:			and the second second second second	a stand the second spin	the second s	a to all the spect
58	NI	SWITCH LOW PRESSURE	HK02ZB027	→	→	→	→	→
59	NI	VALVE.CHECK	EC36SZ062	→	→	-	(a) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	→
60	NI	GASKET, FLARE	DD24FA051	→		→	-	→
60A	NI	MOTOR MASTER (208/230 VOLT)	32LT660004	→	→	X	32LT660004	X
60B	NI	MOTOR MASTER (460 VOLT)	X	X	X	32LT660005	X	32LT660005







			38TG036300	38TG036310	38TG036500	38TG036600	38TG040810	38TG040910
TEM		PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-3-60	460-3-60	220-3-50	380/400-3-50
		ACCESSORY GROUP (CONT	'D)					
61	NI	THERMOSTAT WITH SUB-BASE	HH07AT184	4	→ .		HH07AT191	+
		SINGLE STAGE HTG/CLG-MANUAL	A CONTRACT OF STREET			120		
62	NI	THERMOSTAT	HH07AT174	→	→	→	HH07AT164	-
		SINGLE STAGE HTG/CLG-AUTOMATIC		and the second se				
63	NI	THERMOSTAT SUB-BASE FOR AUTO.	HH93AZ176	<b>→</b>	+	<b>→</b>	→	-
		THERMOSTAT HH07AT174 AND 164	A STAND STATES	1. A	and the provident of the second	Constant Constant	and the second second second	ing - optige states - to
64	NI	KIT. SOUND BLANKET(TEC.AB&AW-E)	X	X	X	X	X	X
64A	NI	KIT, SOUND SHIELD (TEC, AW-F)	X	X	X	X	X	X
65	NI	KIT. SOUND. BLANKET(CARLYLE ''J'')	312994-751	→	<b>→</b>	→	X	X
66	NI	KIT SOLIND BLANKET (TEC. AV)	X	X	X	X	X	X
67	NI	KIT SOUND BLANKET(COPE CRN&CRP	X	X	X	X	X	X
68	NI	KIT HIGH PRESSURE SWITCH	313969-752	→	-	A 1 = 1 = 1	X	X
		INCLUDES:		C. C. Marson			and a second second	
69	NI	SWITCH HIGH PRESSURE	HK02ZA430	-		→	X	X
70	NI	VALVE CHECK	EC36SZ062	→	→	→	X	X
71	NI	GASKET ELABE	DD24FA051	→		→	X	X
72	NI	KIT COMPR START-PTC 25 OHM	X	X	X	X	X	Χ.
12	INI	INCLUDES:				1992		
72	NI	THERMISTOR START	X	X	X	X	X	X
74	NI	KIT COMPR START_PTC 12 5 OHM	313967-752	X	X	X	X	X
14	141	INCLUDES:	010001102		Contraction of States	A CONTRACTOR OF	And the second	A CARLES AND
75	NI	THERMISTOR START	HC95XX008	X	X	X	X	X
75	NI		313965-755	<u>^</u>	X	X	X	X
10	INI	INCLUDES.	313303-133		~	,	La California de la Cal	A State of States
77	NI	DELAV STADT	HN61HB496		X	X	X	X
70	NI		P281-8806		X	X	X	X
70	NI		312256-302	+	X	X	X	X
19	NI		212004-751	Y	X	X	X	X
80	INI	NII, CHANNGAGE REATEN(2009-1)	31304131	<u> </u>				The design
01	-	INCLUDES.	UT22004246	Y	X	X	X	X
81	INI		V V	313004-752	X	X	X	X
82	INT	NI, CHANKGAGE REATER(2009-3)	^	313304 13L	-			and the second
00	-		Y	HT328H246	X	X	X	X
83	INI NI		Ŷ	Y	313904-753	X	X	X
84		KIT, CRAINCASE REATER(400V-3)	^	^	010001100	<u> </u>		a state and states
05	ALL		v	Y	HT328H734	X	X	X
85	NI		2971000011	^ →	→	A	→	→
00	INI		3011300011	1				
		INCLUDES:	210247 201	-				
8/	NI	HP MOUNTING FEET	312247-301				→	
88	NI		313913-201					
89	NI	KIT-TXV(KAPID PRESSURE BALANCE	3151/4-/55					
90	N	KII-IXV (HARD SHUTOFF)	3151/4-/62	-			<u> </u>	Contraction of the second







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		the state of the s	38TG042300	38TG042500	38TG042600	38TG048310	38TG048320	38TG048510
e atre	1	New York and States and States and States and	38TG042310	38TG042510	38TG042610	X	X	X
ITEM	1	PART DESCRIPTION	208/230-1-60	208/230-3-60	460-3-60	208/230-1-60	208/230-1-60	208/230-3-60
		CASING GROUP				- And Store, Marine Statistics		
1		PAN, BASE (NOTE 1)	312206-702137	→	→	→	→ .	→
2		COVER, TOP (NOTE 1)	312212-702137	→	→	→	<b>→</b>	→
3		PANEL, SERVICE (NOTE 2)	312230-701138	→	→	→	<b>→</b>	→
4		POST, CORNER (NOTE 2)	312223-707138	→	→	<b>→</b>	→	· →
5		PANEL, ACCESS (NOTE 1)	312226-758	→	→ ·	→	->	→ ·
6		GRILLE, INLET (FORMED) (NOTE 1)	312258-701	→	→	→	→	→
. 7		LOGO,CARRIER	312250-492	→	→	· →	→	→
8		CLIP,SPEED	(2)AS88PD901	(2) →	(2) →	(2) →	(2) →	(2) →
9		SCREW, CERAMIC(EXTERIOR PANELS)	(20)AL82AT216	(20) →	(20) →	(20) →	(20) →	(20) →
10		SCREW, CERAMIC (ACCESS DOOR)	(4)AL83AT217	(4) →	(4) →	(4) →	(4) →	(4) →
11	NI	PAINT.TOUCH-UP(AMER.STERLING)	313974-751	→ →	→	→ →	→	-
12	NI	PAINT TOUCH-UP(MOUTAIN MIST)	313974-752	→	→	->	→	→
13	NI	PAINT TOUCH-UP(KONA GRAY) COIL	313974-755	→	→	-	→	
		NOTE 1: USE TOUCH-UP PAINT 3	13974-751 (AMERICAN	STERLING)		-		
		NOTE 2: USE TOUCH-UP PAINT 3	13974-752 (MOUNTAIN	MIST)		a second second second		
		COMPRESSOR GROUP						
14		COMPRESSOR	JD4860AA	JY4860AA	JH4860AA	P021-5521	WD5660AA	P021-5551
15		BOLT SHOULDER	(4)P041-5301	(4) →	(4) →	(4) →	(4)P041-5305	(4)P041-5301
16		GROMMET RUBBER	(4)P041-5102	(4) →	(4) →	(4)P041-5103	(4)P041-5104	(4)P041-5103
17		HEATER CRANKCASE	X	X	X	X	P041-4423	X
18		BLANKET SOUND SHIFLD(0 SERIES)	X	X	X	X	X	X
10		BLANKET SOUND SHIELD(1 SERIES)	312994-401	→ ·	→		→	-
18A		PI LIG COMPRESSOR	312906-418		X	X	312906-413	X
18B	NI	KIT-DISCHARGE THERMOSTAT	X	X	X	P041-4901	X	P041-4901
19	NI	OIL COMPRESSOR	SUN-36S	→			→	→
		ELECTRICAL GROUP						
20		COMPLETE CONTROL BOX ASSEMBLY	312324-714	312326-715	→	312324-713	312324-719	312326-709
21		BOX CONTROL	312236-401	→ →	→	→	→	-
22		CONTACTOR	HN51KC024	HN52KC051	→	HN51KC024	→	HN52KC051
23		CAPACITOR DUAL	P291-5553	X	X	P291-4554	P291-8053	X
24		CAPACITOR, SINGLE	X	P291-0503	→	X	X	P291-0503
25		CAPACITOR.START	X	X	X	X	X	X
26		STRAP. DUAL CAPACITOR	312244-302	X	X	312244-302	→ ·	X
27		STRAP, SINGLE CAPACITOR	X	312329-301	→	X	X	312329-301
28		STRAP.START CAPACITOR	X	X	X	X	X	X
29		THERMISTOR, START	HC95XX008	X	X	X	X	X
30		RELAY.START	X	X	X	X	X	X
32		SWITCH.LOW PRESSURE	X	X	X	X	X	X
33		SWITCH, HIGH PRESSURE	X	X	X	X	X	X
34		LUG.GROUND	HY90AZ009	→	→	→	-	→ →
35		SCREW.CERAMIC (CONTROL BOX)	(6)AL83AT216	(6) →	(6) →	(6) →	(6) →	(6) →
36		RELAY TIME DELAY	X	X	X	X	X	X
	1							



	-	and the second	3876042300	38TG042500	38TG042600	38TG048310	38TG048320	38TG048510
			3876042310	3876042510	38TG042610	X	X	X
TEM		PART DESCRIPTION	208/230-1-60	208/230-3-60	460-3-60	208/230-1-60	208/230-1-60	208/230-3-60
I CIM		FAN AND MOTOR GROUP			in the second second			
37		MOTOR FAN	HC39GE232	HC40GE230	HC40GE460	HC39GE232	HC39GE232	HC40GE230
38	-	BI ADE FAN	LA01RA025	-	→	→ -	→	→
30	-	NUT ACORN	(4)306789-103	(4) →	(4) →	(4) →	(4) →	(4) →
40	-	FAN ORIFICE	312292-401	→ →	→ →	312292-402	<b>→</b>	<b>→</b>
41		RACEWAY WIRE	312248-301	+	→	312248-302		
41		COLLAND PIPING GROUP						
12		COIL CONDENSER (SERIES "O")	313914-764	→	<b>→</b>	X	X	X
46		COIL CONDENSER (SERIES''1''&''2'')	313914-769	→	→	313914-765	313914-770	313914-765
12		VALVE SERVICE (LIQUID) 3/8"	312268-401	→	→	→	→	<b>→</b>
43		VALVE SERVICE (SUCTION) 5/8"	X	X	X	X	X	X
44	-	VALVE SERVICE (SUCTION) 3/4"	X	X	X	X	X	X
44		VALVE SERVICE (SUCTION) 7/8"	312267-401	→	→	→	+	<b>→</b>
44	-	DISTON ACCIL_BATER	3800660080	→	→	38CQ660084	3800660082	38CQ660084
45	-		X	X	X	X	X	X
40	-		X	X	X	X	X	X
41	-	STDAINER	KH11NH069	→	→	→	→	→
40		DAD COIL	(3)311397-201	(3) →	(3) →	(3) →	(3) →	(3) →
49	-	CAD DADKED SVC VALVE 3/8"	313971-201	→ →	→ →	→	→	→ →
51		CAP PARKER SVC VI V 5/8 3/4 7/8	313972-201	→	→	-	→	$\rightarrow (1,1,2,\dots,n) \rightarrow (1,1,2,\dots,n)$
52		CAP PARKER VALVE PORT	313970-201	-	→	→	→	→ →
JZ		ACCESSORY GROUP						
53	MI	KIT COMPR (TIME GUARD 2)	313966-751	→	→	→	-	····· →
- 55		INCLUDES.				and the second		8-11 (2)
54	NI	RELAV ELECTRIC	HN67PA024	→	→	→	→	
55	NI		38TH900001	→	→	→	→	→
- 33	141	INCLUDES:		100		and the second		
56	NI	RELAY TIME DELAY	HN67SK045	-	→	→	→	<b>→</b>
57	NI	KIT LOW PRESSURE SWITCH	313968-751	→	→	→	→	→
51	141	INCLUDES:			and the stand of the stand	and the second of the second of the	8	
58	NI	SWITCH LOW PRESSURE	HK027B027	→	→ <sup>1</sup>	→	→	-
50	NI	VALVE CHECK	EC36SZ062	→	→	→	→	→ ·
60	NI	GASKET FLARE	DD24FA051	→	→	→	→ · · · · ·	→
604	NI	MOTOR MASTER (208/230 VOLT)	32LT660004	→	X	32LT660004	→	X
60B	NI	MOTOR MASTER (460 VOLT)	X	X	32LT660005	X	X	32LT660005





-			38TG042300	38TG042500	38TG042600	38TG048310	38TG048320	38TG048510
	100		38TG042310	38TG042510	38TG042610	X	X	X
TEM		PART DESCRIPTION	208/230-1-60	208/230-3-60	460-3-60	208/230-1-60	208/230-1-60	208/230-3-60
TEM.		ACCESSORY GROUP (CONT	'D)					
61	NI	THERMOSTAT WITH SUB-BASE	HH07AT184	→	→		→	→
		SINGLE STAGE HTG/CLG-MANUAL		and the second se	A CONTRACTOR OF A			and the second
62	NI	THERMOSTAT	HH07AT174	→	→		->	>
UL	-	SINGLE STAGE HTG/CLG-AUTOMATIC						and the second second
63	NI	THERMOSTAT SUB-BASE FOR AUTO	HH93A2176	→			. →	→
00		THERMOSTAT HHO7AT174 AND 164		1		State of the second		
64	NI	KIT SOLIND BLANKET(TEC ABSAW-F)	X	X	X	X	- # X	X
644	NI	KIT SOLIND SHIFLD (TEC. AW-F)	X	X	X	X	X	X
65	NI	KIT SOUND BLANKET (CABI YI F ".I")	312994-751		→ '	X	X	X
66	NI	KIT SOUND BLANKET (TEC. AV)	X	X	X	312992-751	→	→
67	NI	KIT SOUND BLANKET (DOE CONSCRP	X X	X	X	X	X	X
07	NI	VIT LICU DECSUE CWITCH	313060-752		→ ·	→	→ →	→
00	FNI	HICI LIDES-	010000 102					
60	NI	SWITCH HICH DECCIDE	HK0276430	<b>→</b>	→		→	→
70	NI	VALVE CHECK	EC3657062	-		→	-	
70	NI		DD24EA051	-	→	<b>→</b>	<b>→</b>	→
70	NI	VIT COMPD STADT DTC 25 OUM	V Y	Y	X	X	X	X
72	NI	KII, CUMPR. START-PTC 23 UNM	^	^	^	^		
70	-	INCLUDES:	v	v	Y	Y	X	X
13	NI	THERMISTUR, START		N N	× ×	Y Y	X	X
14	NI	KII, CUMPR. START-PIC 12.5 UHM	<b>^</b>	^	^	^	^	n n n n n n n n n n n n n n n n n n n
75		INCLUDES:	v	v	×	Y	Y	Y
/5	NI	THERMISTUR, START	λ	A V	1 Å	212065-754	X Y	Y Y
76	NI	KIT, HARD START	313903-733	^	^	313303-734	^	A
		INCLUDES:		v	×	UNG1UD406	Y	Y
11	NI	RELAY,START	HN01HB490	X	A N	D001 1006	X	Y
78	NI	CAPACITOR,START	P281-8806	X	·	210266 202	× ×	Y Y
79	NI	STRAP, CAPACITOR	312256-302	X	× ×	312230-303	X X	Y Y
80	NI	KIT, CRANKCASE HEATER(230V-1)	313904-751	X	×	313904-731	^	^
	-	INCLUDES:	11720011010	V	V V	иториоле	v	Y
81	NI	HEATER,CRANKCASE	H1328H246	λ.	X	N13200240	212004.752	Y Y
82	NI	KIT, CRANKCASE HEATER(230V-3)	X	313904-752	×	^	313904-132	^
	-	INCLUDES:		11700011040		×	UTOODUOAE	Y
83	NI	HEATER,CRANKCASE	X	H132BH246	λ	X	N13200240	212004-753
84	NI	KIT, CRANKCASE HEATER (460V-3)	X	X	313904-753	A	^	313304-733
		INCLUDES:			UT00DU704	- v	V V	UT220U724
85	NI	HEATER;CRANKCASE	X	X	H132BH734	A	^ 	113201134
86	NI	KIT, SUPPORT FEET (NOTE 4)	381H900011		→ 			
	-	INCLUDES:	010017 001					
87	NI	HP MOUNTING FEET	312247-301					
88	NI	RING,GASKET	313915-201					
89	NI	KIT-TXV(RAPID PRESSURE BALANCE	315174-756	>				
90	NI	KIT-TXV (HARD SHUT OFF)	315174-763	→	→ →	-	-	-



		38TG050800 38TG050900		38TG060300	38TG060310	3816060320	
TEM	PART DESCRIPTION	220-3-50	400-3-50	208/230-1-60	208/230-1-60	208/230-1-60	
	CASING GROUP						
1	PAN, BASE (NOTE 1)	312206-702137		→ · ·		-	
2	COVER, TOP (NOTE 1)	312212-702137	-	→	<b>→</b>	-	
3	PANEL, SERVICE (NOTE 2)	312230-705138	→	→	-	→ →	
4	POST.CORNER (NOTE 2)	312223-711138	→	→ ···	→	→ .	
5	PANEL ACCESS (NOTE 1)	312226-762	. →	→	→	→ →	
6	GRILLE, INLET (FORMED) (NOTE 1)	312258-705	→ ·				
7	LOGO.CARRIER	312250-402	→	→ ·····	→		
8	CLIP.SPEED	(2)AS88PD001	(2) →	(2) →	(2) →	(2) →	
9	SCREW.CERAMIC(EXTERIOR PANELS)	(22)AL82AT216	(22) →	(22) →	(22) →	(22) →	
10	SCREW CERAMIC (ACCESS DOOR)	(4)AL83AT217	(4) →	(4) →	(4) → .	(4) →	
11 N	I PAINT TOUCH-UP(AMER.STERLING)	313974-751		→	→	, →	
12 N	I PAINT TOUCH-UP(MOUTAIN MIST)	313974-752	→	→	→	→	
13 N	I PAINT TOUCH-UP(KONA GRAY) COIL	313974-755	→	→	→	→	
10 11	NOTE 1: USE TOUCH-UP PAINT 3139	74-751 (AMERICAN STE	RLING)	and the second second			
	NOTE 2: USE TOUCH-UP PAINT 3139	74-752 (MOUNTAIN MIS	T)	Selection of the selection of the	Contraction of the second	A STATE OF STATE	
	COMPRESSOR GROUP						
14	COMPRESSOR ASSEMBLY	P021-6351	P021-6072	P021-6023		WD6560AA	
15	BOLT SHOULDER	(4)P041-5301	(4) →	(4) → ·	(4) →	(4) →	
16	GROMMET BUBBER	(4)P041-5103	(4) →	(4) →	(4) →	-(4) →	
17	HEATER CRANKCASE	P041-4423	P041-4441	X	Χ.	P041-4423	
18	BLANKET SOUND SHIELD	313931-401	· · →	. X	X	X	
184	PLUG COMPRESSOR	X	X	X	X	X	
10 N	U OU COMPRESSOR	SUN-3GS	→	→	→	Call Barrier and → and	
15 11							
20	COMPLETE CONTROL BOX ASSEMBLY	312320-702	→	312324-712	→	312324-720	
21	BOX CONTROL	312236-402	→	312236-401	→	→	
20	CONTACTOR	HN53CD024		→	→	HN52KD024	
22		X	X	P291-5553	→	P291-9053	
24	CAPACITOR SINGLE	P291-0503		X	X	X	
25	CAPACITOR START	X	X	X	X	X	
26	STRAP DUAL CAPACITOR	X	X	312244-302	→	→	
27	STRAP SINGLE CAPACITOR	312329-301	→	X	X	X	
28	STRAP START CAPACITOR	X	X	X	X	X	
20	THERMISTOR START	X	X	HC95XX008	→	→	
20	PELAV START	X	X	X	X	X	
32	SWITCH LOW PRESSURE (NOTE 3)	X	X	X	X	X	
32	SWITCH HIGH PRESSURE (NOTE 3)	HK027A430		X	X	X	
34		HY90A7027	-	HY90AZ009	→	→	
25	SCREW CERAMIC (CONTROL ROY)	(6)AI 83AT216	(6) →	(6) →	(6) →	(6) →	
30	DELAY TIME DELAY	ΗΝ67ΡΔ024	→ (v)	X	X	X	
36	RELAY, TIME DELAY		→ 52	X	A	^	





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			38TG050800	38TG050800 38TG050900 38TG060300		38TG060310	38TG060320	
ITEM		PART DESCRIPTION	220-3-50	400-3-50	208/230-1-60	208/230-1-60	208/230-1-60	
		FAN AND MOTOR GROUP	Lange Bring Bring					
37		MOTOR, FAN	HC40GE230	HC40GE460	HC39GE232	→	→ · · ·	
38		BLADE, FAN	LA01RA025	→	→	→	→	
39		NUT, ACORN	(4)306789-103	(4) →	(4) -→	(4) →	(4) →	
40		FAN, ORIFICE	312292-402	→	→	→	→	
41		RACEWAY, WIRE	312248-302	→	-	→ →		
		COIL AND PIPING GROUP						
42		COIL,CONDENSER	313914-766	→	→	→	313914-774	
43	1	VALVE, SERVICE (LIQUID) 3/8"	312268-401	→	→ · · · · · · · · · · · · · · · · · · ·	-	→	
44		VALVE, SERVICE (SUCTION) 5/8"	X	X	X	X	X	
44		VALVE, SERVICE (SUCTION) 3/4"	X	X	X	X	X	
44		VALVE, SERVICE (SUCTION) 7/8".	312267-401	→	→	→		
45		PISTON, ACCU-RATER	38CQ660080	→	38CQ660090	38CQ660088	38CQ660093	
46		ACCUMULATOR	KH71KN160	→	X	KH71KN160	→	
47		CUSHION, ACCUMULATOR	X	X	X	312251-201	→	
48		STRAINER	KH11NH069	$\rightarrow$	$\rightarrow$	$\rightarrow$	→	
49		PAD,COIL	(3)311397-201	(3) →	(3) →	(3) →	(3) →	
50		CAP, PARKER SVC VALVE 3/8"	313971-201	→	→	→	→	
51		CAP, PARKER SVC VLV 5/8,3/4,7/8	313972-201	→	→ main and a state of the stat	→	· -	
52		CAP, PARKER VALVE PORT	313970-201	→	→	→	→	
52A		MUFFLER	LM10KH011	→	X	X	X	
		ACCESSORY GROUP						
53	NI	KIT, COMPR. (TIME GUARD 2)	X	X	313966-751	de presidentes → dependentes		
		INCLUDES:	A CALL STREET	and a state of the state of the	Carlo Constanting of the	enter a service provide a	and the state of the	
54	NI	RELAY, ELECTRIC	X	X	HN67PA024	→	$\rightarrow$	
55	NI	KIT, TIME DELAY RELAY	X	X	38TH900001	→	→	
		INCLUDES:	and the second	entresentes en en ritagen et a relación			and the second se	
56	NI	RELAY, TIME DELAY	X	X	HN67SK045	→	→	
57	NI	KIT, LOW PRESSURE SWITCH	313968-751	→	→	→	→	
		INCLUDES:						
58	NI	SWITCH, LOW PRESSURE	HK02ZB027	→	→	→	<b>→</b>	
59	NI	VALVE, CHECK	EC36SZ062	→	→	-	→	
60	NI	GASKET, FLARE	DD24FA051	→	-	→	→	
60A	NI	MOTOR MASTER (208/230 VOLT)	32LT660004	Х	32LT660004	→	→	
60B	NI	MOTOR MASTER (460 VOLT)	X	32LT660005	X	X	X	



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Replacement Components Division

### "SPLIT SYSTEM" AIR CONDITIONER

ART DESCRIPTION CCESSORY GROUP (CONT'D) HERMOSTAT WITH SUB—BASE NGLE STAGE HTG/CLG—MANUAL HERMOSTAT INGLE STAGE HTG/CLG—AUTOMATIC HERMOSTAT SUB—BASE FOR AUTO. HERMOSTAT HH07AT174 AND 164 IT,SOUND BLANKET(TEC.AB&AW-E)	220-3-50 HH07AT191 HH07AT164 HH93AZ176	400-3-50 → →	208/230-1-60 HH07AT184 HH07AT174	208/230-1-60 → →	208/230-1-60 →
CCESSORY GROUP (CONT'D) HERMOSTAT WITH SUB-BASE NGLE STAGE HTG/CLG-MANUAL HERMOSTAT INGLE STAGE HTG/CLG-AUTOMATIC HERMOSTAT SUB-BASE FOR AUTO. HERMOSTAT HH07AT174 AND 164 IT,SOUND BLANKET(TEC.AB&AW-E)	HH07AT191 HH07AT164 HH93AZ176	→ →	HH07AT184 HH07AT174	→ →	
HERMOSTAT WITH SUB—BASE NGLE STAGE HTG/CLG—MANUAL HERMOSTAT INGLE STAGE HTG/CLG—AUTOMATIC HERMOSTAT SUB—BASE FOR AUTO. HERMOSTAT HH07AT174 AND 164 IT,SOUND BLANKET(TEC.AB&AW-E)	HH07AT191 HH07AT164 HH93AZ176	→ →	HH07AT184 HH07AT174	→ →	→ →
NGLE STAGE HTG/CLG—MANUAL HERMOSTAT INGLE STAGE HTG/CLG—AUTOMATIC HERMOSTAT SUB—BASE FOR AUTO. HERMOSTAT HH07AT174 AND 164 IT,SOUND BLANKET(TEC.AB&AW-E)	HH07AT164 HH93AZ176	+	HH07AT174	→	<b>→</b>
HERMOSTAT INGLE STAGE HTG/CLG—AUTOMATIC HERMOSTAT SUB—BASE FOR AUTO. HERMOSTAT HH07AT174 AND 164 IT,SOUND BLANKET(TEC.AB&AW-E)	HH07AT164 HH93AZ176	→ 	HH07AT174	→	→ 
NGLE STAGE HTG/CLG—AUTOMATIC HERMOSTAT SUB—BASE FOR AUTO. HERMOSTAT HH07AT174 AND 164 IT,SOUND BLANKET(TEC.AB&AW-E)	HH93AZ176				
HERMOSTAT SUB—BASE FOR AUTO. HERMOSTAT HHO7AT174 AND 164 IT,SOUND BLANKET(TEC.AB&AW-E)	HH93AZ176				Contraction and
HERMOSTAT HH07AT174 AND 164 IT,SOUND BLANKET(TEC.AB&AW-E)	Contraction of the second second second	the second s	→	→	<b>→</b>
T,SOUND BLANKET(TEC.AB&AW-E)			and a state of the Made	a filing and the second	CACE OF COMPANY
i, ooone ee inter(teetheetheetheetheetheetheetheetheethee	X	X	X	X	X
IT SOUND SHIFLD (TEC. AW-F)	X	X	X	X	X
IT SOUND BI ANKET(CABLYLE ".")	X	X	X	X	X
IT SOUND BLANKET (TEC. AV)	X	X	X	X	X
IT SOUND BLANKET (COPE CBN&CBP	X	X	312997-751	→	$\rightarrow$
IT HIGH PRESSURE SWITCH	X	X	313969-752	→ A	in the second second →
II, HUH PRESSURE SWITCH	^		The second s	C. S. C. Salar	
CHUTCH HIGH DECCURE	Y	X	HK02ZA430	and the second second second	→ · · · · · · · · · · · · · · · · · · ·
SWITCH, HIGH PRESSURE	×	Y Y	EC36S7062	→	→
VALVE, CHECK	×	Y	DD24FA051	→	→
GASKET,FLARE	X	× ×	X	X	X
IT,COMPR.START—PIC 25 UHM	X	^	^		and the action
NCLUDES:		V	×	X so	X
THERMISTOR,START	X	A	× ×	X	X
CIT, COMPR.START—PTC 12.5 OHM	X	Χ	^	<b>^</b>	
NCLUDES:	and the second	v	v	Y	X
THERMISTOR, START	X	X	A	^	Y Y
KIT, HARD START	X	X	313965-760	-	^
NCLUDES:		Carl State of Sec. 194			Y
RELAY, START	X	X	HN61HB496	-	Ŷ
CAPACITOR, START	X	X	P281-1086	-	+ Ŷ
STRAP, CAPACITOR	X	X	312256-303	→ 	× ×
(IT, CRANKCASE HEATER(230V-1)	X	X	X	X	<u> </u>
NCLUDES:					
HEATER, CRANKCASE	X	X	X	X	X
KIT.CRANKCASE HEATER(230V-3)	X	X	X	X	X
NCLUDES:		· · · · · · · · · · · · · · · · · · ·			- Constanting
HEATER CRANKCASE	X	X	X	X	X
KIT CRANKCASE HEATER(460V-3)	X	X	X	X	X
NCLUDES:	1				
HEATER CRANKCASE	X	X	X	X	X
	38TH900011	→	→	→ →	→
KIT SUPPORT FEFT (NOTE 4)		the second se			B. Barren and
KIT,SUPPORT FEET (NOTE 4)		and the second	and the second	a second and a second sec	
KIT, SUPPORT FEET (NOTE 4)	312247-301		→	→	<b>→</b>
KIT, SUPPORT FEET (NOTE 4) INCLUDES: HP MOUNTING FEET	312247-301 313915-201	→ →	→ ····	→ →	→ →
KIT, SUPPORT FEET (NOTE 4) INCLUDES: HP MOUNTING FEET RING, GASKET	312247-301 313915-201 315174-757	→ → →	→ → →	→ → →	
	CLUDES: RELAY, START CAPACITOR, START STRAP, CAPACITOR T, CRANKCASE HEATER(230V-1) CLUDES: HEATER, CRANKCASE T, CRANKCASE HEATER(230V-3) ICLUDES: HEATER, CRANKCASE T, CRANKCASE HEATER(460V-3) ICLUDES: EATER, CRANKCASE EATER, CRANKCASE EATER, CRANKCASE T SUPPORT EFET (MOTE 4)	CLUDES:       RELAY,START     X       CAPACITOR,START     X       STRAP,CAPACITOR     X       T,CRANKCASE HEATER(230V-1)     X       CLUDES:     X       HEATER,CRANKCASE     X       T,CRANKCASE HEATER(230V-3)     X       CLUDES:     X       HEATER,CRANKCASE     X       T,CRANKCASE HEATER(230V-3)     X       ICLUDES:     X       HEATER,CRANKCASE     X       IT,CRANKCASE HEATER(460V-3)     X       ICLUDES:     X       EATER,CRANKCASE     X       IT, CRANKCASE     X       IT, CRANKCASE     X       IT, UPPORT FEET (NOTE 4)     38TH900011	CLUDES:     X     X       RELAY, START     X     X       CAPACITOR, START     X     X       STRAP, CAPACITOR     X     X       STRAP, CAPACITOR     X     X       T, CRANKCASE HEATER(230V-1)     X     X       HEATER, CRANKCASE     X     X       T, CRANKCASE HEATER(230V-3)     X     X       ICLUDES:	CLUDES:XXHN61HB496RELAY,STARTXXP281-1086CAPACITOR,STARTXXP281-1086STRAP,CAPACITORXX312256-303T,CRANKCASE HEATER(230V-1)XXXCLUDES:	CLUDES:XHN61HB496RELAY,STARTXXRELAY,STARTXCAPACITOR,STARTXXP281-1086STRAP,CAPACITORXXXSTRAP,CAPACITORXXXXSTRAP,CAPACITORXXXXSTRAP,CAPACITORXXXXSTRAP,CAPACITORXXXXCLUDES:HEATER,CRANKCASEXXX <t< td=""></t<>





### **38TG** 018-060 SERIES 0, 1, 2

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	BETTEL CATEGORIA ST. M	38TG060500	38TG060510	38TG060520	38TG060600	38TG060610	38TG060620
EM	PART DESCRIPTION	208/230-3-60	208/230-3-60	208/230-3-60	460-3-60	460-3-60	460-3-60
-	CASING GROUP	and the second					
1	PAN, BASE (NOTE 1)	312206-702137	→	-	→	→	·   →
2	COVER, TOP (NOTE 1)	312212-702137	→	→	→	→	<b>→</b>
3	PANEL, SERVICE (NOTE 2)	312230-705138	→	→	→	→	→
4	POST, CORNER (NOTE 2)	312223-711138	→	→	→	→	→
5	PANEL, ACCESS (NOTE 1)	312226-762	→	→	→	→	→
6	GRILLE, INLET (FORMED) (NOTE 1)	312258-705	→	→	→	→ ····	→
7	LOGO, CARRIER	312250-402	→	->	→		→ ···
8	CLIP,SPEED	(2)AS88PD001	(2) →	(2) →	(2) →	(2) →	(2) →
9	SCREW, CERAMIC(EXTERIOR PANELS)	(22)AL82AT216	(22) →	(22) →	(22) →	(22) →	(22) →
0	SCREW, CERAMIC (ACCESS DOOR)	(4)AL83AT217	(4) →	(4) →	(4) →	(4) →	(4) →
1 N	PAINT, TOUCH-UP(AMER.STERLING)	313974-751	→	<b>→</b>	→	→	→
2 N	PAINT, TOUCH-UP(MOUTAIN MIST)	313974-752	→	4	→	-	→
3 N	PAINT, TOUCH-UP(KONA GRAY) COIL	313974-755	→	→	→	→	-
	NOTE 1: USE TOUCH-UP PAINT 3	13974-751 (AMERICAN	STERLING)			and an and a second second	
	NOTE 2: USE TOUCH-UP PAINT 3	13974-752 (MOUNTAIN	MIST)				
	COMPRESSOR GROUP	r antiste Librius i					
4	COMPRESSOR ASSEMBLY	P021-6053	→	WY6560AA2	P021-6072	<b>→</b>	WH6560AA
5	BOLT,SHOULDER	(4)P041-5301	(4) →	(4) →	(4) →	(4) →	(4) →
3	GROMMET, RUBBER	(4)P041-5103	(4) →	(4) →	(4) →	(4) →	(4) →
7	HEATER, CRANKCASE	X	X	P041-4423	X	X	P041-4423
8	BLANKET, SOUND SHIELD	X	X	X	X	X	X
A	PLUG,COMPRESSOR	312906-411	→	X	X	X	X
) N	OIL,COMPRESSOR	SUN-3GS	→	-	→	→	
	ELECTRICAL GROUP					1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	
0	COMPLETE CONTROL BOX ASSEMBLY	312326-711	→	→	→	→	→
1	BOX,CONTROL	312236-401	→	-	→	-	
2	CONTACTOR	HN51KC024	→	-	→	→	-
3	CAPACITOR, DUAL	X	X	X	X	X	X
4	CAPACITOR, SINGLE	P291-0503	→	→	→	→	→
5	CAPACITOR, START	X	X	X	X	X	X
6	STRAP, DUAL CAPACITOR	X	X	X	X	X	X
7	STRAP, SINGLE CAPACITOR	312329-301	→	<b>→</b>	→	-	→
8	STRAP, START CAPACITOR	X	X	X	X	X	X
9	THERMISTOR, START	X	X	X	X	X	X
0	RELAY, START	X	X	X	X	X	X
2	SWITCH, LOW PRESSURE (NOTE 3)	X	X	X	X	X	X
3	SWITCH, HIGH PRESSURE (NOTE 3)	X	X	X	X	X	X
4	LUG,GROUND	HY90AZ009	→	-	→	→	-
5	SCREW, CERAMIC (CONTROL BOX)	(6)AL83AT216	(6) →	(6) →	(6) →	(6) →	(6) →
6	RELAY, TIME DELAY	X	X	X	X	X	X

NOTE: See "Catalog Notes" on last page for explanation of symbolism.

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		the second s	38TG060500	38TG060510 38TG060520		38TG060600	38TG060610	381G060620
TEM		PART DESCRIPTION 208/230-3-60 208		208/230-3-60	208/230-3-60 208/230-3-60		460-3-60	460-3-60
		FAN AND MOTOR GROUP						
37		MOTOR, FAN	HC40GE230	→	HC40GE230	HC40GE460	<b>→</b>	-
38		BLADE, FAN	LA01RA025	→	<b>→</b>	→	<b>→</b>	<b>→</b>
39		NUT.ACORN	(4)306789-103	(4) →	(4) →	(4) →	(4) →	(4) →
40		FAN.ORIFICE	312292-402	→	→	→	· →	-
41		RACEWAY, WIRE	312248-302	<b>→</b>	→	<b>→</b>	→ _:.	-
		COIL AND PIPING GROUP					-	
42		COIL.CONDENSER	313914-766	→	313914-774	313914-766	<b>→</b>	313914-774
43		VALVE.SERVICE (LIQUID) 3/8"	312268-401	→	→	<b>→</b>	d→	+
44		VALVE.SERVICE (SUCTION) 5/8"	X	X	X	X	X	X
44		VALVE.SERVICE (SUCTION) 3/4"	X	X	X	X	X	X
44		VALVE.SERVICE (SUCTION) 7/8"	312267-401	→	<b>→</b>	<b>→</b>	<b>→</b>	<b>→</b>
45		PISTON ACCU-RATER	38CQ660090	38CQ660088	38CQ660093	38CQ660090	3800660088	38CQ660093
46		ACCUMULATOR	X	KH71KN160	→	X	KH71KN160	→
47	1	CUSHION ACCUMULATOR	X	312251-201	<b>→</b>	X	312251-201	-
48		STRAINER	KH11NH069	→	→	→	$\rightarrow$ $\rightarrow$	→
49		PAD.COIL	(3)311397-201	(3) →	(3) →	(3) →	(3) →	(3) →
50		CAP. PARKER SVC VALVE 3/8"	313971-201	→ · · ·	→	→	→	→
51		CAP.PARKER SVC VLV 5/8.3/4.7/8	313972-201	→	→	<b>→</b>	→	-
52	~	CAP. PARKER VALVE PORT	313970-201	' →	→	→	→	<b>→</b>
		ACCESSORY GROUP						- +
53	NI	KIT.COMPR.(TIME GUARD 2)	313966-751	→	→ .	-	→	, →
		INCLUDES:		N. P. State	A State of the second		a sector and	Phillippine
54	NI	RELAY, ELECTRIC	HN67PA024	-	→	→	→ ·	→
55	NI	KIT.TIME DELAY RELAY	38TH900001	-	-		→ <sup>1</sup>	-
		INCLUDES:			and the second second			
56	NI	RELAY, TIME DELAY	HN67SK045	→	→	→	→ suggest	→
57	NI	KIT, LOW PRESSURE SWITCH	313968-751	→	→	→	→ 5000	→
		INCLUDES:		de la contra de la c	a starter i		Section March and	and the second second
58	NI	SWITCH, LOW PRESSURE	HK02ZB027	→ <sup>-10</sup> 1	→	→	→	→
59	NI	VALVE, CHECK	EC36SZ062	→	-		-	-
60	NI	GASKET, FLARE	DD24FA051	→ ····	→	→	. →	+
60A	NI	MOTOR MASTER (208/230 VOLT)	32LT660004	→	→	X	X	X
60B	NI	MOTOR MASTER (460 VOLT)	X	X	X	32LT660005	→	→





# **38TG**

018-060 SERIES 0, 1, 2

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			38TG060500	38TG060510	38TG060520	38TG060600	38TG060610	38TG060620
ITEM	1000	PART DESCRIPTION	208/230-3-60	208/230-3-60	208/230-3-60	460-3-60	460-3-60 <sup>.</sup>	460-3-60
64	AU	ACCESSORT GROUP (CONT	D)					
61	NI	THERMUSTAT WITH SUB-BASE	HHU/AI184	-	-	<b>→</b>	-	-
		SINGLE STAGE HIG/CLG-MANUAL	1010717171					
62	NI	THERMOSTAT	HHU/AI1/4	<b>→</b>	-	<b>→</b>	<b>→</b>	→
	-	SINGLE STAGE HTG/CLG-AUTOMATIC		1	100 March 1			
63	NI	THERMUSTAT SUB-BASE FUR AUTU.	HH93AZ176	<b>→</b>	->	-	-	→
		THERMOSTAT HHU/AI1/4 AND 164			:.			
64	NI	KII,SOUND BLANKEI(IEC.AB&AW-E)	X	X	X	X	X	X
64A	NI	KIT, SOUND SHIELD (TEC. AW-F)	X	X	X	X	X	X
65	NI	KIT, SOUND, BLANKET (CARLYLE ''J'')	X	X	X	X	X	X
66	NI	KIT, SOUND BLANKET (TEC. AV)	X	X	X	X	X	X
67	NI	KIT, SOUND BLANKET (COPE. CRN&CRP	312997-751	<b>→</b>	<b>→</b>	<b>→</b>	→	→
68	NI	KIT, HIGH PRESSURE SWITCH	313969-752	→	→	<b>→</b>	<b>→</b>	<b>→</b>
		INCLUDES:						
69	NI	SWITCH, HIGH PRESSURE	HK02ZA430	→	<b>→</b>	<b>→</b>	<b>→</b>	<b>→</b>
70	NI	VALVE, CHECK	EC36SZ062	→	→	<b>→</b>	<b>→</b>	→
71	NI	GASKET, FLARE	DD24FA051	<b>→</b>	<b>→</b>	<b>→</b>	<b>→</b>	→
72	NI	KIT, COMPR.START-PTC 25 OHM	X	X	X	X	X	X
1		INCLUDES:	representation and the second					
73	NI	THERMISTOR, START	X	X	X	X	X	Х
74	NI	KIT, COMPR. START-PTC 12.5 OHM	X	X	X	X	X	X
1	0.000	INCLUDES:	and a state of the second				Service and the service of the servi	
75	NI	THERMISTOR, START	X	X	X	X	X	X
76	NI	KIT, HARD START	313965-760	->	→		<b>→</b>	→
1.1		INCLUDES:						
77	NI	RELAY,START	HN61HB496	→	X	X	X	X
78	NI	CAPACITOR, START	P281-1086		X	X	· X	X
79	NI	STRAP, CAPACITOR	312256-303	→	→	→	→	->
80	NI	KIT.CRANKCASE HEATER(230V-1)	X	X	X	X	X	X
		INCLUDES:			~	<u>^</u>		^
81	NI	HEATER.CRANKCASE	X	X	X	X	X	¥
82	NI	KIT.CRANKCASE HEATER(230V-3)	X	X	X	X	X	X
		INCLUDES:			~	~	^	^
83	NI	HEATER CRANKCASE	X	X	X	X	X	¥
84	NI	KIT CRANKCASE HEATER(460V-3)	X	X	X	X	X Y	Y
		INCLUDES:	<u> </u>		~	~	<u>A</u>	^
85	NI	HEATER CRANKCASE	X	X	Y	Y	Y	¥
86	NI	KIT. SUPPORT FEET (NOTE 4)	38TH900011	A	→	A	A	A
		INCLUDES:	00111000011					
87	NI	HP MOUNTING FEET	312247-301	→	→	-	-	-
88	NI	BING GASKET	313015-201	-	-	-7	-7	-
89	NI	KIT-TYV/RAPID PRESSURE BALANCE	315174-757		-	-	-	
90	NI	KIT-TXV (HARD SHIITOFF)	315174-764	-	-	-	-	-
50	141	NOTE A: ACOULDE EDOM ENVELLED	00000	-				-,



- 1. All orders should include the complete model and serial number of the unit on which the parts are to be used, and the part number and description of each part.
- 2. Dealers should forward orders to their Carrier distributor.

Replacement Components Division

### GENERAL NOTES

- 1. This catalog contains those items most commonly required for replacement purposes. If parts other than those cataloged are required, please provide the model number and serial number of the unit on which the parts are to be used and a complete description including references to items which are cataloged.
- 2. Casing parts and panels are not normally stocked, but are available upon request while in production. Requests for casing parts and panels for units no longer in production must be cleared for availability prior to submitting an order.
- 3. Complete "Accessory Packages" of "F.I.O.P.'s" (Factory-Installed Option Plan) are not normally stocked or supplied by the Replacement Components Division. (Refer to Master Price Pages and order from your normal source for finished goods.)

Accessory packages and F.I.O.P.'s are listed in this catalog only for reference and to assist in the selection and ordering of replacement components.

4. The replacement parts listed in this catalog are RCD "Factory-Authorized Parts" and, as a result of "standardization," may not be identical to the original part furnished on the equipment.

### CATALOG NOTES

- 1. The part number in the model column indicates the part number required for that model, size and/or voltage.
- 2. An arrow → in the model column indicates that the model, size, and/or voltage uses the same part number as the part number shown to the left.
- 3. An X in the model column indicates that the part is not used on that model, size and/or voltage.
- 4. A number in parenthesis before the part number indicates the quantity required for that model, size, and/or voltage. Part number only in the column indicates a quantity of one.
- 5. The notation "NI" following the item number indicates that the item is not illustrated in the catalog.





# **TAB PLACEMENT HERE**

# **DESCRIPTION:**

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# Installation and Start-Up Instructions

**NOTE:** Read the entire instruction before starting the installation.

#### INTRODUCTION

Model 40YA and 40YR Fan-Coil Units are designed for flexibility in a variety of applications for upflow, horizontal, or downflow applications. All units are available in 18,000through 60,000-Btuh nominal cooling capacities. Factory authorized, field-installed electric heater packages are available in 3 through 30 kilowatts. See product data for available accessory kits.

NOTE: The Model 40YRU Fan Coil must be utilized in upflow or downflow applications ONLY.

#### SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory authorized kits or accessories when modifying this product. Refer to the individual instructions for installation packaged with the kits or accessories.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and National Electrical Code (NEC) for special installation requirements.

It is important to recognize safety information. This is the safety-alert symbol $\underline{\wedge}$ . When you see this symbol on the unit or in instructions and manuals, be alert to the potential for personal injury.

Understand the signal word—DANGER, WARNING, or CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING signifies hazards that could result in personal injury or death. CAUTION is used to identify unsafe practices, which would result in minor personal injury or product and property damage.

#### A WARNING

Before installing or servicing fan coil, always turn off all power to unit. There may be more than one disconnect switch. Turn off accessory heater power if applicable. Electrical shock can cause personal injury or death.

#### INSTALLATION

#### Step 1—Check Equipment

Unpack unit and move to final location. Remove carton taking care not to damage unit.



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Inspect equipment for damage prior to installation. File claim with shipping company if shipment is damaged or incomplete. Locate rating plate on unit. It contains information needed to properly install unit. Check rating plate to be sure unit matches job specifications.

#### Step 2-Mount Fan Coil

Unit can stand or lie on floor, or hang from ceiling or wall. Allow space for wiring, piping, and servicing unit.

**IMPORTANT:** When fan coil is installed over a finished ceiling and/or living area, building codes (CABO M-1701.2, UMC 1205, SBCCI 603.4) may require a field fabricated secondary condensate pan to be installed or unit to have a secondary condensate line. The 40YA,YR Fan Coils are equipped with primary and secondary 3/4-in. FPT drain connections.

When installing any fan coil (of any manufacturer) over a finished ceiling and/or living space, installation of a secondary drain pan under entire unit, to avoid damage to ceiling, is recommended.

The 40YA,YR Fan-Coil Units can be installed for upflow and horizontal-left applications as factory shipped. Units can be installed for horizontal-right applications with field modifications. All units may be converted for downflow applications using factory-authorized accessory kits specified in product data.

→ NOTE: 40YRU Fan Coils are shipped from factory for upflow application. Downflow application requires Downflow Kit 40YA90002101.

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

 Book
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 PC 101
 Catalog No. 534-089
 Printed in U.S.A.
 Form 40YA,YR-14SI
 Pg 1
 12-90
 Replaces: 40YA,YR-12SI

**NOTE:** To ensure proper drainage for horizontal installations, unit must be installed such that it is level within 1/8-in. in both length and width of unit.

UPFLOW INSTALLATIONS — If return air is to be ducted, install duct flush with floor. Set unit on floor over opening. Use fireproof resilient gasket, 1/8- to 1/4-in. thick, between duct, unit, and floor.

Use only return air opening provided. All air must pass through the coil.

#### → HORIZONTAL INSTALLATIONS

#### NOTE: Not for 40YRU units.

Be sure installation complies with all applicable building codes that may require installation of a secondary condensate pan.

- 1. Arrange support for unit, setting it in or above secondary condensate pan.
- When suspending unit from ceiling, dimples in casing indicate proper location of screws for mounting metal support straps. (See Fig. 4, Note \*1.)
- MODULAR UNITS The 40YA, YR Fan-Coil Units in sizes 042, 048, and 060 are available in single piece construction and two-piece modular construction. The 40YRU models are single piece construction. The 40YA060 is available in modular

construction only. Modular construction allows installer to disassemble unit into two components, coil box and blower box, for ease of installation. (See Fig. 5.)



To disassemble unit, remove rear corner brackets by removing the two screws which secure brackets. Remove at front corners, either two screws in each corner of coil box, or two screws in blower box. Do not remove all four screws in each corner. Sections may now be separated by lifting top section from lower section.

To reassemble, reverse procedure above. Be certain to reinstall all fasteners when reassembling.

#### → HORIZONTAL RIGHT CONVERSION OF UNITS WITH A-COILS

#### NOTE: Not for 40YRU units.

To convert 40YA and 40YR units with A-coils for horizontal right installations: (Refer to Fig. 6 and 7.)

- 1. Remove blower and coil access panels.
- 2. Remove clip securing fitting panel to condensate pan. Remove fitting panel. (See Fig. 2.)
- 3. Remove snap-in shipping clip securing A-coil in unit.
- 4. Remove coil assembly.



\*Not applicable for 40YRU Units.

Fig. 2—Dimensional Drawing

2

- 5. Remove metal horizontal drain pan from coil assembly.
  - Remove condensate drain plugs from one side of horizontal drain pan and install in drain connection openings on opposite side.
  - 7. Convert air-seal assembly for horizontal right.
    - Remove air-seal assembly from coil by removing four screws.
    - b. Remove air splitter (B) from coil seal assembly by removing three screws. (See Fig. 7—Factory-Shipped inset.)
    - c. Remove filler plate (A) and install air splitter (B) in place of filler plate.
    - d. Install filler plate (A) as shown in horizontal right application.
    - e. Remove condensate troughs (C) and install on opposite tube sheets.
    - f. Install hose onto plastic spout.
  - 8. Install horizontal pan on right side of coil assembly with plugged condensate openings to rear of assembly.
  - 9. Slide coil assembly into casing. Be sure clips on each corner engage coil support rails.
- Remove condensate drain knockouts from right side of coil access panel.
- 11. Reinstall access and fitting panels, aligning holes with tubing connections and condensate pan connections.

Make sure liquid- and suction-tube grommets are in place to prevent air leaks and cabinet sweating.

→ HORIZONTAL RIGHT CONVERSION OF UNITS WITH SLOPE COILS

#### NOTE: Not for 40YRU units.

FIELD

SUPPLIED

STRAPS

To convert 40YA and 40YR units with slope coils for horizontal right installations:

1. Remove blower and coil access panels and refrigerant connections panel. (See Fig. 8.)

TYPICAL HORIZONTAL INSTALLATION NOT FOR 40YRU INSTALLATIONS 24-IN FRONT SERVICE CLEARANCE (FULL FACE OF UNIT)

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13/4-IN

FILTER ACCESS

OPTIONAL RETURN

- 2. Remove screw securing coil assembly to right side casing flange.
- 3. Remove coil assembly.
- Lay fan-coil unit on its right side and reinstall coil assembly with condensate pan down. Attach coil to casing flange using coil mounting screw removed in No. 2 above.
- Reinstall access panels and refrigerant connections panel, aligning holes with tubing connections and condensate pan connections.

Make sure liquid and suction grommets are in place to prevent air leaks and cabinet sweating.

DOWNFLOW INSTALLATIONS — Refer to installation instructions supplied with kit to properly convert units for downflow application.

#### Step 3—Air Ducts

Connect the supply-air duct over the outside of the 3/4-in. flange provided on the supply-air opening. Secure the duct to the flange, using proper fasteners for the type of duct used, and tape the duct-to-unit joint.

Duct connection flanges are provided on unit air-discharge connection. If return-air flanges are required, install factoryauthorized accessory kit. Refer to installation instructions supplied with kit for proper installation.

When using 40YA,YR units with 20-, 24-, and 30-kw electric heaters, maintain a 1-in. clearance from combustible materials to discharge plenum and ductwork, for a distance of 36 in. from the unit. Use an accessory downflow base to maintain proper clearance on downflow installations.

Use flexible connectors between ductwork and unit to prevent transmission of vibration. When electric heater is installed, use heat resistant material for flexible connector between ductwork and unit at discharge connection. Ductwork passing through unconditioned space must be insulated and covered with vapor barrier.



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POWER ENTRY OPTIONS

LOW VOLT ENTRY OPTIONS

Fig. 3—Horizontal and Upflow Installation Clearances



NODE	COIL	D	<b>)#</b>	E	*	ł	1		J
SIZE	TYPE	IN.	(MM)	IN.	(MM)	IN.	(MM)	IN.	(MM)
40YA018/40YR018,024 40YRU018,024	SLOPE	_	_	18 <sup>3</sup> /18	462.0	18	457.2	181⁄2	469.9
40YA024	A	141/4	362.0	183/18	462.0	181/8	460.4	187/18	468.3
40YA030/40YR030/40YRU030	A	141/4	362.0	183/18	462.0	181/8	460.4	187/16	468.3
40YA036	A	-	-	233/18	589.0	231/8	587.4	237/18	595.3
40YR036/40YRU036	SLOPE	1413/18	376.2	233/18	589.0	23	584.2	231/2	596.9
40YA042/40YR042/40YRU042	A	1415/16	379.4	27	685.8	26 <sup>5</sup> /18	684.2	271/4	692.2
40YA048/40YB048/40YBU048	A	1415/18	379.4	27	685.8	2615/18	684.2	271/4	692.2
40YA060	A	1713/16	452.4	3211/16	830.3	325/8	828.7	3215/18	836.6
40YB060/40YBU060	A	1415/18	379.4	27	685.8	2615/18	684.2	271/4	692.2

\*Not applicable for 40YRU units.

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Fig. 4-Dimensional Drawing











DUCTWORK ACOUSTICAL TREATMENT — Metal duct systems that do not have one 90 degree elbow and 10 feet of main duct to first branch takeoff may require internal acoustical insulation lining.

Line the inside of plenum, branch runs, and main duct with acoustical insulation in accordance with the latest edition of Sheet Metal and Air Conditioning Contractors National Association (SMACNA) application standard for duct liner. Duct liners should be UL classified batts and blankets with a fire hazard classification working of FHC-25/50 or less. Ensure main duct lining is extended 6 to 8 feet down the duct from the plenum.

As an alternative to above, fibrous ductwork may be used if constructed and installed in accordance with the latest edition of SMACNA construction standard on fibrous glass ducts. Both acoustical lining and fibrous ductwork shall comply with National Fire Protection Association as tested by UL Standard 181 for Class I air ducts.

#### Step 4—Electrical Connections

LINE VOLTAGE CONNECTIONS — Units with 15- and 20-kw heaters are factory wired for dual-circuit operation (except for Canadian applications which are single-circuit). When single-circuit operation is desired, install factory-authorized adapter kit for fused models only.

Check all factory wiring per unit wiring diagram and inspect factory wiring connections to be sure none were loosened in transit or installation.

#### A WARNING

Before installing or servicing fan coil, always turn off all power to unit. There may be more than one disconnect switch. Turn off accessory heater power if applicable. Electrical shock can cause personal injury or death.

#### **A** CAUTION

If a disconnect switch is to be mounted on the unit, select a location where drill or fastener will not contact electrical or refrigerant components.

**NOTE:** Before proceeding with electrical connections, make certain that supply voltage, frequency, and phase are as specified on the unit rating plate. Be sure that electrical service provided by the utility company is sufficient to handle the additional load imposed by this equipment.

See unit wiring label for proper field high- and low-voltage wiring. Make all electrical connections in accordance with the NEC and any local codes or ordinances that may apply. Use copper wire only.

The unit must have a separate branch electric circuit with a field-supplied disconnect switch located within sight of, and readily accessible to, the unit.

24-VOLT CONTROL SYSTEM CONNECTIONS TO UNIT PRINTED CIRCUIT BOARD — Refer to unit wiring label for recommended wiring procedures. Use No. 18 AWG colorcoded, insulated (35 C minimum) wire to make the low-voltage connections between the thermostat and the unit. If the thermostat is located more than 100 feet from the unit (as measured along the low-voltage wire), use No. 16 AWG color-coded, insulated (35 C minimum) wire. Printed-circuit board is circuited for single-stage heater operation. When additional heater staging is desired using two-stage or outdoor thermostats (see applicable outdoor unit instructions), break off jumper tabs on printed-circuit board. (See Fig. 10.)

- 1. The 3-, 5-, 8-, and 10-kw heaters are single stage only.
- 2. The 9-, 15-, and 20-kw heaters are adaptable for two-stage operation.
- 3. The 18-, 24-, and 30-kw heaters are adaptable for up to three-stage operation.

Connect low-voltage leads to thermostat and outdoor unit. (See Fig. 11.)

**NOTE:** Where local codes require thermostat wiring be routed through conduit or raceways, splices can be made inside the fan-coil unit. All wiring must be NEC Class 1 and must be separated from incoming power leads.







A factory-authorized disconnect kit is available for installation of 0- through 10-kw applications. When electric heat packages with circuit breakers are installed, the circuit breaker can be used as a disconnect.

**NOTE:** Transformer is factory wired for 230-volt operation. See Fig. 12 for transformer connections. When using 208-volt supply, connect red primary lead to T2 and connect blue primary lead to T3.

The secondary circuit of the transformer is protected by a 5-amp fuse mounted on the printed-circuit board.

According to NEC, ANSI/NFPA 70 and local codes, the cabinet must have an uninterrupted or unbroken ground, to minimize personal injury if an electrical fault should occur. The ground may consist of electrical wire or metal conduit when installed in accordance with existing electrical codes. Failure to follow this warning could result in an electric shock, fire, or death.

Use UL-listed conduit and conduit connector for connecting supply wire(s) to unit and obtaining proper grounding. Grounding may also be accomplished by using grounding lug provided in control box. Use of dual or multiple supply circuits will require grounding of each circuit to ground lugs provided on unit and heaters.



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A90150 Fig. 10—Jumper Tabs on Printed-Circuit Board



USED WITH 40AQ, 40DQ, 40QB/QH OR 40YA/YR/YZ



#### MINIMUM CFM AND MOTOR SPEED SELECTION

#### A WARNING

Unit power must be disconnected before proceeding with motor speed selection. Electrical shock can cause personal injury or death.

Fan-coil units with or without electric heaters require a minimum cfm per ton. Refer to the fan coil wiring label or Table 1 to ensure that the fan speed selected is no lower than the minimum fan speed indicated. See Table 2 for identification of speed taps.

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Factory-selected speed tap is connected to terminal F4. Unused fan speed taps are connected to terminals F2 and F3. (See Table 3.) Select desired speed and attach to terminal F4. Attach unused speed tap to terminals F2 and F3.

#### A WARNING

Make sure control compartment access panel is closed before restoring power to unit. Failure to follow this warning could cause personal injury or death resulting from electrical shock or moving parts.

Table 1—Minimum CFM and Motor Speed Selection

FAN COIL	HEATER										
SIZE	3	5	8	9	10	15	18	20	24	30	
018	525	525	525	-	*600	-	-	-	-	-	
024	700	700	700	-	700	775	-	-	-	-	
030	_	875	875	-	875	875	-	*1060			
036	-	1050	970	970	970	970	_	1040	-	-	
042	-	_	1225	1225	1225	1225	1235	1225	-	_	
048	-	-	1400	1400	1400	1400	1400	1400	1400	1400	
060	-	-	1750	1750	1750	1750	1750	1750	1750	1750	

All motor speeds at low tap unless indicated. \*Indicates medium speed tap for 3 speed motors.

#### Table 2-Color Code For Motor Lead Wires

MOTOR SPEED TAP	WIRE COLOR
COMMON	YELLOW
HIGH	BLACK
MEDIUM	BLUE
LOW	RED (BLUE-2-SPEED MOTORS)

#### Table 3—Fan Speed Taps

UNIT	MOTOR SPEEDS	FACTORY-SELECTED SPEED
40YA018-060	3	MED
40YR/40YRU018-036*	2	LOW
40YR/40YRU042-060	3	MED

\*Units date-coded (first four digits of serial number) prior to 1091 will include three-speed fan motors with a factory-selected speed of medium.

#### Step 5—Refrigerant Tubing

See Fig. 2 for tube connection sizes, type and locations. Use accessory tubing package or field-supplied tubing of refrigerant grade. Insulate entire suction tube if field-supplied tubing is used. Tubing package has an insulated suction line. Do not use damaged, dirty, or contaminated tubing because it may plug

oil polate

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refrigerant flow control device. When tubing package is used and sweat connections are made within 60 seconds, coil and tubing system do not required evacuation. Always evacuate if field-supplied tubing is used.

#### A CAUTION

A brazing shield MUST be used when tubing sets are being brazed to the unit connections to prevent damage to the unit surface.

Units have sweat suction-tube connection and liquid-tube connection. Make suction-tube connection first. Use refrigerant grade tubing.

- 1. Cut tubing to correct length.
- 2. Insert tube into sweat connection on unit until it bottoms.
- 3. Solder with low-temperature 430 F silver alloy solder.

NOTE: Wrap a wet cloth around rear of fitting to prevent damage to factory-made joints.

4. Evacuate coil and tubing system if connections are not made within 60 seconds or tubing package is not used.



SECONDARY FITTING WITH BUILT IN DAM

A90347

Fig. 13—Primary/Secondary Fittings

Step 6-Condensate Drain

18684

#### **A** CAUTION

For horizontal installations use plastic fittings provided. Use pipe dope. Do not overtorque (hand tight plus (1-1/2) one & one half turns).

The condensate pan has primary and secondary drain connections to meet all applicable FHA, BOCA, SUCCI, UMC, and CABO building requirements. See Fig. 4, 6, 7, 8, and 9 for drain connection locations. For horizontal installations, be sure that condensate fittings supplied at appropriate primary and secondary connections are used. (See Fig. 13.) These connections have 3/4-in. female pipe threads (FPT). All condensate drains should be a minimum of 7/8-in. OD copper or plastic tubing or 3/4-in. galvanized iron pipe. The drain should be pitched downward at a minimum slope of 1 in. in 10 feet. If the coil is located in or above a living space where damage may result from condensate overflow, a separate 3/4-in drain must be provided from the secondary drain connection. Run secondary drain to a place where it is noticeable when used. For horizontal installations on A-coil units with secondary drains, use the dam fitting supplied with unit. The slope-coil units have a dam molded into the pan. NOIE: When connecting condensate drain, avoid blocking filter access panel thus preventing removal of filter.

Install a 3-in. trap in condensate drain as close to coil as possible. Make sure that top of trap is below connection to coil to prevent condensate from overflowing drain pan. Prime trap with water, test for leaks, and insulate drain if located above a living area. Consult local codes for additional restrictions or precautions. (See Fig. 14.)



Fig. 14—Condensate Trap

### A CAUTION

Never operate unit without a filter or with filter access panel removed. Damage to blower motor or unit may result.

#### Step 7-Unit Start-Up

Refer to outdoor unit installation instructions for system startup instructions and refrigerant charging method details.

#### Step 8—Sequence of Operation

CONDENSING UNIT

#### COOLING

When the thermostat "calls for cooling", the circuit between R and G is completed and the single-pole double-throw relay (FR) is energized. The normally open contacts will close, causing the blower to operate. The circuit between R and Y is also completed; this completed circuit causes the contactor in the outdoor unit to close and start the compressor and outdoor fan.

#### HEATING

When the thermostat "calls for heat" and the FAN switch is set on AUTO, the circuit between R and W is completed. The heater sequencer (SEQ) will then be energized. (There will be a time delay.) This completed circuit energizes all heating elements (HTR) and the blower motor.

### HEAT PUMP

### COOLING

On a "call for cooling", the thermostat "makes" circuits R-O, R-Y, and R-G. Circuit R-O energizes the reversing valve, switching it to the cooling position. Circuit R-Y energizes the contactor, starting the outdoor fan motor and the compresso Circuit R-G energizes the indoor unit blower relay, starting indoor blower motor.
When the thermostat is satisfied, its contacts open, deenergiz-

 ing the contactor reversing valve and blower relay. This will stop the compressor and fan motors.

#### HEATING

On a "call for heat", the thermostat "makes" circuits R-Y and R-G. Circuit R-Y energizes the contactor, starting the outdoor fan motor and the compressor. Circuit R-G energizes the indoor blower relay, starting the blower motor.

Should the temperature continue to fall, R-W is 'made' through the second-stage room thermostat bulb. Circuit R-W energizes a sequencer, bringing on the supplemental electric heat. When the thermostat is satisfied, its contacts open, deenergizing the contactor and sequencer. All heaters and motors should stop.

#### CARE AND MAINTENANCE

For continuing high performance, and to minimize possible equipment failure, it is essential that periodic maintenance be performed on this equipment. Consult your local dealer as to the proper frequency of maintenance and the availability of a maintenance contract.

The ability to properly perform maintenance on this equipment requires certain mechanical skills and tools. If you do not possess these, contact your dealer for maintenance. The only consumer service recommended or required is filter maintenance. (See Filter Assembly.)

#### A WARNING

Disconnect all power to the unit before servicing the field wires or removing the control package. The disconnect (when used) on the access panel does not disconnect power to the line side of the disconnect, but does allow safe service to all other parts of the unit.

#### A WARNING

If the unit does not have a disconnect, disregard the foregoing. Instead, make sure that a disconnecting means is within sight of, and is readily accessible to, the unit. Disconnect all electrical power to the unit before performing any maintenance or service on it. A failure to follow this warning can cause electrical shock, fire, personal injury, or death.

The minimum maintenance requirements for this equipment are as follows:

- 1. Inspect and clean or replace air filter each month or as required.
- Inspect cooling coil, drain pan, and condensate drain each cooling season for cleanliness. Clean as necessary. An inspection port is provided on all A-coil delta plates. Remove plastic plug to inspect. Replace plug after inspection.
- Inspect blower motor and wheel for cleanliness each heating and cooling season. Clean as necessary.
- Inspect electrical connections for tightness and controls for proper operation each heating and cooling season. Service as necessary.

#### WARNING

As with any mechanical equipment, personal injury can result from sharp metal edges, etc.; therefore, be careful when removing parts.

#### Step 1—FILTER ASSEMBLY

To clean or replace air filter, push plastic connectors toward center of unit and remove filter access panel outward. Push filter up and back into unit. Then slide filter out. Clean filter by using cold water and allow filter to dry. No oiling or coating of filter is required. New filters are available from your local distributor. Place filter in slot with cross-mesh binding up or facing the cooling coil and replace filter access panel.

#### A WARNING

Because of possible damage to equipment or personal injury, maintenance should be performed by a trained serviceperson. Consumer service is recommended only for filter cleaning/replacement.

## Step 2—COOLING COIL, DRAIN PAN, AND CONDENSATE DRAIN

The cooling coil is easily cleaned when it is dry; therefore, inspect the coil and clean (if necessary) before each cooling season. To check or clean the cooling coil, remove the coil access panel. If the coil is coated with dirt or lint, vacuum it with a soft brush attachment.

Be careful not to bend coil fins. If the coil is coated with oil or grease, clean it with a mild detergent and water solution. Rinse the coil thoroughly with clear water. Be careful not to splash water on the insulation.

Inspect the drain pan and condensate drain at the same time the cooling coil is checked. Clean the drain pan and condensate drain by removing any foreign matter from the pan. Flush the pan and drain tube with clear water.

If the drain tube is restricted, it can generally be cleared by high-pressure water. Cut the plastic line and work outside the condensate pan and away from the coil to clean the drain tube.

#### A CAUTION

Do not use caustic household drain cleaners in the condensate pan or near the coil. Drain cleaners can quickly destroy a coil.

#### Step 3—BLOWER MOTOR AND WHEEL

Clean the blower motor and wheel when the cooling coil is cleaned.

#### A CAUTION

Disconnect electrical power before removing any access panels.

To clean blower motor or blower wheel, remove blower access panel. Remove motor leads from printed-circuit board. Note lead location for ease of reassembly. Remove two (outside) screws holding blower/motor assembly against the blower-deck flange and slide assembly out of cabinet. Remove screw in strap holding motor capacitor to blower housing and slide capacitor out from under strap. Remove screw with green wire from blower housing. Mark the blower wheel, motor and motor support in relation to the blower housing before disassembly to ensure proper reassembly. (Note position of blades on wheel.) Loosen set screw holding blower wheel onto motor shaft.



Remove three bolts holding motor mount to blower housing and slide motor and mount out of housing. Further disassembly should not be necessary as adequate clearance is available. Remove blower wheel from housing by removing cutoff plate from blower housing outlet. Note wheel orientation and cutoff location for reassembly. The blower motor and wheel may be cleaned by using a vacuum with a soft-brush attachment. Remove grease with a mild solvent such as hot water and detergent. Be careful not to disturb the balance weights (clips) on the blower-wheel vanes. Also, do not drop or bend wheel, as balance will be affected.

To reassemble blower, place blower wheel back into housing. Be sure to position correctly for proper location. Reassemble cutoff plate to housing, using identified holes from disassembly procedure. Position motor and mount in same position as before when blower housing was in unit. Secure motor mount on housing, using bolts removed. Make sure mount or motor is grounded to blower housing. Locate blower wheel setscrew over flat on motor shaft. Rotate wheel in housing. It should not rub housing and should be centered in inlet opening. If not, loosen setscrew and align as necessary. Attach green wire to blower housing with screw. Secure motor capacitor under strap and tighten strap screw. Slide blower assembly to blower deck. Make sure (once blower is within the unit casing) to force blower assembly toward control box while sliding assembly into unit to ensure that blower assembly engages deck properly. Fasten blower assembly to deck with screws previously removed. Reconnect electrical leads to printed-circuit board. Reconnect electrical power to unit and test fan for proper rotation.

#### Step 4—ELECTRICAL CONTROLS AND WIRING

#### A WARNING

Be sure ALL electrical power to the equipment is turned "off". Electrical shock can cause injury or death.

With ALL power disconnected, inspect all electrical connections for tightness. Tighten all screws on electrical connections. If any discolored or burned connections are noticed, disassemble the connection, clean all parts and stripped wire, and reassemble properly and securely. Electrical controls are difficult to check without proper instrumentation; therefore, reconnect electrical power to unit and observe unit through one complete operating cycle. If there are any discrepancies in the operating cycle, contact your dealer and request service.

#### Step 5—REFRIGERANT CIRCUIT

The refrigerant circuit is difficult to check for leaks without proper equipment. Therefore, if low cooling performance is suspected, contact your local dealer for service.

#### A CAUTION

Damage may occur to the scroll compressor if operated at a negative suction pressure during a "system pumpdown".

Step 6—ACCURATER® PISTON CLEANING OR REPLACE-MENT

Refer to Fig. 15.

- Pump down outdoor unit. Close service valves at outdoor unit.
- Bleed and recover (if possible) remaining refrigerant from tubing and coil through gage port on vapor-tube service valve.
- 3. Disconnect refrigerant (liquid) tube from AccuRater.
- 4. Remove AccuRater piston retainer. Avoid damaging O-ring or machined surfaces on piston, bore, and retainer.
- 5. Using small wire with a hook on end of it, remove piston from AccuRater body.



Fig. 15—AccuRater

A78525

#### A CAUTION

When cleaning the piston orifice, be careful not to scratch or enlarge the opening, as this will affect operation.

- 6. Install new or cleaned piston in AccuRater body.
- Install new retainer (because of probable damage which occurred in initial removal).
- 8. Reconnect refrigerant tube to AccuRater.
- 9. Pressurize tubing and coil, then leak check.
- 10. Evacuate tubing and coil as necessary.

#### A CAUTION

Use a backup wrench and do not overtighten, as deformation of the AccuRater body will occur, causing the piston to lodge in a partially open or closed position.



 Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

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## Installation and Start-Up Instructions

#### NOTE: Before beginning the installation, READ THESE INSTRUCTIONS CAREFULLY AND COMPLETELY.

This instruction covers the installation of accessory electric heaters in 40YA, YR fan coils. Check unit rating plates regarding compatibility of fan coil and electric heater combinations.

#### SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory authorized kits or accessories.

Follow all safety codes. Wear safety glasses and work gloves. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and NEC (National Electrical Code) for special installation requirements.

Recognize safety information. This is the safety-alert symbol A. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

#### Table 1—Accessory Heater Usage

ACCESSORY HEATER NO.	DESCRIPTION (NOM KW@ 240-V)	MODEL 40YA/YR
	1 Phase	and the second
40YA900030 40YA900040	3-KW, Non-Fused 3-KW, Circuit Breaker	018, 024
40YA900050 40YA900060	5-KW, Non-Fused 5-KW, Circuit Breaker	018 thru 036
40YA900080 40YA900090	8-KW, Non-Fused 8-KW, Circuit Breaker	018 thru 060
40YA900100 40YA900110	10-KW, Non-Fused 10-KW, Circuit Breaker	018 thru 060
40YA900150 40YA900170 40YA900160	15-KW, Fused 15-KW, Fused (CSA) 15-KW, Circuit Breaker	024 thru 060
40YA900200 40YA900220 40YA900210	20-KW, Fused 20-KW, Fused (CSA) 20-KW, Circuit Breaker	030 thru 060
- Marine the s	3 Phase Only	
40YA900300 40YA900310	9-KW, Non-Fused 15-KW, Non-Fused	036 thru 060
40YA900320	18-KW, Non-Fused	042 thru 060
an a	3 Phase, Factory Shipped*	and the second
40YA900250 40YA900260 40YA900270 40YA900280	24-KW, Fused 30-KW, Fused 24-KW, Fused (CSA) 30-KW, Fused (CSA)	048, 060

Understand the signal word-DANGER, WARNING, or CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING could result in personal injury or death. CAUTION is used to identify unsafe practices, which would result in minor personal injury or product and property damage.

#### A WARNING

Before installing or servicing system, always turn off main power to system. There may be more than one disconnect switch. Turn off accessory heater power if applicable. A failure to follow this warning could result in electrical shock, fire, personal injury, or death.

NOTE: Accessory heaters require a minimum airflow. See Table 3 for fan unit minimum airflow and motor speed selection before installing. For 3- thru 18-kw heaters, there are no clearance requirements for the first 36 in. of ductwork. For 20- thru 30-kw heaters, a 1-in. clearance is required for the first 36 in. of ductwork.

Fan Coil	Heater Kw												
Size	3	5	8	9	10	15	18	20	24	30			
018	525	525	525	-	600*		1	-	-	-			
024	700	700	700	-	700	775	-	-	-	-			
030	-	875	875	_	875	875	-	1060*	-	-			
036	-	1050	970	970	970	920	-	1040	-	-			
042	-	-	1225	1225	1225	1225	1235	1225	-	-			
048	-	-	1400	1400	1400	1.400	1400	1400	1400	1400			
060	- 1	-	1750	1750	1750	1750	1750	1750	1750	1750			

Table 3-Minimum Cfm and Motor Speed Selection

All motor speeds at low tap unless indicated. \*Medium speed tap.

#### I. INSTALLATION

#### A. Install Accessory Electric Heater Assembly

NOTE: Be sure the heater coils are not deformed or damaged during heater installation.

- 1. Make sure power to unit is off.
- 2. Remove front access panel of fan-coil unit.
- 3. Disconnect two power wires (black and yellow pigtail leads) from terminals L1 and L2 on printed circuit board. Remove cooling control plate from fan coil. See Fig. 1. For 18-, 24-, and 30-kw heaters, remove adapter plate. See Fig. 1.
- 4. Insert heater assembly into front of fan coil so that element rods engage holes in heat shield.



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**Replaces: New** 

Table 2-Electrical Data, Electric Heaters

					-				BRANCH CIRCUIT														
						HEA	TER AMPS		MIN	AMPACITY		MIN WIR	E SIZE (	AWG)	MIN G	ND WIRE	SIZE	FUSE/C	KT BKR / 08/230-V	AMPS	MAX W FOR 2% SINGLE	NE LENGT	DROP
ACCESSORY	ĸ	w		INTERNA	-	2	08/230-V			206/230-4	DOUNT	SINGLE	DUAL	CIRCUIT	SINGLE	DUAL	IRCUIT	SINGLE	DUAL	CIRCUIT	CIRCUIT	L1,L2	L3,L4
HEATER			PHASE	CIRCUIT	SIN	IGLE	DUAL CI	IRCUIT	SINGLE	DUAL C	IRCUIT	CIRCUIT	1112	11314	CIRCUIT	L1.L2	L3.L4	CIRCUIT	L1,L2	L3,L4	FT	FT	FT
NUMBER	240-V	208-V		PROTECTIO	ON CIR	CUIT	L1,L2	L3,L4	CIRCUIT	L1,L2	L3,L4	CINCUIT	61,64	20,24	12			20	-	-	63/65	-	-
AOY A 900030	3	2.3	1	-	10.9	9/12.0	-	-	16.2/17.5	-	-	12	-	-	12	-	-	20	-	-	63/65	-	-
40YA900040	3	2.3	1	СВ	10.9	9/12.0	-	-	16.2/17.5	-	-	12	-		10	-	-	25/30	-	-	61/62	-	-
40Y A 900050	5	3.8	1	-	18.	1/20.0	-	-	26.7/29.0	-	-	10	-		10		-	25/30	-	-	61/62	-	-
0200060	5	3.8	1	СВ	18.	1/20.0	-	-	26.7/29.0	-	-	10	-		10			45/50	-	-	61/62	1 -	-
401 4 300000	8	6	1	-	28.	9/32.0	-	-	43.0/46.9	-	-	8	-	-	10	-	-	45/50		-	61/62	+ -	-
401 A900000	-	6	1	СВ	28.	9/32.0	-	-	43.0/46.9	-	-	8	-	-	10	-	-	45/50			108/111	-	-
40YA900090	0	0	1 2		18.	8/20.8	-	- 33	30.4/32.9	-	-	8	-	-	10	-	-	35/35	+		78/70		-
40YA900300	9	0.0			36	2/40.0	-	-	52.2/56.9	-	-	6	-	-	10	-	-	60/60	-		70/73		
40YA900100	10	7.5		CR	36	2/40.0	-		52.2/56.9	-	-	6	-	-	10	-	-	60/60	-	-	10/19	78/70	78/70
40YA900110	10	7.5	1	CD FUEF	54	2/50.0	36 2/40 0	18 1/20.0	74,7/81.8	52.2/56.9	22.7/25.0	4	6	10	8	10/10	10/10	80/90	60/60	25/25	86/8/	76/19	70/73
40YA900150	15	11.3	1	FUSE	54	2/50.0	36 2/40 0	18 1/20.0	74.7/81.8	52.2/56.9	22.7/25.0	4	6	10	8	10/10	10/10	80/90	60/60	25/25	86/87	18/19	10/13
40YA900170	15	11.3	1	FUSET	34.	2153.3	26 2140.0	18 1/20 0	-	52.2/56.9	22.7/25.0	+	6	10	-	10/10	10/10	-	60/60	25/25	-	78/79	18/1
40YA900160	15	11.3	1	СВ	-	-	30.2/40.0	10.1/20.0	46.0/50.2	-	-	8/6	- 1	-	10	-	-	50/50	-	-	71/112	-	-
40YA900311	15	11.3	3	-	31.	.3/34.6	-		62 0/58 8	-	-	6	-	-	10	-	-	60/60	-	-	94/95	-	-
40YA900320	18	13.5	3	-	37	.6/41.5	-	-	07 2/106 8	52 2/56 9	45 3/50.0	3/2	6	8	6	10/10	10/10	100/110	60/60	50/50	84/106	78/79	58/58
40YA900200	20	15	1	FUSE	72	.3/79.9	36.2/40.0	36.2/40.0	97.3/100.0	52 2/58 9	45 3/50.0	3/2	6	8	6	10/10	10/10	100/110	60/60	50/50	84/106	78/79	58/5
40YA900220	20	15	1	FUSE	72	.3/79.9	36.2/40.0	36.2/40.0	97.3/100.0	52 2/56 0	45 3/50 0		6	8	-	10/10	10/10	-	60/60	50/50	-	78/79	58/5
40YA900210	20	15	1	CB		-	36.2/40.0	36.2/40.0	-	52.2/50.9	43.000.0	4	-	-	8		-	70/80.	-	-	116/117	-	-
40YA900250	24	18	3	FUSE	50	.1/55.4	-	-	69.5//6.2			1	-	-	6	-	-	125/150	1 -	-	112/113	-	-
	24	18	1	FUSE	86	.7/95.9	-	-	116/12/	-				-	8	-	-	70/80	-	-	116/117	-	-
40YA900270	24	18	3	FUSE	50	.1/55.4	-	-	69.5/76.2	-		-		-	6	-	-	125/150	-	-	112/113	-	-
	24	18	1	FUSE	88	.7/95.9	-	-	116/127	-					8	-	-	90/100	-	-	120/121	-	-
40YA900260	30	22.5	3	FUSE	62	.6/69.2	-	-	85.2/93.4	-	-	3					-	150/175	-	-	114/145	-	- 1
	30	22.5	1	FUSE	109	.0/120.0	-	-	143/157	-	-	0/00	-	-	-	-	-	90/100	-	-	120/121	-	- 1
407 4000280	30	22.5	3	FUSE	62	2.6/69.2	-	-	85.2/93.4	-	-	3	-	-	0	-		150/175	+	-	114/145	- 1	- 1
4012300200	30	22.5	1	FUSE	105	0.0/120.0	-	-	143/157	-	-	0/00	-	-	0	1-		1001110		-	1		
			24 and 20	W SINGLE P	HASE		1.1					1.20								100 1 2			
FIELD MULTI-	HEATER	AING OF		ĸw	PHASE		HEA	TER AMPS			MIN AMPAG 208/230-	::ТҮ* V		MIN W	RE SIZE (AV	VG)	MIN GN WIRE SI 208/230-	D ZE F	USE/CKT	1 BKR AMF	S FOR	2% VOLTA 208/230	GE DRI
1 100	MODEL		240	-V 208-V			10	12001	15/16	L1/L2	L3/L4	LS	/L6	L1/L2	L3/L4 L	5/L6		L	1/L2 L	3/L4 L5	/L6 L1/L	2 L3/L4	LSA
M	UMBER				-	L1/		20/24	28.0/22.0	43 0/46 9	36.1/40	0 36.1	/40.0	8	8	8	10	45	5/50 4	0/45 40	/45 61/6	2 73/73	730
40 40Y	YA900250	•	2.	4 18	1	28.9/	32.0 2	8.9/32.0	20.9/32.0	43.0140.3			/60.0	6		8	10	60	0/60 5	0/60 50	160 78/7	9 58/58	58/
40	YA90026		3	0 22.5	1	36.2/	40.0 3	6.2/40.0	36.2/40.0	52.2/56.9	45.1/50	45.1	150.0	0									

**CB-Circuit Breaker** 

\*Includes blower motor amps of largest fan coil heater is used with.

 †CSA fused with single point wiring adapter.
 ‡Copper wire must be used. If other than uncoated (non-plated), 75 degree C ambient, copper wire (solid wire for 10 AWG) and smaller, stranded wire for larger than 10 AWG) is used, consult applicable tables of the National Electric Code (ANSI/NFPA 70). \*\*Length shown is as measured one way along wire path between unit and service panel for a maximum 2% voltage drop. NOTE: The 24- and 30-kw heaters are convertible to 1 phase, single or multiple supply circuit.

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3. For 3- thru 20-Kw circuit-breaker models

After installing heater assembly, attach circuit-breaker assembly to unit with screws provided. See Fig. 3. On fan-coil units size 042 and larger, wire tie that shortens wire length between heater and circuit-breaker assembly must be removed to allow mounting of circuitbreaker assembly. See Fig. 3. Circuit-breaker models require a bezel to be installed in unit door, providing safe access to circuit breakers. Bezel mounts on inside of door with 2 No. 6 screws provided. See Fig. 4.









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#### C. Electrical Connections

Refer to unit instructions for recommended wiring procedures. Install wiring in accordance with all applicable local and national codes.

Connect heater wiring harness plug to receptacle on printed circuit board. See Fig. 5 for plug and connection orientation. A positive connection must be made between plug and receptacle. See Table 2 for recommended wire and fuse sizes for units.

Plug will interlock to receptacle when properly seated. Harness contains both 24-volt control and high-voltage wiring.

Fan-coil units are factory wired for medium speed. Motor speed tap leads are color coded—high (black), medium (blue), low (red), common (yellow) for ease in selecting different motor speeds. After selection of the desired motor speed, the leads should be connected to printed-circuit board terminals— F1 (common), F2 (unused motor speed), F3 (unused motor speed), F4 (motor speed selected). See Fig. 5.

Fig. 1—Installation of 18-, 24-, and 30-Kw Model Heaters

- 5. Attach heater control plate to fan-coil unit using two screws. See Fig. 1. For 18-, 24-, and 30-kw heater models, attach front of heater to fan deck using third screw. See Fig. 1.
- B. Attach Fuse Box or Circuit-Breaker Box
- 1. For 15- and 20-Kw fuse models

After installing heater assembly, attach fuse assembly to side of fan-coil unit by inserting fuse box tab between insulation and left side of unit and fan deck. Mount front of assembly to side flange with two screws provided. On fan-coil units sizes 042 and larger, wire tie that shortens length between heater and fuses must be removed. Fuse cover is closed by engaging dimples in fuse box. See Fig. 2.

2. For 24- and 30-Kw fuse models Fuse assembly is mounted on heater. Be sure fuse cover is closed by engaging clip latch on unit top panel. See Fig. 1.

#### **A** CAUTION

Be sure fuse box is closed before power is turned on.













 For 24-volt control system connections to unit printedcircuit board.

Refer to unit wiring instructions for recommended wiring procedures. Use 18-gauge thermostat wire (above 100 ft, increase wire gauge) for low-voltage control field wiring. Printed-circuit board is circuited for single-stage heater operation. When additional heater staging is desired using 2-stage or outdoor thermostats (see applicable outdoor unit instructions), break off jumper tabs on printed-circuit board. See Fig. 6.

- a. The 3-, 5-, 8- & 10-kw heaters are single stage only.
- b. The 9-, 15-, & 20-kw heaters are adaptable for 2stage operation.
- c. The 18-, 24-, & 30-kw heaters are adaptable for up to 3-stage operation.

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2. High-voltage supply connections to heater

Unit is factory wired for 230-volt operation. See Fig. 7 for transformer connections. When using 208-volt supply, connect red primary lead to T2 and connect blue primary lead to T3.

NOTE: Heater supply circuit wire size and overcurrent protection must comply with NEC/UL "Branch Circo requirements. See Table 2. Wires and overcurrent pr tion, integral to the heater, are not required to meet "Branch Circuit" requirements.

a. Nonprotected heaters

- (1.) The 3- thru 18-kw heaters can be wired for singlesupply circuit only. Supply circuit connects to heater pigtail leads (terminal block on 18-kw heater).
- (2.) The 3- thru 10-kw, 1-phase heaters can use a separate field-installed, factory-authorized, disconnect kit which installs into fan coil.
- b. Circuit-breaker heaters
  - (1.) The 3- thru 10-kw heaters can be wired for singlesupply circuit only.
  - (2.) The 15- and 20-kw heaters can be wired for dualsupply circuits only.
- c. Fused heaters
  - (1.) The 15- and 20-kw heaters can be wired for single- or dual-supply circuits. Single-supply circuit wiring requires a factory-authorized, single-point adapter kit. Canadian models are factory shipped with single-point adapter kit for single-supply circuits.
  - (2.) The 24- and 30-kw heaters can be wired for single-or multiple-supply circuits. Heaters are factory wired for single-circuit, 3-phase. To convert heaters to single circuit 1-phase, disconnect yellow lead from L3 and connect to L2. Disconnect black lead from L3 and connect to L1. To convert heaters to multiplesupply circuit, 1-phase, remove and discard between single-circuit terminal block and fuse block. Remove and discard single-circuit terminal block. Attach L1 through L6 power leads as indicated on label next to fuse block.



Fig. 6—Jumper Tabs on Printed Circuit Board

Fig. 7—Transformer Connections for 230-Volt Operation

- 3. Ground connections
  - a. For nonprotected or single-circuit heaters, one equipment ground connection is provided on fan-coil unit. See Fig. 1 or 2.
  - b. For 15- and 20-kw circuit-breaker heaters, additional ground lug is provided on circuit-breaker mounting bracket for dual-circuit grounding. See Fig. 3.
  - c. For 15- and 20-kw fused heaters, additional ground lug is provided on fuse mounting bracket for dualcircuit grounding. See Fig. 2.
  - d. For 24- and 30-kw fused heaters, two additional ground lugs are provided for 1-phase, multi-circuit wiring. See Fig. 1.

#### **D. Attach Wiring Diagram and Rating Label**

Attach new wiring diagram label to blower housing, completely covering old wiring diagram label. Attach new heater rating label over existing electrical information rating label located on front access door of fan-coil unit. See Fig. 8.



A90111

#### Figure 8—Heater Rating Label Location on Fan-Coil Unit Rating Plate

#### E. Installation Verification

After completion of heater installation, check wiring to be sure proper connections and routings have been made. Be sure that all electrical covers are in place and proper labels have been applied. Replace front access panel to fan-coil unit before turning unit power on.



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**ADDITIONAL NOTES:** 

mand and the self manual states of the

1. First stage of electric heat sequencer is controlled by 24-volt DC power from printed circuit board (same as printed circuit board fan relay). All other sequencers operate on 24-volt AC.

 Interlock of heater controls and fan relay is accomplished by use of low-voltage diodes on printed circuit board. Heaters cannot be energized without fan being energized.

3. A 5-amp low-voltage fuse on printed circuit board will blow if transformer secondary is shorted to protect transformer.

Fig. 9—Typical Wiring Label Showing Maximum Number of Heater Components

 Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

 Book
 1
 4
 PC 101
 Catalog No. 534-078
 Printed in U.S.A.
 Form 40YR-1SI
 Pg 6
 5-90
 Replaces: New

A90155







Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

Page : 1

40YR/YRM

SIZE: 018-060

SERIES: 0



### DIRECT EXPANSION FAN COIL



Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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DESIGN BYRGO

Litho in U.S.A.

40YR/YRM

SIZE: 018-060

SERIES: 0











Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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## DIRECT EXPANSION



**SERIES: 0** 

28.	部	· 这种规则的第三人称单数的资源的资源。	40YR018-300	40YR018-300CD	40YR018-300CG	40YR018-300CS	40YR018-700
TEM	18	PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50
	_	CASING GROUP					
1		WRAPPER	314860-401	->	->	->	->
2		INSULATION	314872-301	•>	->	->	->
3		LOWER WRAPPER	X	X	X	X	×
4		INSULATION	X	X	X	X	×
5	$\vdash$	PANEL ASSY INSUL.	314988-701	->	->	->	->
6		DOOR ASSY LOWER	314989-707	->	*>	->	->
7		DOOR ASSY UPPER	314990-701	->	*	->	->
8		DOOR ASSY FITTING	314991-701	->	->	->	->
9		COIL SUPPORT SIDE	(2) 314958-401	(2) ->	(2) ->	(2) ->	(2) ->
10	$\square$	COIL SUPPORT REAR	314957-201	->	*	->	**
11	Н	BLOWER DECK	314896-401	->	->	->	->
12	$\vdash$	DIFFUSER BAFFLE	(2) 314858-301	(2) ->	(2) ->	(2) ->	(2) ->
13	$\square$	HEATER PLATE	314895-401	->	->	->	
14	$\square$	TIE ANGLE	314867-301	->	->	->	->
15		GROMMETNUT	(2) 61631D7	(2) ->	(2) ->	(2) ->	(2) ->
16	-	SPRING	314868-301	->	->	->	•>
17		FILTER DOOR ASSY	315903-701	->	->		->
18		HOUSING BRACKET	314900-201	->	->	->	->
19		FRONT BRACKET	X	X	X	<u> </u>	×
20		REAR BRACKET	<u> </u>	X	X	X	X
21		FITTING DOOR CLIP	X	X	X	X	X
22		BREAKER.COVER	314981-201	->	->	->	->
23	NI	LOGO	312250-405	->	->	->	*
24		EXTENSION, TUBE SHEET	314893-301	->	->	->	->
25		SUPPORT, COIL	(2) 314894-201	(2) ->	(2) ->	(2) ->	(2) ->
26		BRACKET,TXV	X	X	X	X	X
27		BRACKET,TXV	X	X	X	X	X
28		BRACKET, TOP COIL	316812-701	->	->	->	316821-701
29		SHIELD, HEAT	315925-402	->	->	351925-402	315925-402
30	NI	GROMMET	314986-201	->	->	->	->
31	NI	GROMMET	314987-202	->	->	*>	->
32		COIL BRACKET	X	X	X	X	X
33		COIL BRACKET	X	X	X	X	X
34		COIL BRACKET	X	X	X	X	X
35		FILTER PLATE	X	X	X	X	X
36		CHANNEL COND	316808-301	•>	->	->	->
37	NI	DRAIN FITTING	316809-202	->	->	->	->
38	NI	DRAIN FITTING	X	X	X	X	X
39	1	DRIP BAFFLE	X	X	X	X	X
		ELECTRICAL GROUP					100000
41		TRANSFORMER	HT01BD208	->	->	.>	HI01BF230
42		PRINTED CIRCUIT BOARD	HK61GA001	->	->	->	*>
43		GROUND LUG	HY90AZ021	->	->	->	->
44		LOW VOLTAGE TERM.BOX	3-05772	->	->	.>	.>
45		FUSE	ATC5	->	->	->	•>
		FAN AND MOTOR GROUP					
46		BLOWER ASSY (COMPLETE)	316804-751	->	•>	->	316804-765
		INCLUDES:	a program the second second				- And Marine and And
47		HOUSING ASSY	316803-751	->	*>	->	->
48		BLOWER WHEEL	LA22LA026	->	->	->	->
49		MOTOR,FAN	HC37AE200 ·	->	.>	->	HC37AE202
50		CAPACITOR	P291-0503	->	->	->	*
51		PROTECTIVE BOOT	P281-0002	->	->	->	->
52	1	STRAP, CAPACITOR	P281-0022	->	->	->	->
53		ARM MOTOR MOUNT	(3) HC98ZZ252	(3) ->	(3) ->	(3) ->	(3) ->
54		BAND MTR MOUNT	P251-0078	->	->	->	*
55		GROMMET	(3) P251-0079	(3) ->	(3) ->	(3) ->	(3) ->
	_						



#### Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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## FAN COIL



ITEM	the second	PART DESCRIPTION	40YR018-300 208/230-1-60	40YR018-300CD 208/230-1-60	40YR018-300CG 208/230-1-60	40YR018-300CS 208/230-1-60	40YR018-700 230-1-50
		COIL AND PIPING GROUP					
56		COIL ASSY (COMPLETE)	316224-751	->	3>	.>	->
57		VALVE THERMO EXPANSION	×	V	×	v	Y
5/			EA090D102	^	^	^	^
50		CONDENSATE TROUGH	EAUOQUIUS	-3	-> V	Y	Y
60		CONDENSATE ASSV	Ŷ	- ·	Ŷ	Y Y	X
61		CONDENSATE TROUGH	÷	÷	N N	÷	Y
62		CONDENSATE DAN SHIELD	214025 202	1	1	-	~
62		CONDENSATE PAN	214925-302	.,			
64		CONDENSATE DAN	314000-401 V	->	->	y v	Y
65		PLUG PLASTIC	(2) LE20P7021	(2)	(2)	(2)	(2) ->
66	NI	RETAINER	AL 12504272				->
67	NI	PISTON	EASODHOSS				
69	NI	PISTON BODY	200407-201	3			
60	NI	STRAINER	KH11HH066				
		ELECTRIC HEAT GROUP	KITTITITIOOO				
70		HEATER ASSY (COMPLETE)	Y	3-05789-2	3-05802-2	3-05802-1	X
10		INCLUDES:	^	5-05/05-2	5-05002-2	0.00002 1	<u>^</u>
71	NI	FI FMENT ASSY	Y	2.05556-010	-	2-05556-009	X
72	NI	CONTROL PANEL	X X	2-055772-2	2.05773-6	20000000	X
73	NI	LIMIT SWITCH	X X	HH107A065	(2) HH1074050	(2) ->	X
74	NI	LIMIT SWITCH	Ŷ	Y	X	X	X
75	NI	LIMIT SWITCH	Ŷ	Ŷ	Ŷ	X	X
76	NI	SECUENCER	Ŷ	HN670005	HNEZOCODE	~	X
77	NI	PLUG HOUSING	Ŷ	HV06AM012	111070000		X
78	-	FLISE BOX ASSY (COMPLETE)	X X	Y	Y	X	X
10		INCLUDES:	^	^	^	-	in the second second
70	NI	COVER FLISE	Y	Y	Y	X	X
80	NI	FUSE	Ŷ	Ŷ	X	X	X
81	NI	FUSE	Ŷ	Ŷ	Y Y	X	X
82	NI	FUSE BLOCK	Y Y	X	X	X	X
UL		FILTER GROUP	^	<b>^</b>	~	A	A CONTRACTOR
83		FILTER BACK ASSY	Y	Y	Y	X	X
00		INCLUDES:	^	^	^	~	
84		FILTER	315014-401	-		->	
85		GRILLE EILTER	V	Y	Y	X	X
86		FILTER BACK	Ŷ	Ŷ	X	X	X
87		RETAINED FILTED	Ŷ	Ŷ	Ŷ	X	X
07	-	ACCESSORY GROUP	<b>^</b>	^	<b>^</b>	X	~
88	NI	TWO SPEED BELAY	4074900351		-		
	-	INCLUDES:	4017300331				
89	NI	RELAY 2 SPEED	HN61P.1024		->		->
90	N	TIME DELAY BELAY	40YA900361				->
	-	INCLUDES:	40171000001			A STATE OF A STATE OF A STATE	Contraction of the second s
91	NI	RELAY TIME DELAY	HN67G.1002		->	->	->
92	NI	DISCONNECT KIT	40YA900371	->	->	.>	->
	-	INCLUDES:	10111000011			A CARLON AND A CARLON AND	a design in the second second
93	NI	DISCONNECT ASSY	2-05896-1		->	->	->
94	NI	DISCONNECT	HB6177001	->	->	->	->
95	N	DISCONNECT	HB6177002		->	->	->
96	NI	LATENT CAPACITY CONTROL	40YA900381		->	->	->
		INCLUDES:	*		a state of the second second	a second second second second	
97	NI	SWITCH.HUMIDISTAT	3-05464	· · ·	->	->	->
98	NI	RELAY, TWO SPEED	HN61P.1024		.>	.>	->
99	NI	ELECTRIC HEAT KIT (5 KW)	40YA900051	.>	.>	->	->
		INCLUDES:	1		all a second and the		
100	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05789-2	->	->	->	->
101	NI	ELECTRIC HEAT KIT (8KW)	40YA900081	->	->	->	->
		INCLUDES:			a state of the second	Alter Chippel and an	a second a strandard and
102	NI	FLEMENT ASSY "SEE HEAT SECT"	3-05802-1		->	->	•>

Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes." on last page for explanation of symbolism.











1. 1	de.	sound the second statements	40YR018-300	40YR018-300CD	40YR018-300CG	40YR018-300CS	40YR018-700	
ITEM	10	PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50	
		ACCESSORY GROUP (CONT'D)						
103	NI	ELECTRIC HEAT KIT (10KW)	40YA900101	>	->		a second to be the same	
		INCLUDES:		and the second			Contraction of the second	
104	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05802-2	->	•>	->	->	
105	NI	ELECTRIC HEAT KIT (15KW)	X	X	X	X	X	
1.1		INCLUDES:		and the state of the second	A MARCENEE			
106	NI	ELEMENT ASSY "SEE HEAT SECT"	X	X	X	X	ATTENDED AND AND	
107	NI	ELECTRIC HEAT KIT (20KW)	X	X	X	X	The Ast X have	
-		INCLUDES:					Charles and the second second	
108	NI	ELEMENT ASSY "SEE HEAT SECT"	X	X	X	X	X	
109	NI	ELETRIC HEAT KIT (9KW)	X	X	X	X	<b>X</b>	
		INCLUDES:	Contraction of the	and the second second second		7 11.40	V	
110	NI	HEATER ASSY	X	X	X	X	Χ	
19.2.2		INCLUDES:	and the second second					
111	NI	ELEMENT ASSY	X	X	X	X	X	
112	NI	CONTROL PANEL	X	X	X	X	×	
113	NI	LIMIT SWITCH	X	X	X	X	÷	
114	NI	SEQUENCER	X	X	X	×	÷	
115	NI	ELECTRIC HEAT KIT (15KW)	X	X	X	X	<b>^</b>	
	-	INCLUDES:						
116	NI	HEATER ASSY	X	X	X	X	<b>^</b>	
-		INCLUDES:			and the second se		V	
117	NI	ELEMENT ASSY	X	X	X	X	A	
118	NI	CONTROL PANEL	X	X	X	X	X	
119	NI	LIMIT SWITCH	X	X	X	X	×	
120	NI	SEQUENCER	X	X	X	X	×	
121	NI	ELECTRIC HEAT KIT (18KW)	X	X	X	X	X	
16.0	-	INCLUDES:						
122	N	HEATER ASSY	X	X	X	X	X	
		INCLUDES:	and the second					
123	NI	ELEMENT ASSY	X	X	X	X	X	
124	N	CONTROL PANEL	X	X	X	X	X	
125	N	LIMIT SWITCH	X	X	X	X	X	
126	N	SEQUENCER	X	X	X	X	×	
127	N	ELECTRIC HEAT KIT (24KW)	X	X	X	X	X	
1	-	INCLUDES:		Sector and the sector of the s				
128	N	HEATER ASSY	X	X	X	X	X	
-		INCLUDES:	and the second second					
129	N	ELEMENT ASSY	X	X	X	X	X	
130	N	CONTROL PANEL	X	×	X	X	×	
131	N	FUSE	X	X	X	X	X	
132	N	LIMIT SWITCH	X	X	X	X X	×	
133	N	SEQUENCER	X	X	X	X	X	
134	N	TERMINAL BLOCK	X	X	X	X	X	
135	N	BLOCK	X	X	X	X	X	
136	N	ELECTRIC HEAT KIT (30KW)	X	X	X	X	X	
-	-	INCLUDES:	and the second second					
137	N	HEATER ASSY	X	X	X	X	X	
		INCLUDES:	States - States and	Contractor and the second	and the second s			
138	N	ELEMENT ASSY	X	X	X	X	X	
139	N	CONTROL PANEL	X	X	X	X	X	
140	N	FUSE	X ·	X	X	X	X	
141	N	LIMIT SWITCH	X	X	X	X	X	
142	N	SEQUENCER	X	X	X	X	X	
143	N	TERMINAL BLOCK	X	X	X	X	X	
144	N	BLOCK	X	X	X	X	X	



#### Catalog No.: 40.024 (9-90)

Supersedes: NEW

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Note: See "Catalog Notes " on last page for explanation of symbolism.



### FAN COIL

#### 40YR018-700 · And the state of the state 40YR018-300 40YR018-300CD 40YR018-300CG 40YR018-300CS and the state of the second 100 230-1-50 PART DESCRIPTION ITEM 208/230-1-60 208/230-1-60 208/230-1-60 208/230-1-60 ACCESSORY GROUP (CONT'D) UNA -> 型251)16F 1445 C- FC 145 NI ELECTRIC HEAT KIT (3KW) 40YA900031 -> INCLUDES: -> -> 3-05789-1 146 NI HEATER ASSY -> -> INCLUDES: 147 NI ELEMENT ASSY -> 2-05556-008 -> -> -> -> 148 NI CONTROL PANEL 2-05773-2 -> -> -> HH19ZA950 -> -> -> 149 NI LIMIT SWITCH -> X 150 NI LIMIT SWITCH X X X X X 151 NI LIMIT SWITCH X X X X -> -> 152 NI SEQUENCER HN67QC005 -> -> -> 153 NI PLUG HOUSING HY06AM012 -> -> -> -> -> 154 NI ELECTRIC HEAT KIT (3KW) 40YA900041 -> -> INCLUDES: 3-05797-1 -> -> -> 155 NI HEATER ASSY -> INCLUDES: 156 NI ELEMENT ASSY -> -> 2-05556-008 -> -> -> 157 NI CONTROL PANEL 2-05773-2 -> -> -> 2-05805-1 -> -> 158 NI **CIRCUIT BREAKER ASSY** -> -> INCLUDES: -> NI CIRCUIT BREAKER HH83ZC007 -> -> 159 -> -> -> 160 NI CIRCUIT BREAKER MOUNTING BASE HH94ZZ001 -> -> -> NI ELECTRIC HEAT KIT (5KW) 40YA900061 -> -> -> 161 INCLUDES: -> 162 NI HEATER ASSY -> 3-05797-2 -> -> INCLUDES: 163 NI ELEMENT ASSY -> -> 2-05556-010 -> -> -> -> 164 NI CONTROL PANEL 2-05773-2 -> -> 2-05805-1 -> -> CIRCUIT BREAKER BOX ASSY -> 165 NI -> INCLUDES: -> 166 NI CIRCUIT BREAKER HH83ZC007 -> -> -> -> 167 NI CIRCUIT BREAKER MOUNTING BASE -> HH94ZZ001 -> ->

Catalog No.: 40.024 (9-90)

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Note: See "Catalog Notes " on last page for explanation of symbolism.

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40YR/YRM

SIZE: 018-060 0000000

SERIES: 0



Replacement Components Division

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### DIRECT EXPANSION FAN COIL



SERIES: 0

and the start	44	where the stand standards a	40YR024-300	40YR024-300CD	40YR024-300CG	40YR024-300CS	40YR024-700	
ITEM	1 A	PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50	
		CASING GROUP					이 옷 옷 옷 옷 다 갔다.	
1		WRAPPER	314860-401		and the second	->		
2		INSULATION	314872-301	->	->	->	->	
3		LOWER WRAPPER	X	X	X	X	×	
4		INSULATION	X	X	X	X	X	
5		PANEL ASSY INSUL.	314988-701	->	->	.>.	->	
6		DOOR ASSY LOWER	314989-707	->	->	->	->	
7		DOOR ASSY UPPER	314990-701	->	->	•>	->	
8		DOOR ASSY FITTING	314991-701	•>	->	->	->	
9		COIL SUPPORT SIDE	(2) 314958-401	(2) ->	(2) ->	(2) ->	(2) ->	
10		COIL SUPPORT REAR	314957-201	->	->	->	->	
11		BLOWER DECK	314896-401	->	->	->	->	
12		DIFFUSER BAFFLE	(2) 314858-301	(2) ->	(2) ->	(2) ->	(2) ->	
13		HEATER PLATE	314895-401	->	->	->	->	
14		TIE ANGLE	314867-301	->	->	->	->	
15		GROMMET NUT	(2) 61631D7	(2) ->	(2) ->	(2) ->	(2) ->	
16		SPRING	314868-301	->	->	->	->	
17		FILTER DOOR ASSY	315903-701	->	->	->	->	
18		HOUSING BRACKET	314900-201	->	->	->	->	
19		FRONT BRACKET	X	X	X	X	X	
20		REAR BRACKET	X	X	X	X	X	
21		FITTING DOOR CLIP	X	X	X	X	X	
22		BREAKER,COVER	314981-201	->	->	->	->:()	
23	NI	LOGO	312250-405	->	->	->	->	
24		EXTENSION, TUBE SHEET	314893-301	->	->	->	->	
25		SUPPORT, COIL	314894-304	->	->	->	->1	
26		BRACKET,TXV	X	X	X	X	X	
27		BRACKET,TXV	X	X	X	X	X	
28		BRACKET, TOP COIL	316821-701	->	->	->	->	
29		SHIELD, HEAT	315925-402	->	->	.>	->	
30	NI	GROMMET	314986-201	•>	->	->	->	
31	NI	GROMMET	314987-201	•>	->	->	->	
32	1	COIL BRACKET	X	X	X	X	X	
33		COIL BRACKET	X	X	X	X	X	
34	+	COIL BRACKET	X	X	X	X	X	
35	+	FILTER PLATE	×	X	×	X	X	
36		CHANNEL COND	316808-301		->	->	->	
37	NI	DRAIN FITTING	316809-202			->	->	
38	NI	DRAIN FITTING	X	X	X	X	X	
39	1	DRIP BAFFI F	X	X	X	X	X	
00		ELECTRICAL GROUP	~					
41		TRANSFORMER	HT01BD208			->	HT01BF230	
42	-	PRINTED CIRCUIT BOARD	HK61GA001		->	->	->	
43		GROUND LUG	HY90A7021		->		->	
44		LOW VOLTAGE TERM BOX	3-05772		->		->	
45		FUSE	ATC5			->	>	
40		FAN AND MOTOR GROUP	AIOS					
46		BLOWER ASSY (COMPLETE)	316804-752				316804-759	
-10		INCLUDES:	310004-732			and the second second		
47	-	HOUSING ASSY	316802.751			-		
40	+	BLOWER WHEEL	1 4 221 4 026	*				
40	+	MOTOR FAN	HC27AE200				HC374F203	
50	+	CAPACITOR		**	.,		TIOUTALLOU	
51	+	PROTECTIVE BOOT	P291-0753	**	.,			
50	-	STRAP CARACITOR	P201-0002	*	~	*		
52	-		(2) HC0077050	->	->	(2)	(3)	
53	-		(3) HU9022252	(3) ->	(3) ->			
54	-	CROMMET	(2) DOE1 0070	->	->	(2)	(3)	
00	1	GOOMINE	1131 F251-00/9	11.31 ->	1.3) ->	->	10	



#### Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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## DIRECT EXPANSION

FAN COIL

ITEM	10116	PART DESCRIPTION	40YR024-300 208/230-1-60	40YR024-300CD 208/230-1-60	40YR024-300CG 208/230-1-60	40YR024-300CS 208/230-1-60	40YR024-700 230-1-50
-		COIL AND PIPING GROUP					
56		COIL ASSY (COMPLETE)	316224-751	->	->	->	.>
-	-	INCLUDES:				V	×
5/	-	VALVE THERMO EXPANSION	X	X	X	×	<b>^</b>
58	-	CONDENSATE TROUCH	EA08QD104	->	->	->	->
59	+	CONDENSATE TROUGH	×	×	^ V	<b>^</b>	Ŷ
60	+	CONDENSATE ASST	X	×	×	÷	Ŷ
61	-	CONDENSATE TROUGH	X	×	<b>^</b>	^	^
62	-	CONDENSATE PAN SHIELD	314925-302	->	->	->	->
63	+	CONDENSATE PAN	314000-401	->	->		Y
65	+	DULIC DUASTIC	(2) LE20D7021	X (2)	(2)	(2)	(2)
60	NI	DETAINED	(2) LF39R2021	(2) ->	(2) ->		
67	NU	RETAINER	AU3DUA272	->	.>		
60	NI	PISTON BODY	EA32FR001	->	-3		
60	NU	STDAINED	300497-201	->	.3		
09	IN	ELECTRIC HEAT GROUP	KHTTHHUOO	->			
70		HEATER ASSY (COMPLETE)	Y	2.05780.2	3.05802-2	3-05802-1	X
10	+	INCLUDES:	^	3-03/09-2	5-03002-2	0 00002 1	
71	NI	ELEMENT ASSY	v	2.05556.010	(2)	(2) 2.05556.009	X
72	NI		Ŷ	2-05550-010	2.05772.6	12 20000000	X
72	NI	LIMIT SWITCH	Ŷ	LH107A065	(2) HH107A050	(2) ->	X
74	NU		Ŷ	V NILITZAGOS	(2) HITISEASSU	X X	X
74	NI		Ŷ		Y.	X	X
75	NI		×	LINEZOCODE	LINEZOADOS	^	X
70		DUICHOUGING	×		FINO/GAUUO		÷
70	INI		A	HTUDAMU12	->		
18	+	FUSE BOX ASSY (COMPLETE)	×	X	×	^	^
70	1.	INCLUDES:	- V	v	V	V	v
/9		COVER,FUSE	X	X	<u> </u>	×	-
80	N	FUSE	X	X	X	X	×
81		FUSE	X	X X	X X	×	÷
82	N	FUSE BLOCK	X	X	X		^
00		FILTER GROUP	N. N.	×	V	×	V
83	+	FILTER RACK ASSY	X	X	×		^
-	+	INCLUDES:					
84	-	FILIER	315914-401	->	->	->	->
85	+	GRILLE FILTER	X	X	X	×	÷
86	-	FILTER RACK	X	X	X	×	-
87		RETAINER FILTER	X	X	X	<b>A</b>	
		ACCESSORY GROUP-					
88	IN	TWO SPEED RELAY	40YA900351	*	->	->	
-	-	INCLUDES:	LINICIPICA				10 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -
89	N	RELAY 2 SPEED	HN61PJ024		->	•>	.>
90	IN	INCLUDES:	40YA900361	->	->	.>	
-	-	INCLUDES:	1101070 1000				
91	N	HELAY, TIME DELAY	HN6/GJ002	->	->	.>	*>
92	N	DISCONNECT KIT	40YA9003/1	->	->	->	
-	-	INCLUDES:					
93	N	DISCONNECT ASSY	2-05896-1	->	->	->	->
94	N	DISCONNECT	HR61ZZ001	•>	->	->	*
95	N	DISCONNECT	HR61ZZ002	->	>	->	*
96	N	LATENT CAPACITY CONTROL	40YA900381	->	->	->	*
-	-	INCLUDES:					
97	N	SWITCH, HUMIDISTAT	3-05464	.>	->	->	*
98	N	RELAY, TWO SPEED	HN61PJ024	->	->	->	*
99	N	ELECTRIC HEAT KIT (5 KW)	40YA900051	•>	->	->	->
-	-	INCLUDES:					
100	N	ELEMENT ASSY "SEE HEAT SECT"	3-05789-2	->	->	->	*
101	N	ELECTRIC HEAT KIT (8KW)	40YA900081	.>	->	->	->
Contraction in the		INCLUDES:		,			
102	IN	ELEMENT ASSY "SEE HEAT SECT"	3-05802-1	->	->	->	->

Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

101 age Litho in U.S.A?

40YR/YRM

SIZE: 018-060

SERIES: 0









### DIRECT EXPANSION C FAN COIL



3	12.	1988 The BURNESS PORT POR	40YR024-300	40YR024-300CD	40YR024-300CG	40YR024-300CS	40YR024-700	
TEM	Ski.	PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50	
		ACCESSORY GROUP (CONT'D)						
103	NI	ELECTRIC HEAT KIT (10KW)	40YA900101	->	1997 - State -	· ·>	•	
101		INCLUDES:						
104	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05802-2	->	*>	->	->	
105	NI	ELECTRIC HEAT KIT (15KW)	40YA900151	*>	->	->	->	
106	NI	ELEMENT ASSY #SEE HEAT SECT	0.05701.4					
107	NI	ELEMENT ASST SEE HEAT SECT	3-05/91-1	->	·> V	-> Y	Y	
107	-	INCLUDES:	^	<u> </u>	^	^	^	
108	NI	FIEMENT ASSY "SEE HEAT SECT"	Y	Y	Y	X	X	
109	NI	FLETRIC HEAT KIT (9KW)	X	X	X	X	X	
100		INCLUDES:	^	^	~	<u>^</u>		
110	NI	HEATER ASSY	X	X	X	X	X	
		INCLUDES:	· · · · ·					
111	NI	ELEMENT ASSY	X	X	X	X	X	
112	NI	CONTROL PANEL	X	X	X	X	X	
113	NI	LIMIT SWITCH	X	X	X	X	X	
114	NI	SEQUENCER	X	X	X	X	X	
115	NI	ELECTRIC HEAT KIT (15KW)	X	X	X	X	X	
		INCLUDES:	and the second se				and the second sec	
116	NI	HEATER ASSY	X	X	X	X	X	
		INCLUDES:				and the second	and the second second	
117	NI	ELEMENT ASSY	X	X	X	X	X	
118	NI	CONTROL PANEL	X	X	X	X	X	
119	NI	LIMIT SWITCH	X	X	X	X	X	
120	NI	SEQUENCER	X	X	X	X	X	
121	NI	ELECTRIC HEAT KIT (18KW)	X	X	X	X	X	
		INCLUDES:			States and the second	and the second	Indexed in the second	
122	NI	HEATER ASSY	X	X	X	X	X	
Shi		INCLUDES:			and the second	and the second second		
123	NI	ELEMENT ASSY	X	X	X	X	X	
124	NI	CONTROL PANEL	X	X	X	X	X	
125	NI	LIMIT SWITCH	X	X	X	X	X	
126	NI	SEQUENCER	X	X	X	X	X	
127	NI	ELECTRIC HEAT KIT (24KW)	X	X	X	X	X	
		INCLUDES:						
128	N	HEATER ASSY	X	X	X	X	X	
100		INCLUDES:					~	
129	NI	CONTROL DANIEL	<u>×</u>	X	X	X	X	
130	NI	CUNTROL PANEL	<u>X</u>	X	<u>×</u>	<u>×</u>	<u> </u>	
131	NI	FUSE	X	X	X	X	÷	
132	NI		X	X	X	X	×	
100	NI		Χ	X	X	×	\$	
125	NI		X	X	× .	×	Ŷ	
135	NI		×	×	× ·	×	Ŷ	
130		INCLUDES:	λ	×	×	^	^	
137	NI	HEATED ASSV	v	v	v	Y .	Y	
137	141	INCLUDES:	Λ	^	^	^	^	
138	NI	FI FMENT ASSV	Y	V	Y	X	X	
139	N	CONTROL PANEL	× v	Ŷ	× ×	Ŷ	Ŷ	
140	N	FUSE	X	X	Ŷ	X	x	
141	N	LIMIT SWITCH	X	X	x	X	X	
142	NI	SEQUENCER	· X	x	x	X	X	
143	NI	TERMINAL BLOCK	X	X	X	X	X	
144	NI	BLOCK	Y	Y Y	X	X	X	



#### Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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### DIRECT EXPANSION FAN COIL



	18	999764 1- 30008-6506708	40YR024-300	40YR024-300CD	40YR024-300CG	40YR024-300CS	40YR024-700
ITEM	蒙	PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50
destand	2004	ACCESSORY GROUP (CONT'D)					
145	NI	ELECTRIC HEAT KIT (3KW)	40YA900031	< ->	10100001->	1	and set a first and
		INCLUDES:	1			a second a second second	a the second state of the
146	NI	HEATER ASSY	3-05789-1		->	· · · · · · · · · · · · · · · · · · ·	->
		INCLUDES:			and the production of the second	Arrist and a second	and the fail and the
147	NI	ELEMENT ASSY	2-05556-008	->	->	->	->
148	NI	CONTROL PANEL	2-05773-2			and the second second	->
149	NI	LIMIT SWITCH	HH19ZA950	->	¥ ->	->	->
150	NI	LIMIT SWITCH	X	X	X	X	X
151	NI	LIMIT SWITCH	X	X	X	X	X
152	NI	SEQUENCER	HN67QC005	->	->	->	->
153	NI	PLUG HOUSING	HY06AM012	->	->	->	->
154	NI	ELECTRIC HEAT KIT (3KW)	40YA900041	->	->	•>	->
		INCLUDES:					
155	NI	HEATER ASSY	3-05797-1	->	->	•>	->
		INCLUDES:	and the second se				
156	NI	ELEMENT ASSY	2-05556-008	->	->	->	->
157	NI	CONTROL PANEL	2-05773-2	->	->	->	->
158	NI	CIRCUIT BREAKER ASSY	2-05805-1	->	•>	->	->
		INCLUDES:		and the second second second second second			The second s
159	NI	CIRCUIT BREAKER	HH83ZC007	->	->	->	->
160	NI	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001	->	•>	->	->
161	NI	ELECTRIC HEAT KIT (5KW)	40YA900061	->	-> :	->	•>
		INCLUDES:	and the second second	a constant and a second			a state of the second state of the second
162	NI	HEATER ASSY	3-05797-2	->	•>	->	->
		INCLUDES:				and the second second	Martin Advantage
163	NI	ELEMENT ASSY	2-05556-010	->	->	->	->
164	NI	CONTROL PANEL	2-05773-2	->	•>	->	•>
165	NI	CIRCUIT BREAKER BOX ASSY	2-05805-1	->	->	->	•>
		INCLUDES:				State of the second second	
166	NI	CIRCUIT BREAKER	HH83ZC007	->	->	->	*>
167	NI	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001	->	->	->	->
168	NI	ELECTRIC HEAT KIT ((8KW)	40YA900091	->	->	->	*>
		INCLUDES:			and the second s	and the second	A State State State
169	NI	HEATER ASSY	3-05803-1	->	->	->	•>
		INCLUDES:					
170	NI	ELEMENT ASSY	(2) 2-05556-009	(2) ->	(2) ->	(2) ->	(2) ->
171	NI	CONTROL PANEL	2-05773-6	->	->	->	->
172	NI	CIRCUIT BREAKER BOX ASSY	2-05805-1	•>	->	->	->
		INCLUDES:					
173	NI	CIRCUIT BREAKER	HH83ZC007	->	->	->	->
174	NI	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001	->	->	->	->
175	NI	LIMIT SWITCH	(2) HH19ZA001	(2) ->	(2) ->	(2) ->	(2) ->
176	N	SEQUENCER	HN67QC006	->	->	->	->

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SERIES: 0

# DIRECT EXPANSION



1. 1. 19	1	MANYAN - BUNGSLOUDANDS	40YR024-300	40YR024-300CD	40YR024-300CG	40YR024-300CS	40YR024-700
ITEM	1	PART DESCRIPTION -	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50
		ACCESSORY GROUP (CONT'D)					
177	NI	ELECTRIC HEAT KIT (10KW)	40YA900111		->	->	1 1 4 4 6 - S 1.
10.10		INCLUDES:					1. S.
178	NI	HEATER ASSY	3-05803-2	->	->	->	10 - 50 -> 10 - 10 - 10 - 10 - 10 - 10 - 10 -
100		INCLUDES:	State Resident B	March & State State	Contraction Arrest	a finan aya dan san ara sa	and the second second second
179	NI	ELEMENT ASSY	(2) 2-05556-010	(2) -> .	(2) ->	(2) ->	(2) ->
180	NI	CONTROL PANEL	2-05773-6	->	->	-> birte	
181	NI	CIRCUIT BREAKER BOX ASSY	2-05805-1	->	->	-> particip	
1		INCLUDES:	and the second second		- References and the second	in the there is a section of the	
182	NI	CIRCUIT BREAKER	HH83ZC007	->	->	->	->
183	NI	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001	->	->	-> 13	*
184	NI	LIMIT SWITCH	(2) HH19ZA950	(2) ->	(2) ->	(2) ->	(2) ->
185	NI	SEQUENCER	HN67QC006	->	->	->	*>
186	NI	ELECTRIC HEAT KIT (15KW)	40YA900161	->	->	->	->
		INCLUDES:					
187	NI	HEATER ASSY	3-05795-1	->	->	->	>
-		INCLUDES:	Service Land		and the second second		
188	NI	ELEMENT ASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
189	NI	CONTROL PANEL	2-05773-4	->	->	->	->
190	NI	CIRCUIT BREAKER BOX ASSY	2-05805-2	->	->	->	->
		INCLUDES:					
191	NI	CIRCUIT BREAKER	(2) HH83ZC007	(2) ->	(2) ->	(2) ->	(2) ->
192	NI	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
193	NI	SEQUENCER	HN62QC008	->	->	->	
194	NI	ELECTRIC HEAT KIT (20KW)	X	X	X	X	X
		INCLUDES:					1
195	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:			e la construcción de la construcción		
196	NI	ELEMENT ASSY	X	X	X	X	X
197	NI	CONTROL PANEL	X	X	X	X	X
198	NI	CIRCUIT BREAKER BOX ASSY	X	X	X	X	X
		INCLUDES:	and the second second				
199	NI	CIRCUIT BREAKER	X	X	X	X	X
200	NI	CIRCUIT BREAKER MOUNTING BASE	X	X	X	X	X
201	NI	LIMIT SWITCH	X	X	X	X	X
202	NI	LIMIT SWITCH	X	X	X	X	X
203	NI	LIMIT SWITCH	X	X	X	X	X
204	NI	SEQUENCER	X	X	X	X	X
205	NI	ELETRIC HEAT KIT (15KW)	40YA900171	->	->	->	->
		INCLUDES:	Section of the Streements		Sec. 2012 miles in	and a second second	
206	NI	HEATER HEATER ASSY	3-05791-2	->	->	->	•>
1.00		INCLUDES:			Phase inclusion in the later.	e lene i strangestation	and a start of the
207	NI	ELEMENT ASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
208	NI	CONTROL PANEL	2-05773-4	->	->	•>	*
209	NI	FUSE BOX ASSY	2-05804-3	->	->	->	->
		INCLUDES:	Section of the sectio				C. C. State State State State
210	NI	FUSE	(2) FRN-R30	(2) ->	(2) ->	(2) ->	(2) ->
211	NI	FUSE	(2) FRN-R60	(2) ->	(2) ->	(2) ->	(2) ->
212	NI	FUSE BLOCK	HY11UM461	->	->	->	->
213	NI	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
214	NI	SECHENCER	HN670G005				





Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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## FAN COIL



1. 18	184		40YR030-300	40YR030-300AJ	40YR030-300CG	40YR030-300CS	40YR030-700
ITEM	20.	PART DESCRIPTION	208/230-1-60	208/230-1-60	00- 208/230-1-60	208/230-1-60	230-1-50
		CASING GROUP					
1		WRAPPER	314860-402	->	11140A ->	S GRASTINA PAS	12-005-1-201 -> 12893 1-1
2		INSULATION	314872-302	->	->	->	->
3		LOWER WRAPPER	X	X	X	X	X
4		INSULATION	X	X	X	X	X
5		PANEL ASSY INSUL.	314988-702	->	->	->	E -> ->
6		DOOR ASSY LOWER	314989-702	->	st 1 /	-> towar	
7		DOOR ASSY UPPER	314990-702	->	<b></b>		->
8		DOOR ASSY FITTING	314991-703	->	->	> .	0 MAR ->
9		COIL SUPPORT SIDE	(2) 314958-402	(2) ->	(2) ->	(2) ->	(2) ->
10		COIL SUPPORT REAR	314957-202	5 ->	- 140.540 ->		->
11		BLOWER DECK	314896-402	->	A	>	-> ->
12		DIFFUSER BAFFLE	(2) 314858-301	(2) ->	(2) ->	(2) ->	(2) ->
13		HEATER PLATE	314895-402	->	->	->	->
14	1	TIE ANGLE	314867-302	->	->	->	->
15	T	GROMMET NUT	(2) 61631D7	(2) ->	(2) ->	(2) ->	(2) ->
16		SPRING	314868-301	->	->	->	->
17		FILTER DOOR ASSY	315903-702	->	->	•>	->
18	T	HOUSING BRACKET	314900-202	->	->	->	->
19	1	FRONT BRACKET	X	X	X	X	X
20	1	REAR BRACKET	X	X	X	X	X
21	1	FITTING DOOR CLIP	314999-201	->	->	->	->
22	1	BREAKER,COVER	314981-201	->	->	->	->
23	N	LOGO	312250-405	->	->	->	->
24		EXTENSION, TUBE SHEET	X	X	X	X	X
25	1	SUPPORT, COIL	X	X	X	X	X
26	1	BRACKET,TXV	X	X	X	X	X
27		BRACKET,TXV	X	X	X	X	X
28	T	BRACKET, TOP COIL	X	X	X	X	X
29	1	SHIELD.HEAT	315925-401	->	->	->	->
30	N	GROMMET	314985-301	->	->	->	->
31	N	GROMMET	314987-201	->	->	->	->
32	T	COIL BRACKET	X	X	X	X	X
33	T	COIL BRACKET	(2) 314879-301	->	(2) ->	(2) ->	(2) ->
34	1	COIL BRACKET	(2) 314879-302	->	(2) ->	(2) ->	(2) ->
35	T	FILTER PLATE	316242-701	->	->	->	->
36	1	CHANNEL COND	X	X	X	X	X
37	N	I DRAIN FITTING	316809-201	->	->	->	->
38	N	DRAIN FITTING	316809-202	->	->	->	->
39	T	DRIP BAFFLE	(2) 316834-202	(2) ->	(2) ->	(2) ->	(2) ->
		ELECTRICAL GROUP				<b>的问题,在这些问题</b> 是	
41		TRANSFORMER	HT01BD208	->	->	->	HT01BF230
42	-	PRINTED CIRCUIT BOARD	HK61GA001	>	•>	->	->
43	T	GROUND LUG	HY90AZ021	->	->	->	->
44	1	LOW VOLTAGE TERM.BOX	3-05772	->	->	->	->
45	1	FUSE	ATC5	->	->	-> '	->
		FAN AND MOTOR GROUP			the state and the state of the state		
46		BLOWER ASSY (COMPLETE)	316804-753	->	•>	->	316804-760
	1	INCLUDES:					
47	+	HOUSING ASSY	316803-752	->	->	->	->
48	1	BLOWER WHEEL	LA22LA095	->	->	->	•>
49	1	MOTOR, FAN	HC41AE202	· ->	->	->	HC41AE203
50	+	CAPACITOR	P291-1003	->	->	->	->
51	+	PROTECTIVE BOOT	P281-0002	->	->	->	->
52	+	STRAP.CAPACITOR	P281-0022	->	->	->	->
53	+	ARM MOTOR MOUNT	(3) HC98ZZ252	(3) ->	(3) ->	(3) ->	(3) ->
54	1	BAND MTR MOUNT	P251-0078	->	->	->	->
55	+	GROMMET	(3) P251-0079	(3) ->	(3) ->	(3) ->	(3) ->

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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# DIRECT EXPANSION

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40YR030-300CS 40YR030-700 40YR030-300CG 40YR030-300 40YR030-300AJ 60+1-64 PART DESCRIPTION ITEM 208/230-1-60 208/230-1-60 230-1-50 208/230-1-60 208/230-1-60 COIL AND PIPING GROUP COIL ASSY (COMPLETE) 316822-758 -> 56 -> -> -> INCLUDES: X X 57 VALVE THERMO EXPANSION X X X EA08QD004 -> 58 DISTRIBUTOR -> -> -> 361236-201 316236-201 59 CONDENSATE TROUGH 316236-201 -> -> -> 60 CONDENSATE ASSY 316241-703 -> -> (2) (2) (2) -> CONDENSATE TROUGH (2) 316236-203 (2) -> 61 -> -> (2) (2) 62 CONDENSATE PAN SHIELD (2) 314925-301 (2) -> (2) -> -> -> CONDENSATE PAN 314880-402 -> -> 63 -> -> 315907-701 X X 64 CONDENSATE PAN 315907-701 -> (3) (3) 65 PLUG, PLASTIC (3) LF39RZ021 (3) (3) -> -> -> -> NI RETAINER 66 AU35QA272 -> -> -> -> NI PISTON EA52PH067 -> -> 67 -> -> NI PISTON BODY -> 68 300497-201 -> -> NI STRAINER 69 KH11HH066 -> -> -> -> ELECTRIC HEAT GROUP 3-05802-1 X HEATER ASSY (COMPLETE) 3-05791-1 3-05802-2 70 X INCLUDES: (2) 2-05556-009 X NI ELEMENT ASSY 2-05556-010 71 (2) X (3) -> X 72 NI CONTROL PANEL X 2-05773-4 2-05773-6 X (2) HH19ZA950 (2) 73 NI LIMIT SWITCH X (3) HH19ZA930 -> X X 74 NI LIMIT SWITCH X X X 75 NI LIMIT SWITCH X X X X X X NI SEQUENCER HN67QG005 HN67QC006 -> 76 X X 77 NI **PLUG HOUSING** X HY06AM012 -> -> X X X FUSE BOX ASSY (COMPLETE) X 2-05804-1 78 INCLUDES: X X COVER, FUSE 2-05784 X 79 NI X X X NI FUSE X (2) FRN-R20 X 80 X 81 NI FUSE X **NON-20** X X HY11UM461 X X X 82 NI FUSE BLOCK X FILTER GROUP X X 83 FILTER RACK ASSY X X х INCLUDES: 84 FILTER 315914-402 -> -> -> -> **GRILLE FILTER** X X X X 85 X X X X 86 FILTER RACK X х 87 **RETAINER FILTER** X X X X X ACCESSORY GROUP NI TWO SPEED RELAY 40YA900351 -> 88 -> -> -> INCLUDES: **RELAY 2 SPEED** HN61PJ024 -> -> 89 NI -> -> 90 NI TIME DELAY RELAY 40YA900361 -> -> -> -> INCLUDES: -> 91 NI RELAY, TIME DELAY HN67GJ002 -> -> -> NI DISCONNECT KIT 40YA900371 92 -> -> -> -> INCLUDES: 93 NI DISCONNECT ASSY 2-05896-1 -> -> -> -> 94 NI DISCONNECT HR61ZZ001 -> -> -> -> 95 NI DISCONNECT HR61ZZ002 -> -> -> -> NI LATENT CAPACITY CONTROL -> -> 96 40YA900381 -> -> INCLUDES: 97 NI SWITCH, HUMIDISTAT 3-05464 -> -> -> -> HN61PJ024 98 NI RELAY, TWO SPEED -> -> -> -> ELECTRIC HEAT KIT (5 KW) 40YA900051 -> -> -> 99 NI -> INCLUDES: ELEMENT ASSY "SEE HEAT SECT" 100 NI 3-05789-2 -> -> -> -> NI ELECTRIC HEAT KIT (8KW) -> 40YA900081 -> 101 -> -> INCLUDES: 102 NI ELEMENT ASSY "SEE HEAT SECT" 3-05802-1 \* -> -> -> ->

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Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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## DIRECT EXPANSION

### FAN COILA



ITEM	在	PART DESCRIPTION	40YR030-300	40YR030-300AJ	40YR030-300CG	40YR030-300CS 208/230-1-60	40YR030-700 230-1-50
		ACCESSORY GROUP (CONT'D)	200/200-1-00	200/200-1-00			
103	NI	ELECTRIC HEAT KIT (10KW)	40YA900101		ANT AN ANT	-> dir wear	Teach and store and
100	-	INCLUDES:	40171000101			and the second sec	and the second se
104	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05802-2	.>	->	->	->
105	NI	ELECTRIC HEAT KIT (15KW)	40YA900151	->		->	
		INCLUDES:	+ Department of the second		1	and the second second	-GAL
106	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05791-1	->	the set ->	->	1
107	NI	ELECTRIC HEAT KIT (20KW)	40YA900201	-> 13	->	->	100 m 10
		INCLUDES:	· · · · · · · · · · · · · · · · · · ·	and a subaran free free .	Section 22 Section	in the second part of	
108	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05792-1	->	->	>	•>
109	NI	ELETRIC HEAT KIT (9KW)	X	X	X	X	X
		INCLUDES:					
110	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:		and the second second second	and the second sec		and the second
111	NI	ELEMENT ASSY	X	X	X	X	X
112	NI	CONTROL PANEL	X	X	X	X	X
113	NI	LIMIT SWITCH	X	X	X	X	X
114	NI	SEQUENCER	X	X	X	X	X
115	NI	ELECTRIC HEAT KIT (15KW)	X	X	X	X	X
		INCLUDES:		A CONTRACTOR OF A CONTRACTOR	the second second second		
116	NI	HEATER ASSY	X	X	X	X	X
1		INCLUDES:	and a second second second second			-	
117	NI	ELEMENT ASSY	X	X	X	X	X
118	NI	CONTROL PANEL	X	X	. X	X	X
119	NI	LIMIT SWITCH	X	X	X	X	X
120	NI	SEQUENCER	X	X	X	X	X
121	NI	ELECTRIC HEAT KIT (18KW)	X	X	X	X	X
e keungeng		INCLUDES:					and the second
122	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:	the second reading of	and the second second	the second second second	The second second second second	C. C. Starting St. Skinger
123	NI	ELEMENT ASSY	X	X	X	X	X
124	NI	CONTROL PANEL	X	X	X	X	X
125	NI	LIMIT SWITCH	Χ.	X	× X	X	X
126	NI	SEQUENCER	X	X	X	X	X
127	NI	ELECTRIC HEAT KIT (24KW)	X	X	X	X	X
-		INCLUDES:					
128	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:				1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	
129	NI	ELEMENT ASSY	X	X	X	X	X
130	N	CONTROL PANEL	X	X	X	X	X
131	NI	FUSE	X	X	X	X	X
132	NI	LIMIT SWITCH	X	X	X	X	X
133	NI	SEQUENCER	X	X X	X	X	X
134	NI	TERMINAL BLOCK	X	X	X	X	X
135	NI	BLOCK	X	X	X	X	X
136	NI	ELECTRIC HEAT KIT (30KW)	X	X	X	X	Χ
107	-	INCLUDES:			A CONTRACTOR OF THE OWNER	~	v
137	INI	HEATER ASSY	X	X	× ×	× *	^
100		ELEMENT ACOV				v	Y
138	INI	CONTROL DANS!	X	X	X	×	×
139	NI	FLICE	X	X	X	×	Ŷ
140	NI		4 X	X	X	×	Ŷ
141	NI		X	X	×	×	X
142	NI		X	X	×	×	Ŷ
143	NI		X	X	×	× ×	Ŷ
144	IN	DLOUR	× ×	1 Å	· · ·	A .	A

Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.







40YR030-700 40YR030-300CG 40YR030-300CS 40YR030-300 40YR030-300AJ C. CERCATAR ITEM PART DESCRIPTION 208/230-1-60 208/230-1-60 208/230-1-60 230-1-50 208/230-1-60 ACCESSORY GROUP (CONT'D) 145 NI ELECTRIC HEAT KIT (3KW) X X X X X INCLUDES: NI HEATER ASSY x X 146 X X X INCLUDES: NI ELEMENT ASSY 147 X X X X X 148 NI CONTROL PANEL X X X X X 149 NI LIMIT SWITCH X X X X X 150 NI LIMIT SWITCH X X X X X 151 NI LIMIT SWITCH X X X X X 152 NI SEQUENCER X X X X X 153 NI PLUG HOUSING X X X X x 154 NI ELECTRIC HEAT KIT (3KW) X X X x x INCLUDES: 155 NI HEATER ASSY X X X X X INCLUDES: 156 NI ELEMENT ASSY X X X X X 157 NI CONTROL PANEL X X X X х 158 NI CIRCUIT BREAKER ASSY Х X X X X INCLUDES: 159 NI CIRCUIT BREAKER X X X X X 160 NI CIRCUIT BREAKER MOUNTING BASE X X X X X 161 NI ELECTRIC HEAT KIT (5KW) 40YA900061 -> -> -> -> INCLUDES: 162 NI HEATER ASSY 3-05797-2 -> -> -> -> INCLUDES: 163 NI ELEMENT ASSY 2-05556-010 -> -> -> -> 164 NI CONTROL PANEL 2-05773-2 -> -> -> -> NI CIRCUIT BREAKER BOX ASSY 165 2-05805-1 -> -> -> -> INCLUDES: NI CIRCUIT BREAKER 166 HH83ZC007 -> -> -> -> 167 NI CIRCUIT BREAKER MOUNTING BASE HH94ZZ001 -> -> -> -> NI ELECTRIC HEAT KIT ((8KW) 168 40YA900091 -> -> -> -> INCLUDES: 169 NI HEATER ASSY 3-05803-1 -> -> -> -> INCLUDES: 170 NI 2-05556-009 ELEMENT ASSY (2) (2) (2) (2) (2) -> -> -> -> 171 NI CONTROL PANEL 2-05773-6 -> -> -> -> 172 NI CIRCUIT BREAKER BOX ASSY 2-05805-1 -> -> -> -> INCLUDES: 173 NI CIRCUIT BREAKER HH83ZC007 -> -> -> -> 174 NI CIRCUIT BREAKER MOUNTING BASE HH94ZZ001 -> -> -> -> 175 NI 176 NI LIMIT SWITCH SEQUENCER (2) (2) (2) HH197A001 (2) -> (2) -> -> -> HN67QC006 -> -> -> ->





Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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## DIRECT EXPANSION FAN COIL



1.000	-	THE REAL PROPERTY AND THE PROPERTY AND T	40YR030-300	40YR030-300AJ	40YR030-300CG	40YR030-300CS	40YR030-700
ITEM	10	PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50
		ACCESSORY GROUP (CONT'D)					
177	NI	ELECTRIC HEAT KIT (10KW)	40YA900111		and some the		
		INCLUDES:	and the second second second		a second s	and a substantian a specific to a second second	and the first of the second second
178	NI	HEATER ASSY	3-05803-2	->	->		->
		INCLUDES:	a contra and a second and	and the second	والمراجعة والمعادية والمراجع والمراجع والمراجع	and the second sec	and an end the second second
179	NI	ELEMENT ASSY	(2) 2-05556-010	(2) ->	(2) ->	(2)>	(2) ->
180	NI	CONTROL PANEL	2-05773-6		and the second s	and the second s	->
181	NI	CIRCUIT BREAKER BOX ASSY	2-05805-1	>	······································	a server and a server and the	->
- alde	100	INCLUDES:	and the state of the second second	No. of the second se	and a star with a second of a	and the second sec	and a second second
182	NI	CIRCUIT BREAKER	HH83ZC007	->	->		->
183	NI	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001	->		->	->
184	NI	LIMIT SWITCH	(2) HH19ZA950	(2) ->	(2) ->	(2) ->	(2) ->
185	NI	SEQUENCER	HN67QC006	->	->	->	->
186	NI	ELECTRIC HEAT KIT (15KW)	40YA900161	->	->	->	->
		INCLUDES:				Contraction of the second	Sector Sector
187	NI	HEATER ASSY	3-05795-1	->	->	->	->
	1	INCLUDES:	President and a second second		and the second		and the second second
188	NI	ELEMENT ASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
189	NI	CONTROL PANEL	2-05773-4	->	->	->	->
190	NI	CIRCUIT BREAKER BOX ASSY	2-05805-2	->	->	->	->
		INCLUDES:					
191	NI	CIRCUIT BREAKER	(2) HH83ZC007	(2) ->	(2) ->	(2) ->	(2) ->
192	NI	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
193	NI	SEQUENCER	HN62QC008	->	->	->	->
194	NI	ELECTRIC HEAT KIT (20KW)	40YA900211	->	->	->	->
		INCLUDES:				States and Balances	Contraction of the second second
195	NI	HEATER ASSY	3-05796-1	•>	->	->	->
		INCLUDES:			10		1
196	NI	ELEMENT ASSY	(4) 2-05556-010	(4) ->	(4) ->	(4) ->	(4) ->
197	NI	CONTROL PANEL	2-05773-5	•>	->	->	->
198	NI	CIRCUIT BREAKER BOX ASSY	2-05805-2	->	->	->	->
Section 1		INCLUDES:	a sugar an ang ang ang ang				1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -
199	NI	CIRCUIT BREAKER	(2) HH83ZC007	(2) ->	(2) ->	(2) ->	(2) ->
200	NI	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001	->	->	->	->
201	NI	LIMIT SWITCH	HH12HV145	->	->	->	->
202	N	LIMIT SWITCH	HH19ZA940	->	->	->	->
203	NI	LIMIT SWITCH	HH19ZA940	->	->	->	->
204	NI	SEQUENCER	HN67QG005	->	->	->	->



Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.







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1	13	Carton anno seatting	40YR030-300	40YF	R030-300AJ	40	/R030-300CG	40	R030-300CS	40	YR030-700
ITEM		PART DESCRIPTION	208/230-1-60	200	8/230-1-60	. 2	08/230-1-60	2	08/230-1-60	prost in	230-1-50
		ACCESSORY GROUP (CONT'D)									
205	NI	ELETRIC HEAT KIT (15KW)	40YA900171	2 P. P. B. P. Manual C.		and the state	->	San	-> ->	na an a	server a state of the server o
Section.		INCLUDES:	en per ser en ser e		general and the second second			and the second	Charles and space and		
206	NI	HEATER HEATER ASSY	3-05791-2	and the second second	->		->		->		•>
		INCLUDES:					States & States			Sec. The	and the second second
207	NI	ELEMENT ASSY	(3) 2-05556-010	(3)	->	(3)	->	(3)	->	(3)	->
208	NI	CONTROL PANEL	2-05773-4		->		-> .		->		->
209	NI	FUSE BOX ASSY	2-05804-3		->		->	1	->	- Section of the	->
125		INCLUDES:	and the second		1.	a Calence	No.			1.1	
210	NI	FUSE	(2) FRN-R30	(2)	->	(2)	->	(2)	->	(2)	->
211	NI	FUSE	(2) FRN-R60	(2)	->	(2)	->	(2)	->	(2)	->
212	NI	FUSE BLOCK	HY11UM461		->	T	->	-	->		->
213	NI	LIMIT SWITCH	(3) HH19ZA930	(3)	->	(3)	->	(3)	->	(3)	->
214	NI	SEQUENCER	HN67QG005		->		->		->		->
215	NI	ELECTRIC HEAT KIT (20KW)	40YA900221	1910	->		->		->	1.6.1	->
1256 (204)	1	INCLUDES:	an a		and a second second second		and the second second second	and the second second			and the second
216	NI	HEATER ASSY	3-05792-2		->		->		->		->
		INCLUDES:									
217	NI	ELEMENT ASSY	(4) 2-05556-010	(4)	->	(4)	->	(4)	->	(4)	->
218	NI	CONTROL PANEL	2-05773-5		->		->	1111	->		->
219	NI	FUSE BOX ASSY	2-05804-4	AND	->		->	1000	->	100	-> /0
		INCLUDES:								and the second	and the second
220	NI	FUSE	(4) FRN-R60	(4)	->	(4)	->	(4)	->	(4)	-> %
221	NI	FUSE BLOCK	HY11UM601		->		->		->		->
222	NI	LIMIT SWITCH	HH19ZA940		->		->	and the second	->		->
223	NI	LIMIT SWITCH	HH19JA945		->		->		->	1.1.1	->
224	NI	SEQUENCER	HN67QG005		->		->	-	->	1.1.1.1	->





Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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## FAN COIL

TEN	版	PART DESCRIPTION	40YR036-300	40YR036-300AJ	40YR036-300AL	40YR036-300CG	40YR036-300CS
IIEM		PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60
		CASING GROUP	011000 100				
1		WHAPPER	314860-403				
2			314072-303	->	->	Y Gal	Y
3			Y Y	Ŷ	X	X	X
5		DANEL ASSY INSUL	21/089.702	^	^	A -	->
6		DOOR ASSY LOWER	314900-702				and the survey of
7		DOOR ASSY LIPPER	214000-702		Restances and a		a state and the second second
8		DOOR ASSY FITTING	214001-701		~		
0	-	COIL SUPPORT SIDE	(2) 214058-401	(2)	(2)	(2) ->	(2) ->
10		COIL SUPPORT BEAR	214957-202			->	->
11		BLOWED DECK	214906-402				
12		DIEELISED BAEELE	(2) 21/959 201	(2)	(2)	(2) ->	(2) ->
12			2) 314030-301	(2) ->	(2) ->	->	->
10			314093-402	->			
14			314007-302	->	->	(2)	(2)
16		SPRING	21/969 201	(2) ->	(2) -3	(2) ->	
17			215002 702	->			
18	-	HOUSING BRACKET	31/900-202				.>
10		FRONT BRACKET	V	Y	Y	X	X
20		REAR BRACKET	× ×	X	X	X	X
21		FITTING DOOR CLIP	X	X	X	X	X
22		BREAKER COVER	314981-201	~	~	->	->
23	NI	1060	312250-405			->	
24	-	EXTENSION TUBE SHEET	314893-302		.>	->	.>
25		SUPPORT COIL	(2) 314894-202		(2)	->	(2) ->
26		BRACKET TXV	X	X	X	X	X
27		BRACKET TXV	X	X	X	X	X
28	-	BRACKET TOP COIL	316821-701	~	~	->	->
20		SHIELD HEAT	315025-402				
30	NI	GROMMET	31/086-201			.>	
31	NI	GROMMET	314087.201				
32	1	COIL BRACKET	X	Y Y	Y	X	x
33		COIL BRACKET	X	X X	X X	X	X
34		COIL BRACKET	× ×	X	X	X	X
35		FILTER PLATE	× ×	X	X Y	X	X
36		CHANNEL COND	316808-301	Y Y	X	X	X
37	NI	DRAIN FITTING	316809-201	~	-	->	->
38	NI	DBAIN FITTING	316800-202				
30	1	DRIP BAFFI F	¥	Y	Y	X	X
00		ELECTRICAL GROUP	~				
41		TRANSFORMER	HT01BD208			· · · ·	
42		PRINTED CIRCUIT BOARD	HK61GA001			->	->
43		GROUND LUG	HY90A7021			->	->
44		LOW VOLTAGE TERM BOX	3-05772			->	->
45		FUSE	ATC5	->	.>	.>	->
		FAN AND MOTOR GROUP	, in oo		Contraction of the local division of the loc		
46		BLOWER ASSY (COMPLETE)	316804-754	· · · ·	.>	->	->
		INCLUDES:					
47	1	HOUSING ASSY	316803-753	->	.>	->	->
48		BLOWER WHEEL	LA22BA100	.>	.>	->	->
49		MOTOR.FAN	HC41AE200	->		->	->
50	+	CAPACITOR	P291-1003			->	.>
51	1	PROTECTIVE BOOT	P281-0002			->	->
52	1	STRAP.CAPACITOR	P281-0022	.>	.>	->	.>
53	1	ARM MOTOR MOUNT	(3) HC9877252	(3) ->	(3) ->	(3) ->	(3) ->
54	1	BAND MTR MOUNT	P251-0078	->	->	->	->
55	1	GROMMET	(3) P251-0079	(3) ->	(3) ->	(3) ->	(3) ->

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Note: See "Catalog Notes " on last page for explanation of symbolism.

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40YR/YRM

SIZE: 018-060

SERIES: 0



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### DIRECT EXPANSION IC FAN COILAR

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40YR036-300CG 40YR036-300CS 40YR036-300AL PART DESCRIPTION \$ 64.89 40YR036-300 40YR036-300AJ ITEM 208/230-1-60 208/230-1-60 208/230-1-60 208/230-1-60 208/230-1-60 COIL AND PIPING GROUP COIL ASSY (COMPLETE) 316822-752 AM -> 11 1 -> 56 -> -> INCLUDES: VALVE THERMO EXPANSION X X X 57 X X DISTRIBUTOR 58 EA08QD006 -> -> -> -> X CONDENSATE TROUGH X х X 59 X CONDENSATE ASSY X X X 60 X X X x 61 CONDENSATE TROUGH X X 62 CONDENSATE PAN SHIELD 314925-302 -> -> -> -> 63 CONDENSATE PAN 314866-402 -> -> -> -> X 64 CONDENSATE PAN X X X X (2) LF39RZ021 (2) (2) (2) 65 PLUG, PLASTIC (2) -> -> -> -> 66 NI RETAINER AU35QA272 -> -> -> -> NI PISTON -> 67 **FA52PH078** -> -> -> NI PISTON BODY 68 300497-201 -> -> -> -> 69 NI STRAINER KH11HH066 -> -> -> -> ELECTRIC HEAT GROUP 3-05802-2 3-05802-1 HEATER ASSY (COMPLETE) 3-05791-1 3-05792-1 70 X INCLUDES: (2) 2-05556-009 71 NI ELEMENT ASSY X 2-05556-010 (4) (2) (3) -> -> 2-05773-6 72 NI CONTROL PANEL 2-05773-4 2-05773-5 -> X (2) HH19ZA950 (2) 73 NI LIMIT SWITCH HH19ZA940 х (3) HH19ZA930 -> HH19ZA940 X 74 NI LIMIT SWITCH X X X LIMIT SWITCH HH12HV145 X X 75 NI X X HN67QC006 76 NI SEQUENCER HN67QG005 -> X -> 77 NI PLUG HOUSING X HY06AM012 -> -> -> X X 78 FUSE BOX ASSY (COMPLETE) X 2-05804-1 2-05804-2 INCLUDES: X X 79 NI COVER, FUSE X 2-05784 80 NI FUSE X FRN-R20 NON-20 X X X FUSE **NON-20** X 81 NI X -> HY11UM601 X X 82 NI FUSE BLOCK X HY11UM461 FILTER GROUP х FILTER RACK ASSY X X 83 X Х INCLUDES: FILTER 315914-402 84 -> -> -> -> X 85 **GRILLE FILTER** X X X х X X FILTER RACK 86 X X X X X 87 RETAINER FILTER X X X ACCESSORY GROUP NI TWO SPEED RELAY 40YA900351 88 -> -> -> -> INCLUDES: 89 NI RELAY 2 SPEED HN61PJ024 -> -> -> -> 90 NI TIME DELAY RELAY 40YA900361 -> -> -> -> INCLUDES: NI RELAY, TIME DELAY HN67GJ002 91 -> -> -> -> 92 NI DISCONNECT KIT 40YA900371 -> -> -> -> INCLUDES: 93 NI DISCONNECT ASSY 2-05896-1 -> -> -> -> 94 NI DISCONNECT HR61ZZ001 -> -> -> -> 95 NI DISCONNECT HR61ZZ002 -> -> -> -> LATENT CAPACITY CONTROL 40YA900381 -> 96 NI -> -> -> INCLUDES: 97 NI SWITCH, HUMIDISTAT 3-05464 -> -> -> -> 98 NI RELAY, TWO SPEED HN61PJ024 -> -> -> -> 99 NI ELECTRIC HEAT KIT (5 KW) 40YA900051 -> -> -> -> INCLUDES NI ELEMENT ASSY "SEE HEAT SECT" 3-05789-2 100 -> -> -> -> NI ELECTRIC HEAT KIT (8KW) 40YA900081 -> 101 -> -> -> INCLUDES: 102 NI ELEMENT ASSY "SEE HEAT SECT" 3-05802-1 4 -> -> -> ->

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Note: See "Catalog Notes " on last page for explanation of symbolism.



## 40YR/YRM SIZE: 018-060 SERIES: 0

1 1400	9.	STATUS	140YR036-300	40YR036-300AJ	40YR036-300AL	40YR036-300CG	40YR036-300CS
ITEM	3.	PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60
		ACCESSORY GROUP (CONT'D)					
103	NI	ELECTRIC HEAT KIT (10KW)	40YA900101		Service Providence	-> 04	a fair the part of
		INCLUDES:	+				and the state of the second second
104	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05802-2	->	->	->	->
105	NI	ELECTRIC HEAT KIT (15KW)	40YA900151	>	->	->	->
		INCLUDES:			and the second	1	
106	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05791-1	->	->	-> FGCP	->
107	NI	ELECTRIC HEAT KIT (20KW)	40YA900201	>	->	->	
100		INCLUDES:	0.05700.4		and the second	and the second	
108	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05/92-1	->	->	->	
109	INI	INCLUDES.	401A900301	->	->	->	
110	NI	HEATED ASSY	2 05901 1				
110		INCLUDES:	3-03001-1	->	->		
111	NI	FI FMENT ASSY	(3) 2.05556.008	(2)	(2)	(2)	(2)
112	NI	CONTROL PANEL	2-05772-4				
113	NI	LIMIT SWITCH	(3) HH107A020	(3)	(2)	/3)	(3)
114	NI	SEQUENCER	HN670G005	101 -2	101 -2	10/ ->	
115	NI	FLECTRIC HEAT KIT (15KW)	4074900311				
1.0		INCLUDES:	4017300311		1		
116	NI	HEATER ASSY	3-05801-2		->	->	
		INCLUDES:	U COOUT E			1	
117	NI	ELEMENT ASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
118	NI	CONTROL PANEL	2-05773-4	->	->	->	->
119	NI	LIMIT SWITCH	(3) HH197A930	(3) ->	(3) ->	(3) ->	(3) ->
120	NI	SEQUENCER	HN67QG005	->	.>	->	->
121	NI	ELECTRIC HEAT KIT (18KW)	X	X	X	X	X
		INCLUDES:					
122	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:	the state of the second second	and the state of the second			and the second
123	NI	ELEMENT ASSY	X	X	X	X	X
124	NI	CONTROL PANEL	X	X	X	X	X
125	NI	LIMIT SWITCH	X	X	X	X	X
126	NI	SEQUENCER	X	X	X	X	X
127	NI	ELECTRIC HEAT KIT (24KW)	X	X	X	X	X
-		INCLUDES:		the second second			
128	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:				a the she when he was a set	Contraction and the second
129	NI	ELEMENT ASSY	X	X	X	X	X
130	NI	CONTROL PANEL	X	X	X	X	X
131	NI	FUSE	X	X	X	X	X
132	NI	LIMIT SWITCH	X	X	X	X	X
133	NI	SEQUENCER	X	X	X	X	X
134	NI	TERMINAL BLOCK	X	X	X	X	X
135	NI	BLOCK	X	X	X	X	X
136	NI	ELECTRIC HEAT KIT (30KW)	X	X	X	X	X
		INCLUDES:		and the second second second			
137	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:					
138	NI	ELEMENT ASSY	X	X	X	X	X
139	N	CONTROL PANEL	X	X	X	X	X
140	N	FUSE	X	· X	X	X	X
141	NI	LIMIT SWITCH	X	X	X	X	X
142	NI		X	X	X	×	X
143	NI		X	X	X	×	X

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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SERIES: 0

TEM	1		40YR036-300	40YR036-300AJ	40YR036-300AL	40YH030-300CG	4011030-30005
ILEM	- 49-5	PART DESCRIPTION	208/230-1-60	208/2:30-1-60	208/230-1-60	208/230-1-00	208/230-1-00
145		ACCESSORY GROUP (CONT'D)	, Y	X	V	V	Var
145	NI	ELECTRIC HEAT KIT (3KW)	r X	X	X. Jan	<b>X</b>	•
4.40	-	INCLUDES:			V N	V	V
140		HEATERASSY	X	X	×	A	<b>^</b>
4.47	-	INCLUDES:					V
14/		ELEMENT ASSY	X	X	×	A	÷
148		LINE SWITCH	X	X	× ×	÷	Ŷ
149			X	X	×	\$	<b>•</b>
150			X	×	× ×	÷	Ŷ
151		CIMIT SWITCH	×	X	+ <u></u>	<b>^</b>	Ŷ
152		DUIC HOUGING	X	X	÷	2	<b>\$</b>
153			×	×	÷	Ŷ	Ŷ
154	INI	ELECTRICHEAT KIT (3KW)	X	×	×	^	<b>^</b>
155	-	INCLUDES:		V		×	V
155		INCLUDES:	×	×	^	<u> </u>	^
150	-	ELEMENT ACOV	v	v	×	v	V
150	NI		X	X	×	÷	Ŷ
15/		CONTROL PANEL	<u>×</u>	×	<u> </u>	÷	Ŷ
158		CIRCUIT BREAKER ASSY	X	X	X	×	^
450	-	INCLUDES:		v		V	v
159			X	X	×	÷	Ŷ
100		ELECTRIC LIEAT KIT (EKAN	λ	×	<u>^</u>	^	^
101		INCLUDES	40YA900061	->	->	->	.,
100	-	INCLUDES:	0.05707.0				
162		HEATER ASSY	3-05/9/-2	->	->	->	.>
100	-	INCLUDES:		and the second		Contraction of the Contraction o	
103	INI	CONTROL DANIEL	2-05556-010	->	->	->	
104		CONTROL PANEL	2-05//3-2	->	->	•>	
105		CIRCUIT BREAKER BOX ASSY	2-05805-1		->	->	.>
100	-	CIDCUIT DDEAKED	100070007			and the second	1000
100		CIRCUIT BREAKER	HH832C007	->	->	.>	*
10/		CIRCUIT BREAKER MOUNTING BASE	HH9422001	->	->	->	
100			40YA900091	->	->	->	.,
100	-	INCLUDES.	0.05000.4			A Contraction	
109		HEATER ASSY	3-05803-1	->	->	->	•>
170	-	INCLUDES:		(0)	(0)	(0)	(0)
170			(2) 2-05556-009	(2) ->	(2) ->	(2) ->	(2) ->
1/1	N	CONTROL PANEL	2-05//3-6	->	->	->	.>
1/2		CIRCUIT BREAKER BOX ASSY	2-05805-1	->	.>	->	.>
170	-	INCLUDES:	1010070100	and the second			
1/3			HH832C007	->	->	->	->
1/4		CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001	->	->	->	->
1/5			(2) HH19ZA001	(2) ->	(2) ->	(2) ->	(2) ->
1/0		SEQUENCER	HN6/QC006	->	->	->	->
1//		ELECTRIC HEAT KIT (10KW)	40YA900111	->	->	->	~
170	+	INCLUDES:				and the second s	and the second
1/8		HEATERASSY	3-05803-2	->	->	->	*>
170	-	INCLUDES:					103
1/9		ELEMENTASSY	(2) 2-05556-010	(2) ->	(2) ->	(2) ·>	(2) ->
180	N	CONTROL PANEL	2-05773-6	->	->	->	->
181	N	CIHCUIT BREAKER BOX ASSY	2-05805-1	->	•>	->	->
100	-		100070007				
182	N		HH832C007	->	->	->	**
183	N	LINE CHICUT BREAKER MOUNTING BASE	HH9422001	->	->	->	->
184	N		(2) HH19ZA950	(2) ->	(2) ->	(2) ->	(4) ->
185	IN	I SEQUENCER	HIND/QC006	*	->	->	->



Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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Note: See "Catalog Notes " on last page for explanation of symbolism.

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### DIRECT EXPANSION IC FAN COILAR



1.	197	SIGNARYON ! JACKS SHORE !	1.4.40YR036-700	00140YR042-300	40YR042-300AJ	40YR042-300AL	40YR042-300CG
TEM	转	PART DESCRIPTION	230-1-50	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60
		CASING GROUP					
1	14	WRAPPER	314860-403	314860-404	100 (Carbo 1997)	-> \\F	->
2		INSULATION	314872-303	314872-304	->	->	->
3		LOWER WRAPPER	X	X	X	X + 1	X
4		INSULATION	X	Cier X	000F3755X 3	X	X
5		PANEL ASSY INSUL.	314988-702	314988-703	->	->	
6		DOOR ASSY LOWER	314989-708	314989-704	->	-> Vica	A4
7		DOOR ASSY UPPER	314990-703	314990-704	->	->	12200-120-5
8		DOOR ASSY FITTING	314991-701	314991-703		->	1630000 St 1 St
9		COIL SUPPORT SIDE	(2) 314958-401	(2) 314958-402	(2)>	(2) ->	(2) ->
10		COIL SUPPORT REAR	314957-202	314957-203	->	->	>
11		BLOWERDECK	314896-403	314896-404		->	->
12		DIFFUSER BAFFUE	(2) 314858-301	(2) ->	(2) ->	(2) ->	(2) ->
13		HEATER PLATE	314895-402	314895-403		->	->
14		TIE ANGLE	314867-302	314867-303		.>	->
15			(2) 6162107	(2)	(2)	(2) ->	(2) ->
10		SPRING	0100107	(2) ->			->
10	-		314000-301	->			+
17	-	FILTER DOOR ASSY	315903-702	315903-703	->	->	
18	-	HOUSING BRACKET	314900-202	314900-203	->	->	->
19	-	FRONT BRACKET	X	X	X	×	<u> </u>
20	-	REAR BRACKET	X	X	X	X	×
21		FITTING DOOR CLIP	X	314999-201	->	->	->
22		BREAKER,COVER	314981-201	•>	->	->	->
23	NI	LOGO	312250-405	->	->	->	->
24		EXTENSION, TUBE SHEET	314893-302	X	X	X	X
25		SUPPORT, COIL	(2) 314894-202	X	X	X	X
26		BRACKET,TXV	X	X	X	X	X
27		BRACKET,TXV	X	X	X	X	X
28		BRACKET, TOP COIL	316821-701	X	X	X	X
29		SHIELD, HEAT	315925-402	315925-401	->	->	->
30	NI	GROMMET	314986-201	314985-301	->	->	->
31	NI	GROMMET	314987-201	->	->	->	->
32		COIL BRACKET	X	X	X	X	X
33		COIL BRACKET	X	(2) 314879-301	->	(2) ->	(2) ->
34		COIL BRACKET	X	(2) 314879-302	->	(2) ->	(2) ->
35	-	FILTER PLATE	X	316242-701	->	->	->
36	+	CHANNEL COND	X	X	X	X	X
37	NI	DRAIN FITTING	216800-201			->	.>
28	NI	DRAIN FITTING	216900 202				->
20	141	DDID BAEELE	310009-202 V	(2) 216924 202	(2)	(2)	(2) ->
39			^	(2) 310034-203	(2)	(2)	(=)
44		TRANSFORMER	LITOIDEOOO	LITOIPDOOR			
41	-		HIUIBE230	HIUIBD208	**		
42	-	PRINTED CIRCUIT BOARD	HK61GA001	->	->	**	
43	-	GROUND LUG	HY90AZ021	->	->	->	
44	-	LOW VOLTAGE TERM.BOX	3-05772	->	->	->	*>
45		FUSE	ATC5	->	->	X	X
		FAN AND MOTOR GROUP					
46		BLOWER ASSY (COMPLETE)	316804-761	316804-755	->	->	->
1.00		INCLUDES:	and the second				
47		HOUSING ASSY	316803-753	316803-754	->	->	->
48		BLOWER WHEEL	LA22RA100	LA22LA034	->	->	->
49		MOTOR,FAN .	HC41AE204	HC41AE200	->	->	•>
50		CAPACITOR	P291-1003	->	->	->	->
51		PROTECTIVE BOOT	P281-0002	->	->	->	->
52		STRAP, CAPACITOR	P281-0022	->	->	->	~
53		ARM MOTOR MOUNT	(3) HC98ZZ252	(3) HC98ZZ244	(3) ->	(3) ->	(3) ->
54		BAND MTR MOUNT	P251-0078	->	->	->	->
55	-	GROMMET	(3) P251-0079	(3)	(3) ->	(3) ->	(3) ->



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Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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5.43		ANTRAS AND ANTRAS	40 40YR036-700	00840YR042-300	40YR042-300AJ	40YR042-300AL	40YR042-300CG
ITEM	182.	PART DESCRIPTION - 1 COM BOS	08-1 230-1-50	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60
		COIL AND PIPING GROUP					
56		COIL ASSY (COMPLETE)	316822-752	316822-754		->	
		INCLUDES:	and the second second	10 K	1 1 1 A	-	V
57		VALVE THERMO EXPANSION	Χ	X	X	X	A
58		DISTRIBUTOR	EA08QD006	EA08QD108	->	->	.>
59		CONDENSATE TROUGH	X	316236-201	->	->	Vigation 1
60		CONDENSATE ASSY	X	316241-703		310241-701	E CERAN S
61		CONDENSATE TROUGH	A 1005 000	310230-204			1241.0.0
62		CONDENSATE PAN SHIELD	314925-302	314925-301	2		->
64		CONDENSATE PAN	314000-402 Y	315007-703		->	· · · · · · · · · · · · · · · · · · ·
65		PLUG PLASTIC	(2) 1 E39B7021	(3) ->	(3) ->	(2) ->	(2) ->
66	NI	RETAINER	ALI350A272		->	->	->
67	NI	PISTON	EA52PH078	EA52PH082	->	->	->
68	NI	PISTON BODY	300497-201	->	->	->	->
69	NI	STRAINER	KH11HH066	->	->	->	->
		ELECTRIC HEAT GROUP					
70		HEATER ASSY (COMPLETE)	X	X	3-05791-1	3-05792-1	3-05802-2
		INCLUDES:	Starting and starting				
71	NI	ELEMENT ASSY	X	X	(3) 2-05556-010	(4) ->	(2) ->
72	NI	CONTROL PANEL	X	X	2-05773-4	2-05773-5	2-05773-6
73	NI	LIMIT SWITCH	X	X	(3) HH19ZA930	HH19ZA940	(2) HH19ZA950
74	NI	LIMIT SWITCH	X	X	X	HH19ZA940	X
75	NI	LIMIT SWITCH	X	X	X	HH12HV145	X
76	NI	SEQUENCER	X	X	HN67QG005	->	HN6/QC006
77	NI	PLUG HOUSING	X	X	HY06AM012	->	->
78	-	FUSE BOX ASSY (COMPLETE)	X	X	2-05804-1	2-05804-2	^
	-	INCLUDES:					
79	NI	COVER,FUSE	X	X	2-05/84	->	
80	N	FUSE	X	X	(2) FRN-R20	(2) NUN-20	× ×
81	N	FUSE	X	X		(2) ->	X
82	N	FUSE BLOCK	X	X	HYTTOM461	HTTOMOUT	<b>^</b>
00		FILTER GROUP	× ×	X	Y	X	X
83	+	INCLUDES:	^	^	^		
04	+	EILTED	215014-402	315914-403	>	->	->
85	+	GRULE ENTER	X	X	X	X	X
86	+	FILTER BACK	X	X	X	X	X
87	+	RETAINER FILTER	X	X	X	X	X
01		ACCESSORY GROUP				Start Barries Start	
88	N	TWO SPEED RELAY	40YA900351	->	->	->	->
		INCLUDES:					
89	N	RELAY 2 SPEED	HN61PJ024	->	->	•>	->
90	N	TIME DELAY RELAY	40YA900361	->	->	->	->
		INCLUDES:					
91	N	RELAY, TIME DELAY	HN67GJ002	->	•>	->	•>
92	N	DISCONNECT KIT	40YA900371	->	->	->	>
		INCLUDES:					
93	N	DISCONNECT ASSY	2-05896-1	->	->	->	->
94	N	DISCONNECT	HR61ZZ001	->	->	*	**
95	N	DISCONNECT	HR61ZZ002	->	->	->	
96	N	LATENT CAPACITY CONTROL	40YA900381	->	->	->	.,
	-	INCLUDES:	0.05404			1	
9/	N	SWITCH, HUMIDISTAT	3-05464	->			
98	IN	HELAY, IWO SPEED	HN61PJ024	-> V	-> Y	X	X
99	IN		401A900051	^	^		
100	N	ELEMENT ASSY "SEE HEAT SECT"	3.05780.2	X	X	X	X
100	N	ELECTRIC HEAT KIT (9KM)	40¥4000081	->	->	->	->
101	11	INCLUDES.	40100001			a management of the	
102	N	FLEMENT ASSY "SEE HEAT SECT"	3-05802-1	->	->	->	->
	- 10 M I				the second se		

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Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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### DIRECT EXPANSION 10 FAN COIL A 1



SERIES: 0

ITEM	a state	PART DESCRIPTION	230-1-50	40YR042-300 208/230-1-60	40YR042-300AJ 208/230-1-60	40YR042-300AL 208/230-1-60	40YR042-300CG 208/230-1-60
		ACCESSORY GROUP (CONT'D)					
103	NI	ELECTRIC HEAT KIT (10KW)	40YA900101	->	•>	->	->
-		INCLUDES:				and the second se	and the second second
104	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05802-2	->	.>	->	.>
105	NI	ELECTRIC HEAT KIT (15KW)	40YA900151	•>	->	->	->
-		INCLUDES:		Section of the		1	
106	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05791-1	->	->	->	-> ->
107	NI	ELECTRIC HEAT KIT (20KW)	40YA900201	•>	>	->	· · · · · · · · · · · · · · · · · · ·
-	-	INCLUDES:	and the second second			the second se	A The Product of the second
108	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05792-1	•>	*	->	7.00 ·>
109	INI	ELETRIC HEAT KIT (9KW)	40YA900301	•>	*>	->	->
-	-	INCLUDES:	N		Charles and the		The second second second second
110	N	HEATER ASSY	3-05801-1	•>	•>	->	->
	-	INCLUDES:					
111	NI	ELEMENTASSY	(3) 2-05556-008	(3) ->	(3) ->	(3) ->	(3) ->
112	NI	CONTROL PANEL	2-05773-4	->	•>	->	->
113	NI	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
114	NI	SEQUENCER	HN67QG005	•>	•>	->	•>
115	NI	ELECTRIC HEAT KIT (15KW)	40YA900311	->	•>	->	->
-	1	INCLUDES:				and the second	
116	NI	HEATER ASSY	3-05801-2	->	•>	->	->
	-	INCLUDES:				Sector Andrews	and a start
117	NI	ELEMENT ASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
118	NI	CONTROL PANEL	2-05773-4	->	•>	->	->
119	NI	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
120	NI	SEQUENCER	HN67QG005	->	•>	->	->
121	NI	ELECTRIC HEAT KIT (18KW)	X	40YA900321	.>	->	•>
-	-	INCLUDES:	Sector Sector Sector	E	Start of Starting	No. 19	
122	NI	HEATER ASSY	X	3-05798-1	->	->	•>
-		INCLUDES:	the second second second	and the second second	- Andrew States		and the second
123	NI	ELEMENT ASSY	X	(6) 2-05556-008	(6) ->	(6) ->	(6) ->
124	NI	CONTROL PANEL	X	3-05782	->	->	•>
125	NI	LIMIT SWITCH	X	(3) HH12HV151	(3) ->	(3) ->	(3) ->
126	NI	SEQUENCER	X	HN67QC007	->	->	->
127	NI	ELECTRIC HEAT KIT (24KW)	X	X	X	X	X
-		INCLUDES:					A Support
128	NI	HEATER ASSY	X	X	X	X	X
-	-	INCLUDES:			and the second		and the second sec
129	NI	ELEMENT ASSY	X	X	X	X	X
130	NI	CONTROL PANEL	X	X	X	X	X
131	NI	FUSE	X	X	X	X	X
132	NI	LIMIT SWITCH	X	X	X	X	X
133	NI	SEQUENCER	X	X	X	X	X
134	NI	TERMINAL BLOCK	X	X	X	X	X
135	NI	BLOCK	X	X	X	X	X
136	NI	ELECTRIC HEAT KIT (30KW)	X	X	X	X	X
	-	INCLUDES:	The second second in	March March 199		1 de la compañía de l	a and a thought
137	NI	HEATER ASSY	X	X	X	X	X
- Antonio		INCLUDES:	and the second second	and the second se	and the set of the set of the set of the		
138	NI	ELEMENT ASSY	X	X	X	X	X
139	NI	CONTROL PANEL	X	· X ·	X	X	X
140	NI	FUSE	X	X	X	X	X
141	NI	LIMIT SWITCH	X	X	X	X	X
142	NI	SEQUENCER	X	X	X	X	X
143	NI	TERMINAL BLOCK	X	X	X	X	X
144	N	BLOCK	X	X	X	X	X



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Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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## DIRECT EXPANSION

## FAN COLLAR

1:23	SE	1 40 FREME-SCHALL 1 402 FRMAZE	40YR036-700	40YB042-300	40YR042-300AJ	40YR042-300AL	40YR042-300CG
ITEM	である	PART DESCRIPTION	230-1-50	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60
Lit.Aurotati		ACCESSORY GROUP (CONT'D)					
145	NI	ELECTRIC HEAT KIT (3KW)	X	X	0100HA X 1	X 910 3	XELEX
140		INCLUDES:	1		a second s		n Paul Julie
146	NI	HEATER ASSY	X	X	X	X	X
1.10		INCLUDES:			State Art State	¥1725 173	the second second second
147	NI	ELEMENT ASSY	X	X	X	X	A CONTRACT Y
148	N	CONTROL PANEL	< X	X	CHARGE X	UT A X HAR CO	1997 - 1997 - 1997 - 1997 - 1997
149	NI	LIMIT SWITCH	X	X	CSDORA X	X	- AND XI WE TO
150	NI	LIMIT SWITCH	X	X	X	X	Takit X
151	NI	LIMIT SWITCH	< · X	X	X	Our DX Const	X AFF.
152	NI	SEQUENCER	X	X	X	X	A SHALL X
153	NI	PLUG HOUSING	X	X	X	X	X
154	NI	FLECTRIC HEAT KIT (3KW)	X	X	X	X	X
154	1	INCLUDES:					A CONTRACTOR OF A CONTRACTOR
155	NI	HEATER ASSY	X	X	X	X	X
100	1	INCLUDES:			A statement and a statement	The second second	
156	NI	ELEMENT ASSY	X	X	X	X	X
157	NI	CONTROL PANEL	X	X	X	X	X
158	NI	CIBCLUT BREAKER ASSY	X	X	X	X	X
1.50	1	INCLUDES:	~				,
150	NI	CIRCUIT BREAKER	¥	X	X	X	X
160	NI	CIRCUIT BREAKER MOUNTING BASE	X	X	X	X	-X
161	NI	ELECTRIC HEAT KIT (5KWA	407400061	X	X	X	X
101	INI	INCLUDES:	4017300001	A		and the second state of the second second	
160	NI	HEATED ASSY	2.05707.2	Y	X	X	X
102	INI	INCLUDES	3-03/3/-2	^	^		and the second second
160	NI	ELEMENT ASSY	2.05556.010	Y	X	X	X
103	INI NI		2-05550-010	× ×	X	X	X
104		CIDCUIT RDEAKED DOX ASSY	2-05/73-2	Ŷ	Y	X	X
100	INI	INCLUDES:	2-0000-1	^	^		
100	-	INCLUDES.	LU927C007	v	Y	X	X
100	INI	CIRCUIT DREAKER MOUNTING PASE		Ŷ	X	X	X
10/		CIRCUIT BREAKER MOUNTING BASE	10VA000001	Ŷ	× ×	X	X
100	INI	INCLUDES:	401A900091	<b>^</b>	^		
100	-	INCLUDES:	0.05000.4	V	×	Y	X
169		HEATER ASSY	3-05803-1	^	^	^	1
170	-	INCLUDES:		V	v	Y	X
170	INI		(2) 2-05555-009	×	× ×	Y	X
1/1	NI	CONTROL PANEL	2-05//3-6	×	- <u> </u>	× ×	X
1/2	INI	CIRCUIT BREAKER BOX ASSY	2-05805-1	×	^	^	
	-	INCLUDES:	100070007		v	Y	X
1/3	N	CIRCUIT BREAKER	HH832C007	×	÷	Y	X
1/4	INI	CIRCUIT BREAKER MOUNTING BASE	HH9422001	A	×	Y	X
1/5	IN	LIMIT SWITCH	(2) HH19ZA001	×	Ŷ	X	X
1/6	IN	SEQUENCER	HN6/QC006	×	^	~	
11/		ELECTRIC HEAT KIT (10KW)	40YA900111	->	•>		The second second
	-	INCLUDES:				-	
1/8	IN	HEATER ASSY	3-05803-2	->	.>		
-	-	INCLUDES:		10	(0)	(2)	(2)
179	N	ELEMENTASSY	(2) 2-05556-010	(2) ->	(2) ->		14
180	N	CONTROL PANEL	2-05773-6	->	->	**	.,
181	N	CIRCUIT BREAKER BOX ASSY	2-05805-1	->	->	->	.,
	-	INCLUDES:					
182	N	CIRCUIT BREAKER	HH83ZC007	->	->	->	
183	N	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001	->	->	->	(2)
184	N	LIMIT SWITCH	(2) HH19ZA950	(2) ->	(2) ->	->	(4) ->
1 185	IN	SEQUENCER	HN67QC006	->	->	->	.>

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Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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ARM)REF.A 1.8/ 40YR036-700 40YR042-300 00 40YR042-300AJ 40YR042-300AL 40YR042-300CG 35-640FFF 85 ITEM PART DESCRIPTION 208/230-1-60 208/230-1-60 230-1-50 208/230-1-60 208/230-1-60 ACCESSORY GROUP (CONT'D) 186 NI ELECTRIC HEAT KIT (15KW) 40YA900161 -> --> -> -> INCLUDES: NI HEATER ASSY 187 3-05795-1 -> -> -> -> INCLUDES: 188 NI ELEMENT ASSY (3) 2-05556-010 (3) (3) (3) (3) -> -> -> -> 189 NI CONTROL PANEL 2-05773-4 -> -> -> -> 190 NI CIRCUIT BREAKER BOX ASSY 2-05805-2 -> -> -> -> INCLUDES: 191 NI CIRCUIT BREAKER (2) HH83ZC007 (2) -> (2) -> (2) -> (2) -> 192 NI LIMIT SWITCH HH19ZA930 (3) (3) (3) (3) -> (3) -> -> -> 193 NI SEQUENCER HN62QC008 -> -> -> -> 194 NI ELECTRIC HEAT KIT (20KW) 40YA900211 -> -> -> -> INCLUDES: 195 NI HEATER ASSY 3-05796-1 -> -> -> -> INCLUDES: ELEMENT ASSY 196 NI (4) 2-05556-010 (4) (4) (4) (4) -> -> -> -> 197 NI CONTROL PANEL 2-05773-5 -> -> -> -> CIRCUIT BREAKER BOX ASSY 198 NI 2-05805-2 -> -> -> -> INCLUDES: CIRCUIT BREAKER 199 NI (2) HH83ZC007 (2) (2) (2) (2) -> -> -> -> 200 NI **CIRCUIT BREAKER MOUNTING BASE** HH94ZZ001 -> -> -> -> 201 NI LIMIT SWITCH HH12HV145 -> -> -> -> 202 NI LIMIT SWITCH HH19ZA940 -> -> -> -> 203 NI LIMIT SWITCH HH197A940 -> -> -> -> NI 204 SEQUENCER HN67QG005 -> -> -> -> NI ELETRIC HEAT KIT (15KW) 205 40YA900171 -> -> -> -> INCLUDES: NI 206 HEATER HEATER ASSY 3-05791-2 -> -> .> -> INCLUDES: 207 ELEMENT ASSY NI (3) 2-05556-010 (3) (3) (3) (3) -> -> -> -> 208 NI CONTROL PANEL 2-05773-4 -> -> -> -> FUSE BOX ASSY NI 209 2-05804-3 -> -> -> -> INCLUDES: 210 NI FUSE FRN-R30 (2) (2) (2) -> (2) -> -> (2) -> 211 NI FUSE FRN-R60 (2) (2) (2) (2) (2) -> -> -> -> 212 NI FUSE BLOCK HY11UM461 -> -> -> -> 213 LIMIT SWITCH NI (3) HH19ZA930 (3) (3) (3) (3) -> -> -> -> 214 NI SEQUENCER HN67QG005 -> -> -> -> 215 NI ELECTRIC HEAT KIT (20KW) 40YA900221 -> -> -> -> INCLUDES: 216 NI HEATER ASSY 3-05792-2 -> -> -> -> INCLUDES: 217 NI ELEMENT ASSY (4) 2-05556-010 (4) (4) (4) (4) -> -> -> -> 218 NI CONTROL PANEL 2-05773-5 -> -> -> -> 219 NI FUSE BOX ASSY 2-05804-4 -> -> -> -> INCLUDES: 220 NI FUSE (4) FRN-R60 (4) -> (4) -> (4) -> (4) -> 221 NI FUSE BLOCK HY11UM601 -> -> -> -> 222 NI LIMIT SWITCH HH19ZA940 -> -> -> -> 223 NI LIMIT SWITCH HH19JA945 -> -> -> -> 224 NI SEQUENCER HN67QG005 -> -> -> ->



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Note: See "Catalog Notes " on last page for explanation of symbolism.



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SELEXAN 40YR048-300AL 40YR048-300CG 40YR042-700 40YR048-300 40YR048-300AJ PART DESCRIPTION TEM 208/230-1-60 208/230-1-60 208/230-1-60 208/230-1-60 230-1-50 CASING GROUP -> 111 30 1 WRAPPER 314860-404 -> -> -> 2 INSULATION 314872-304 -> -> -> -> 3 LOWER WRAPPER X X X X 4 INSULATION x X X X X PANEL ASSY INSUL 5 314988-703 -> -> -> -> DOOR ASSY LOWER 6 314989-704 -> -> -> -> 7 DOOR ASSY UPPER 314990-704 -> -> -> -> 8 DOOR ASSY FITTING 314991-703 -> -> -> -> (2) (2) 9 COIL SUPPORT SIDE (2) 314958-402 (2) -> (2) -> -> -> 10 COIL SUPPORT REAR 314957-203 -> -> -> -> 11 **BLOWER DECK** 314896-404 -> -> -> -> 12 **DIFFUSER BAFFLE** (2) 314858-301 (2) -> (2) -> (2) -> (2) -> 13 HEATER PLATE 314895-403 -> -> -> -> 14 TIE ANGLE 314867-303 -> -> -> -> 15 **GROMMET NUT** (2) 61631D7 (2) (2) (2) (2) -> -> -> -> 16 SPRING 314868-301 -> -> -> -> 17 FILTER DOOR ASSY 315903-703 -> -> -> -> 18 HOUSING BRACKET 314900-203 -> -> -> -> FRONT BRACKET X X 19 X Х X 20 REAR BRACKET X X X X X FITTING DOOR CLIP 21 314999-201 -> -> -> -> 22 BREAKER, COVER 314981-201 -> -> -> -> LOGO 23 NI 312250-405 -> -> -> -> EXTENSION, TUBE SHEET X X X 24 X X 25 SUPPORT, COIL X X X X X BRACKET,TXV 26 X X X X X 27 BRACKET, TXV X X X X X 28 BRACKET, TOP COIL X X X X X 29 SHIELD, HEAT 315925-401 -> -> -> -> 30 NI GROMMET 314985-301 -> -> -> -> NI GROMMET 31 314987-201 -> -> -> -> COIL BRACKET X 32 X X X X COIL BRACKET 33 (2) 314879-301 (2) (2) (2) -> -> -> -> COIL BRACKET 34 314879-302 (2) -> (2)(2) -> (2) -> -> FILTER PLATE X X 35 X X X 36 CHANNEL COND X X X Х Х 37 **DRAIN FITTING** NI 316809-202 -> -> -> -> 38 NI DRAIN FITTING 316809-201 -> -> -> -> 39 DRIP BAFFLE (2) (2) 316834-203 (2) (2) -> -> -> ELECTRICAL GROUP 41 TRANSFORMER HT01BF230 HT01BD208 -> -> -> PRINTED CIRCUIT BOARD 42 HK61GA001 -> -> -> -> 43 **GROUND LUG** HY90AZ021 -> -> -> -> 44 LOW VOLTAGE TERM.BOX 3-05772 -> -> -> -> 45 FUSE X ATC5 -> -> -> FAN AND MOTOR GROUP 46 **BLOWER ASSY (COMPLETE)** 316804-756 316804-762 -> -> -> INCLUDES: 47 HOUSING ASSY 316803-754 -> -> -> -> 48 **BLOWER WHEEL** LA22LA034 -> -> -> -> 49 MOTOR, FAN HC41AE205 HC45AE202 -> -> -> 50 CAPACITOR P291-1003 P291-1503 -> -> -> 51 PROTECTIVE BOOT P281-0002 -> -> -> -> 52 STRAP, CAPACITOR P281-0022 -> -> -> -> 53 ARM MOTOR MOUNT (3) (3) (3) HC98ZZ244 (3) (3) -> -> -> -> 54 BAND MTR MOUNT P251-0078 -> -> -> -> (3) 55 (3) GROMMET (3) (3) -> (3) P251-0079 -> -> ->

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Note: See "Catalog Notes " on last page for explanation of symbolism.

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12	1,00	state to the patients is	40YR042-700	40YR048-300	40YR048-300AJ	40YR048-300AL	40YR048-300CG
ITEM	8.	PART DESCRIPTION	230-1-50	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-00
_		COIL AND PIPING GROUP					and the second s
56		COIL ASSY (COMPLETE)	316822-754	316822-755	and the second		• • • •
-	-	INCLUDES:				1 1998 1997 V 2.154	1. 1. 1. V
57	+	VALVE THERMO EXPANSION	X	X	×	A	<u>^</u>
58	+	DISTRIBUTOR	EA08QD108	EA08QD008	->	~ ~	
59	-	CONDENSATE TROUGH	316236-201	->	*>	The second second	
60		CONDENSATE ASSY	316241-/01	->	->	The second se	And the second second second
60		CONDENSATE DAN SHIELD	310230-204	->	(2) ->		
62		CONDENSATE PAN SHIELD	314925-301	.>		The second second	
64		CONDENSATE PAN	314000-403				
65		PLUG PLASTIC	(2) LE20B7021	-3	(3)	(3) ->	(3) .>
66	NI	RETAINER	AL 1350A 272	10/ ->			
67	NI	PISTON	FA52PH082	E452PH084	->	.>	.>
68	NI	PISTON BODY	300497-201	ENOLTHOOT	->	.>	.>
69	NI	STRAINER	KH11HH066		->	->	
		ELECTRIC HEAT GROUP	14111111000				
70		HEATER ASSY (COMPLETE)	X	X	3-05791-1	3-05792-1	3-05802-2
10		INCLUDES:	~				
71	NI	FLEMENT ASSY	X	X	(3) 2-05556-010	(4) ->	(2) ->
72	NI	CONTROL PANEL	X	X	2-05773-4	2-05773-5	2-05773-6
73	NI	LIMIT SWITCH	X	X	(3) HH197A930	HH19ZA940	(2) HH19ZA950
74	NI	LIMIT SWITCH	X	X	X	HH19ZA940	X
75	NI	LIMIT SWITCH	X	X	X	HH12HV145	X
76	NI	SEQUENCER	X	X	HN67QG005	->	HN67QC006
77	NI	PLUG HOUSING	X	X	HY06AM012	.>	->
78	1	FUSE BOX ASSY (COMPLETE)	X	X	2-05804-1	2-05804-2	X
		INCLUDES:	A Star Barrier				
79	NI	COVER.FUSE	X	X	2-05784	->	X
80	NI	FUSE	X	X	(2) FRN-R20	(2) NON-20	X
81	NI	FUSE	X	X	(2) NON-20	(2) ->	X
82	NI	FUSE BLOCK	X	X	HY11UM461	HY11UM601	X
		FILTER GROUP		a substanting states of the second			
83		FILTER RACK ASSY	X	X	X	X	X
		INCLUDES:					
84		FILTER	315914-403	->	->	->	.>
85		GRILLE FILTER	X	X	X	X	X
86		FILTER RACK	X	X	X	X	X
87		RETAINER FILTER	X	X	X	X	X
		ACCESSORY GROUP					
88	NI	TWO SPEED RELAY	40YA900351	->	->	->	.>
		INCLUDES:					
89	NI	RELAY 2 SPEED	HN61PJ024	->	->	->	->
90	NI	TIME DELAY RELAY	40YA900361	.>	->	->	*
		INCLUDES:		and the second			1.1.1 A. 27
91	NI	RELAY, TIME DELAY	HN67GJ002	->	->	->	->
92	NI	DISCONNECT KIT	40YA900371	->	->	.>	*
	-	INCLUDES:					
93	NI	DISCONNECT ASSY	2-05896-1	->	->	->	>
94	NI	DISCONNECT	HR61ZZ001	->	->	->	->
95	NI	DISCONNECT	HR61ZZ002	->	->	->	->
96	NI	LATENT CAPACITY CONTROL	40YA900381	>	->	->	->
	-	INCLUDES:					
97	N	SWITCH, HUMIDISTAT	3-05464	->	•>	->	->
98	N	HELAY, TWO SPEED	HN61PJ024	->	->	->	*>
99	N	ELECTRIC HEAT KIT (5 KW)	40YA900051	X	X	X	X
-	-	INCLUDES:	1				
100	N	ELEMENT ASSY "SEE HEAT SECT"	3-05789-2	X	X	X	X
101	N	ELECTRIC HEAT KIT (8KW)	X	40YA900081	->	->	->
-	-	INCLUDES:			a construction of the second		
102	IN	ELEMENT ASSY "SEE HEAT SECT"	X +	3-05802-1	->	->	->

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J. Stat			40YR042-700	40YR048-300	40YR048-300AJ	40YR048-300AL	40YR048-300CG
ITEM		PART DESCRIPTION	230-1-50	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60
		ACCESSORY GROUP (CONT'D)				Constant and the second	
103	INI	ELECTRIC HEAT KIT (10KW)	40YA900101		4-1 - A-1	-> -> ->	- telepine dit -> 1 1 mm
1.1.18.04		INCLUDES:	and the second	and the second	the second second second		Accurring a star
104	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05802-2	.>	1	1012 -> 100 Mil	
105	NI	ELECTRIC HEAT KIT (15KW)	40YA900151	1999 1	···>	->	
		INCLUDES:			STREES IN	1	93 1
106	NI	FLEMENT ASSY "SEE HEAT SECT"	3-05791-1			-> 11.Fm	AND AN AND AND AND AND AND AND AND AND A
107	NI	ELECTRIC HEAT KIT (20KW)	40YA900201		1 1.3-10.00-5	->. (CAT-)	APH ( 14.5 1 1 11
107		INCLUDES:	TUTNOODE		1 00.335.85	1	127
108	NI	ELEMENT ASSY "SEE HEAT SECT"	3.05702-1			->	
100	NI	ELETRIC HEAT KIT (9KW)	4074900301		101 - 10 - N		> 55
103	-	INCLUDES:	4017300001			1	and the second second
110	NI	HEATED ASSY	2.05901-1		1 10 10		->
110	141	INCLUDES:	5-05001-1				
111	All	ELEMENT ASSV	(2) 2 05556 009	(2)	(2)	(3)	(3) ->
110	NI	CONTROL DANIEL	(3) 2-05550-000	(3) ->			
112	NU		(2) UU1074000	->	(2)	(2)	(3)
113	NU	SEQUENCED	(3) HHISZASSU	(3) ->	(3) -3	(3)	
114	NI	SEQUENCER	HIND/QGUUS	->	->		
115	INI	ELECTRIC HEAT KIT (15KW)	40TA900311	->	->		
140		INCLUDES:	0.05001.0				
116	INI	HEATER ASST	3-05801-2	->	->		
117		INCLUDES:		(0)	(0)	(0)	(2)
117	NI	ELEMENT ASST	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
118	NI	CONTROL PANEL	2-05//3-4	->	->	->	->
119	NI	LIMITSWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
120	NI	SEQUENCER	HN67QG005	->	->	*	->
121	NI	ELECTRIC HEAT KIT (18KW)	40YA900321	->	->	->	->
-	-	INCLUDES:					
122	N	HEATER ASSY	3-05798-1	->	->	->	->
		INCLUDES:		and the second	the same in the state of the state of the state of the		10
123	NI	ELEMENT ASSY	(6) 2-05556-008	(6) ->	(6) ->	(6) ->	(6) ->
124	NI	CONTROL PANEL	3-05782	•>	->	->	->
125	NI	LIMIT SWITCH	(3) HH12HV151	(3) ->	(3) ->	(3) ->	(3) ->
126	NI	SEQUENCER	HN67QC007	->	->	->	->
127	NI	ELECTRIC HEAT KIT (24KW)	X	40YA900251	->	->	->
		INCLUDES:					P. S. William
128	NI	HEATER ASSY	X	3-05793-1	->	->	->
		INCLUDES:					
129	NI	ELEMENT ASSY	X	(6) 2-05556-009	(6) ->	(6) ->	(6) ->
130	NI	CONTROL PANEL	X	3-05782	->	->	->
131	NI	FUSE	X	(6) FRN-R60	(6) ->	(6) ->	(6) ->
132	NI	LIMIT SWITCH	X	(3) HH12HV151	(3) ->	(3) ->	(3) ->
133	NI	SEQUENCER	X	HN67QC007	->	->	•>
134	NI	TERMINAL BLOCK	X	HY11UC125	->	•>	->
135	NI	BLOCK	X	HY11UM465	->	->	->
136	NI	ELECTRIC HEAT KIT (30KW)	X	40YA900261	•>	->	->
		INCLUDES:					No. 19 No. 19 No. 19
137	NI	HEATER ASSY	X	3-05793-2	*	->	` ->
		INCLUDES:	and the second second	A Constant State of State			
138	NI	ELEMENT ASSY	X	(6) 2-05556-010	(6) ->	(6) ->	(6) ->
139	NI	CONTROL PANEL	X	3-05782	->	->	->
140	NI	FUSE	X	(6) FRN-R60	(6) ->	(6) ->	(6) ->
141	NI	LIMIT SWITCH	۰. X	(3) HH12HV151	(3) ->	(3) ->	(3) ->
142	NI	SEQUENCER	X	HN67QC007	*	->	->
143	NI	TERMINAL BLOCK	X	HY11UC125	*>	->	->
144	NI	BLOCK	X	HY11UM465	->	->	->



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	3	internet i rearrantities i	40YR042-700	40YR048-300	40YR048-300AJ	40YR048-300AL	40YR048-300CG
ITEM	100	PART DESCRIPTION	230-1-50	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60
		ACCESSORY GROUP (CONT'D)					
145	NI	ELECTRIC HEAT KIT (3KW)	X	X	P. # 1 11 X	COX ON A LA	X
	-	INCLUDES:		i.			and the second second
146	NI	HEATER ASSY	Х	X	(	X	X
		INCLUDES:	A CARLES AND A CARL	Rate March 1			the second second
147	NI	ELEMENT ASSY	X	X	X	X	<ul> <li>Answell X and state</li> </ul>
148	NI	CONTROL PANEL	X	X	X	X	A A A AND A
149	NI	LIMIT SWITCH	× X	X	X	X	X
150	NI	LIMIT SWITCH	X	X	X	X	Χ
151	NI	LIMIT SWITCH	X	X	X	X	X
152	NI	SEQUENCER	X	X	X	All X	X
153	NI	PLUG HOUSING	X	X	X	X	X
154	NI	ELECTRIC HEAT KIT (3KW)	X	X	X	X	X
		INCLUDES:			A Service Aller		And And And And
155	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:	a sa				
156	NI	ELEMENT ASSY	X	X	X	X	X
157	NI	CONTROL PANEL	X	X	X	X	X
158	NI	CIRCUIT BREAKER ASSY	X	X	X	X	X
		INCLUDES:					and the second sec
159	NI	CIRCUIT BREAKER	X	X	X	X	X
160	NI	CIRCUIT BREAKER MOUNTING BASE	X	X	X	X	X
161	NI	ELECTRIC HEAT KIT (5KW)	X	X	X	X	X
1.1.1.1		INCLUDES:			and the second second second		All and a second s
162	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:					1
163	NI	ELEMENT ASSY	X	X	X	X	X
164	NI	CONTROL PANEL	X	X	X	X	X
165	NI	CIRCUIT BREAKER BOX ASSY	X	X	X	X	X
		INCLUDES:					
166	NI	CIRCUIT BREAKER	X	X	X	X	X
167	NI	CIRCUIT BREAKER MOUNTING BASE	X	X	X	X	X
168	NI	ELECTRIC HEAT KIT ((8KW)	X	X	X	X	X
		INCLUDES:				1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	
169	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:					
170	NI	ELEMENT ASSY	X	X	X	X	X
171	NI	CONTROL PANEL	X	X	X	X	X
172	NI	CIRCUIT BREAKER BOX ASSY	X	X	X	X	X
		INCLUDES:	and the second second second	a fine of the second second	Contraction and South	and the second	
173	NI	CIRCUIT BREAKER	X	X	X	X	X
174	NI	CIRCUIT BREAKER MOUNTING BASE	X	X	X	X	X
175	NI	LIMIT SWITCH	Χ	X	X	X	X
176	NI	SEQUENCER	X	X	X	X	X



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	1	一点15月4月25日	40YR042-700	40YR048	-300 40YR048-300AJ	40YR048-300AL	40YR048-300CG
ITEN		PART DESCRIPTION	230-1-50	208/230-	1-60 208/230-1-60	208/230-1-60	208/230-1-60
		ACCESSORY GROUP (CONT'D)					
177	NI	ELECTRIC HEAT KIT (10KW)	40YA900111	->	->	>	
	-	INCLUDES:					· · · · · · · · · · · · · · · · · · ·
178	NI	HEATER ASSY	3-05803-2	->	->	->	->
	-	INCLUDES:					additional and a second
179	NI	ELEMENT ASSY	(2) 2-05556-010	(2) ->	(2) ->	(2) ->	(2) ->
180	NI	CONTROL PANEL	2-05773-6	->	× ->	->	
181	NI	CIRCUIT BREAKER BOX ASSY	2-05805-1	->	· · >	->	
	-	INCLUDES:	· · · · ·				$= \int d^{2} d^{2} = - \int d^{2} d^{2} = \int d^{2} $
182	NI	CIRCUIT BREAKER	HH83ZC007	->	->	->	->
183	NI	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001	->	->	->	->
184	NI	LIMIT SWITCH	(2) HH19ZA950	(2) ->	(2) ->	(2) ->	(2) ->
185	NI	SEQUENCER	HN67QC006	->	->	->	.>
186	NI	ELECTRIC HEAT KIT (15KW)	40YA900161	->	->	.>	->
	-	INCLUDES:					
187	NI	HEATER ASSY	3-05795-1	->	->	->	->
	-	INCLUDES:					
188	NI	ELEMENT ASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
189	NI	CONTROL PANEL	2-05773-4	->	->	•>	.>
190	NI	CIRCUIT BREAKER BOX ASSY	2-05805-2	->	->	->	->
	-	INCLUDES:					
191	NI	CIRCUIT BREAKER	(2) HH83ZC007	(2) ->	(2) ->	(2) ->	(2) ->
192	NI	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
193	NI	SEQUENCER	HN62QC008	->	•>	->	->
194	NI	ELECTRIC HEAT KIT (20KW)	40YA900211	->	->	->	->
		INCLUDES:					
195	NI	HEATER ASSY	3-05796-1	->	->	->	->
-		INCLUDES:					Contraction of the second second
196	NI	ELEMENT ASSY	(4) 2-05556-010	(4) ->	(4) ->	(4) ->	(4) ->
197	NI	CONTROL PANEL	2-05773-5	.>	->	•>	->
198	NI	CIRCUIT BREAKER BOX ASSY	2-05805-2	->	->	->	->
		INCLUDES:					-
199	NI	CIRCUIT BREAKER	(2) HH83ZC007	(2) ->	(2) ->	(2) ->	(2) ->
200	NI	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001	->	->	->	->
201	NI	LIMIT SWITCH	HH12HV145	->	->	•>	•>
202	NI	LIMIT SWITCH	HH19ZA940	->	->	->	->
203	NI	LIMIT SWITCH	HH19ZA940	->	->	->	•>
204	NI	SEQUENCER	HN67QG005	->	->	->	->
205	NI	ELETRIC HEAT KIT (15KW)	40YA900171	->	->	->	->
		INCLUDES:					
206	NI	HEATER HEATER ASSY	3-05791-2	->	->	->	->
		INCLUDES:				and the second second second	
207	NI	ELEMENT ASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
208	NI	CONTROL PANEL	2-05773-4	->	->	->	->
209	NI	FUSE BOX ASSY	2-05804-3	->	->	->	->
1.1.1.1		INCLUDES:					
210	NI	FUSE	(2) FRN-R30	(2) ->	(2) ->	(2) ->	(2) ->
211	NI	FUSE	(2) FRN-R60	(2) ->	(2) ->	(2) ->	(2) ->
212	NI	FUSE BLOCK	HY11UM461	->	->	->	->
213	NI	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
214	NI	SEQUENCER	HN67QG005	->	->	->	.>



Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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1.4.3	Ser.	4099B020-00000 1 000 6380	40YR042-700	40YR048-300	40YR048-300AJ	40YR048-300AL	40YH048-300CG
TEM	1	PART DESCRIPTION	230-1-50	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60
		ACCESSORY GROUP (CONT'D)					
215	NI	ELECTRIC HEAT KIT (20KW)	40YA900221	->	->	->	1 (Add 9 -> 1 7
		INCLUDES:		and the second		A State of the second	·····································
216	NI	HEATER ASSY	3-05792-2	->	•>	->	
		INCLUDES:				and the second sec	1997年1月1日日本·
217	NI	ELEMENT ASSY	(4) 2-05556-010	(4) ->	(4) ->	(4) ->	(4) ->
218	NI	CONTROL PANEL	2-05773-5	->	->	->	AN .
219	NI	FUSE BOX ASSY	2-05804-4	->		-> 11/1-11	100 A 10 - 20 - 20 - 20 - 20 - 20 - 20 - 20 -
		INCLUDES:		and the second second		14 <sup>11</sup>	T
220	NI	FUSE	(4) FRN-R60	(4) ->	(4) ->	(4) ->	(4) ->
221	NI	FUSE BLOCK	HY11UM601	->	•>	->	->
222	NI	LIMIT SWITCH	HH19ZA940	->	->	->	->
223	NI	LIMIT SWITCH	HH19JA945	->	->	->	•>
224	NI	SEQUENCER	HN67QG005	->	->	->	•>
225	NI	ELECTRIC HEAT KIT (24KW)	X	40YA900271	->	->	•>
		INCLUDES:			and a support in the second	a state of the second second	Constant Constant of State
226	NI	HEATER ASSY	X	3-05693-3	->	•>	->
		INCLUDES:				and the second	
227	NI	ELEMENT ASSY	X	(6) 2-05556-009	(6) ->	(6) ->	(6) ->
228	NI	CONTROL PANEL	X	3-05782	->	•>	•>
229	NI	FUSE	X	(6) FRN-R60	(6) ->	(6) ->	(6) ->
230	NI	LIMIT SWITCH	X	(3) HH12HV151	(3) ->	(3) ->	(3) ->
231	NI	SEQUENCER	X	HN67QC007	->	->	->
232	NI	TERMINAL BLOCK	X	HY11UC125	->	->	•>
233	NI	BLOCK	X	HY11UM465	->	->	.,
234	NI	ELECTRIC HEAT KIT (30KW)	X	40YA900281	->	->	->
		INCLUDES:		A A STATE AND A STATE OF A STATE	The second second		and the second
235	NI	HEATER ASSY	X	3-05793-4	->	*	->
		INCLUDES:			C. C. States	A State of the second	
236	NI	ELEMENT ASSY	X	(6) 2-05556-010	(6) ->	(6) ->	(6) ->
237	NI	CONTROL PANEL	X	3-05782	->	->	->
238	NI	FUSE	X	(6) FRN-R60	(6) ->	(6) ->	(6) ->
239	NI	LIMIT SWITCH	X	(3) HH12HV151	(3) ->	(3) ->	(3) ->
240	NI	SEQUENCER	X	HN67QC007	•>	*	->
241	N	TERMINAL BLOCK	X	HY11UC125	->	•>	->
242	N	BLOCK	X	HY11UM465	->	->	->





Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.





SERIES: U

10	22	SPORTS I LADESTRONTIN	40YR048-700	40YR060-300	40YR060-300AL	40YR060-300CG	40YR060-700
ITEM	家	PART DESCRIPTION	230-1-50	208/230-1-60	208/230-1-60	208/230-1-50	230-1-50
-		CASING GROUP				241	
1		WRAPPER	314860-404	->	Startin State	129-2 5	
2	$\square$		314872-304	->	*	->	->
3		LOWER WRAPPER	X	X	X	X	×
4		INSULATION	X	X	X	×	
5		PANEL ASSY INSUL.	314988-703	->		->	->
6	·	DOOR ASSY LOWER	314989-704	->	- 11 ->	->	> 2.2
/	$\square$	DOOR ASSY UPPER	314990-704		3-2>. · · ·	-> .	->
8		DOOR ASSY FITTING	314991-703	->	->	->	->
9		COIL SUPPORT SIDE	(2) 314958-402	(2) ->	(2) ->	(2) ->	(2) ->
10	$\square$	COIL SUPPORT REAR	314957-203	->	.>	->	->
11		BLOWER DECK	314896-404	->	->	->	->
12	$\square$	DIFFUSER BAFFLE	(2) 314858-301	(2) ->	(2) ->	(2) ->	(2) ->
13			314895-403	->	->	->	3
14	$\square$		31400/-303	->	->	->	(2)
15	$\square$	SPRING	(2) 01031D7	(2) ->	(2) ->	(2) ->	
10	$\square$		314000-301	->	->		
10		HOUSING BRACKET	315903-703	->	->	->	
10			314900-203	->	->	->	V V
19			X	×	×	× ×	Ŷ
20	$\square$		A 014000 001	^	^	^	^
21	$\vdash$	PREAKED COVED	314999-201	->	->	->	->
22		BREAKER,COVER .	314981-201	->	->	->	
23	NI	LOGO	312250-405	->	->	->	->
24		EXTENSION, TUBE SHEET	X	X	X	X	X
25		SUPPORT, COIL	X	X	X	X	X
26		BRACKET,TXV	X	X	X	X	X
27		BRACKET,TXV	X	X	X	X	X
28		BRACKET, TOP COIL	X	X	X	X	X
29		SHIELD, HEAT	315925-401	->	->	->	->
30	NI	GROMMET	314985-301	->	•>	->	->
31	NI	GROMMET	314987-201	->	->	->	->
32		COIL BRACKET	X	X	X	X	X
33		COIL BRACKET	(2) 314879-301	->	->	->	->
34		COIL BRACKET	(2) 314879-302	->	->	X	->
35		FILTER PLATE	X	X	X	X	X
36		CHANNEL COND	X	X	X	X	X
37	NI	DRAIN FITTING	316809-202	->	->	->	->
38	NI	DRAIN FITTING	316809-201	->	•>	->	->
39		DRIP BAFFLE	(2) 316834-203	(2) 316834-204	(2) ->	(2) ->	(2) ->
		ELECTRICAL GROUP					
41		TRANSFORMER	HT01BF230	HT01BD208	->	->	HT01BF230
42		PRINTED CIRCUIT BOARD	HK61GA001	· · · >	•>	->	->
43		GROUND LUG	HY90AZ021	->	->	->	->
44		LOW VOLTAGE TERM.BOX	3-05772	->	->	->	->
45		FUSE	ATC5	->	•>	->	->
		FAN AND MOTOR GROUP			그는 것이 없어요. 그렇는 것이 아이들 것이다.		And the extent shall be the
46		BLOWER ASSY (COMPLETE)	316804-763	316804-757	*	->	316804-764
N.		INCLUDES:			and the second state of the second	Contraction of the	
47		HOUSING ASSY	316803-754	316803-755	->	->	->
48		BLOWER WHEEL	LA22LA034	LA22LA094	->	->	->
49		MOTOR, FAN	HC45AE203	HC45AE202	•>	->	HC45AE204
50		CAPACITOR	P291-1503	->	.>	->	->
51		PROTECTIVE BOOT	P281-0002	->	->	->	->
52		STRAP, CAPACITOR	P281-0022	->	->	->	->
53		ARM MOTOR MOUNT	(3) HC98ZZ244	(3) HC98ZZ250	(3) ->	(3) ->	(3) ->
54		BAND MTR MOUNT	P251-0078	->	->	->	->
55		GROMMET	(3) P251-0079	(3) ->	(3) ->	(3) ->	(3) ->

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ITEM	Ser .	PART DESCRIPTION	40YR048-700 230-1-50	40YR060-300	40YR060-300AL 208/230-1-60	40YR060-300CG 208/230-1-60	40YR060-700 230-1-50
50			010000 755	016000 756		Allow A There is a	La material La Mail Servi
- 30		INCLUDES:	310022-755	310022-750	· · · · · · · · · · · · · · · · · · ·		2 V 14 200 1
57		VALVE THERMO EXPANSION	Y	Y	X	Maria X and	X
58		DISTRIBUTOR	FA080D008	EA0800114	->	S HATA	a the stand at
59		CONDENSATE TROUGH	316236-201	->		->	->'
60		CONDENSATE ASSY	316241-701	316241-702	A CARLER A	The I shall be a second	. 7
61		CONDENSATE TROUGH	316236-204	316236-202	(2) ->	Section Sector Sector	14 OHAY -> 18
62		CONDENSATE PAN SHIFLD	314925-301	(2) ->	(2) ->	(2) ->	(2) ->
63		CONDENSATE PAN	314880-403		->	>	14 Mar ->
64		CONDENSATE PAN	315907-703		->	->	9
65		PLUG.PLASTIC	(3) LF39BZ021	(3) ->	(3) ->	(2) ->	(3) ->
66	NI	RETAINER	AU350A272	.>	->	->	->
67	NI	PISTON	EA52PH084	EA52PH098	->	->	->
68	NI	PISTON BODY	300497-201	.>	->	->	->
69	NI	STRAINER	KH11HH066	->	->	->	->
		ELECTRIC HEAT GROUP	1				
70		HEATER ASSY (COMPLETE)	X	X	3-05792-1	3-05802-2	X
		INCLUDES:		State of the second		Contractor and the second	
71	NI	ELEMENT ASSY	X	X	(4) 2-05556-010	(2) ->	X
72	NI	CONTROL PANEL	X	X	2-05773-5	2-05773-6	X
73	NI	LIMIT SWITCH	X	X	HH19ZA940	(2) HH19ZA950	<b>X</b>
74	NI	LIMIT SWITCH	X	X	HH19ZA940	X	X
75	NI	LIMIT SWITCH	X	X	HH12HV145	X	X
76	NI	SEQUENCER	X	X	HN67QG005	HN67QC006	X
77	NI	PLUG HOUSING	X	X	HY06AM012	->	X
78	-	FUSE BOX ASSY (COMPLETE)	X	X	2-05804-2	X	X
		INCLUDES:	^	^	200012		
79	NI	COVER FLISE	Y	Y	2-05784	· X	X
80	NI	FLISE	X	X	(2) NON-20	X	X
81	NI	FUSE	Ŷ	× ×	(2) NON-20	X	X
82	NI	FUSE BLOCK	Ŷ	Ŷ	HV1111M601	X	X
02		FIL TER GROUP	^	~	THTTOMOUT		
83		FILTER BACK ASSY	X	X	X	X	X
		INCLUDES:	<u>^</u>	~			
84		FILTER	315914-403		.>	.>	->
85		GRILLE FILTER	X	X	X	X	X
86		FILTER BACK	X	X	X	X	X
87		BETAINER FILTER	X	X	X	X	X
		ACCESSORY GROUP				The second second second	
88	NI	TWO SPEED BELAY	40YA900351				· ->
	1	INCLUDES:		The second second	Charles and Charles		The second second
89	NI	RELAY 2 SPEED	HN61P.1024			.>	->
90	NI	TIME DELAY RELAY	40YA900361			•>	->
	1	INCLUDES:					Contraction of the
91	NI	RELAY, TIME DELAY	HN67G.1002		·. · · · · · · · · · · · · · · · · · ·	->	•>
92	N	DISCONNECT KIT	40YA900371				.>
-	1	INCLUDES:	-			1	
93	NI	DISCONNECT ASSY	2-05896-1	-	No.		·.>
94	NI	DISCONNECT	HR6177001				
95	NI	DISCONNECT	HB6177002				
96	NI	LATENT CAPACITY CONTROL	40YA900381				•>
	1.1	INCLUDES:			Contract Ades	1	
97	NI	SWITCH HUMIDISTAT	3-05464	-		->	.>
08	N	RELAY TWO SPEED	HN61P.1024	-			->
99	N	ELECTRIC HEAT KIT (5 KW)	X	X	X	X	X
	1	INCLUDES:	^	^			
100	N	FLEMENT ASSY "SEE HEAT SECT"	X	Y	X	X	X
101	N	ELECTRIC HEAT KIT (8KW)	40YA900081			->	->
	1	INCLUDES:	1017100001		the state of the state	a state of the second second	
102	N	ELEMENT ASSY "SEE HEAT SECT"	3-05802-1	•>	->	->	.>

Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes." on last page for explanation of symbolism.

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	1	and shares the second second	40YR048-700	40YR060-300	40YR060-300AL	40YR060-300CG	40YR060-700
ITEM		PART DESCRIPTION	230-1-50	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50
		ACCESSORY GROUP (CONT'D)					
103	NI	ELECTRIC HEAT KIT (10KW)	40YA900101		1997 ->	->	->
	1	INCLUDES:	and the second second		<u></u>		
104	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05802-2	->	->	->	->
105	NI	ELECTRIC HEAT KIT (15KW)	40YA900151	->	->	->	->
		INCLUDES:	and the second second	and the second second	1. The second		
106	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05791-1	->	->	->	
107	NI	ELECTRIC HEAT KIT (20KW)	40YA900201	->	->	->	->
-		INCLUDES:					
108	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05792-1	->	*>	->	
109	NI	ELETRIC HEAT KIT (9KW)	40YA900301	->	.,		
		INCLUDES:	0.05001.1		-	->	1
110	NI	HEATER ASST	3-05001-1	->			and the second sec
444	All	ELEMENT ASSY	(2) 2.05556.008	(2)	(3) ->	(3) ->	(3) ->
111	NI		2-05772-4	(3) ->	->	->	->
112	NI		(3) HH1974930	(3) ->	(3) ->	(3) ->	(3) ->
114	NI	SEQUENCER	HN67OG005	->	->	->	->
115	NI	ELECTRIC HEAT KIT (15KW)	4074900311		->	->	->
115		INCLUDES:	4017000011				
116	NI	HEATER ASSY	3-05801-2	->	->	->	->
110	-	INCLUDES:	0 00001 2				a server server and a server
117	N	FLEMENT ASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
118	N	CONTROL PANEL	2-05773-4	->	->	->	->
119	N	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
120	N	SEQUENCER	HN67QG005	->	->	->	->
121	N	ELECTRIC HEAT KIT (18KW)	40YA900321	->	->	->	*>
		INCLUDES:					
122	N	HEATER ASSY	3-05798-1	->	->	•>	->
		INCLUDES:	a survey and the second	and the second	a la construction de la construcción		
123	N	ELEMENT ASSY	(6) 2-05556-008	(6) ->	(6) ->	(6) ->	(6) ->
124	N	CONTROL PANEL	3-05782	•>	->	->	->
125	N	LIMIT SWITCH	(3) HH12HV151	(3) ->	(3) ->	(3) ->	(3) ->
126	N	SEQUENCER	HN67QC007	->	->	*	->
127	N	ELECTRIC HEAT KIT (24KW)	40YA900251	->	->	->	->
-		INCLUDES:					
128	N	HEATER ASSY	3-05793-1	->	->	->	->
2.000	-	INCLUDES:			(0)	(6)	(6)
129	N	ELEMENT ASSY	(6) 2-05556-009	(6) ->	(6) ->	(6) ->	(0) ->
130	N	CONTROL PANEL	3-05782	->	->	->	(6)
131	N	FUSE	(6) FRN-R60	(6) ->	(0) ->	(0) ->	(3) ->
132	N		(3) HH12HV151	(3) ->	(3) ->	(3) ->	
133	IN	JEQUENCER					.>
134	IN	PLOCK	HT110C125	.>	.,		
135	IN		HT110M465	->	.,		->
130	IN	INCLUDES.	401A900201	.,			
197	N	HEATED ASSY	3,05702.2			->	>
13/	1	INCLUDES:	5-05/55-2			and the state of the state	The second second second
138	N	FLEMENT ASSY	(6) 2-05556-010	(6) ->	(6) ->	(6) ->	(6) ->
130	N	CONTROL PANEL	3-05782		->	->	->
140	N	FUSE	(6) FRN-R60	(6) ->	(6) ->	(6) ->	(6) ->
141	N	LIMIT SWITCH	(3) HH12HV151	(3) ->	(3) ->	(3) ->	(3) ->
142	N	SEQUENCER	HN67QC007	->	->	->	->
143	N	TERMINAL BLOCK	HY11UC125	->	->	->	->
144	N	BLOCK	HY11UM465	->	->	->	->

Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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Replacement Components Division

## DIRECT EXPANSION FAN COIL

SIZE: 018-060

40YR/YRM

**SERIES: 0** 

			40YR048-700	40YR060-300	40YR060-300AL	40YR060-300CG	40YR060-700
ITEM		PART DESCRIPTION	230-1-50	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50
		ACCESSORY GROUP (CONT'D)					
145	NI	ELECTRIC HEAT KIT (3KW)	X	X	X	X	X
1100.00		INCLUDES:	Constant of the second		distant and		
146	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:		Sugar States			
147	NI	ELEMENT ASSY	X	X	X	X	X
148	NI	CONTROL PANEL	X	X	X	X	X
149	NI	LIMIT SWITCH	X	X	X	X	X
150	NI	LIMIT SWITCH	X	X	X	X	X
151	NI	LIMIT SWITCH	X	X	X	X	X
152	NI	SEQUENCER	X	X	X	X	X
153	NI	PLUG HOUSING	X	X	X	X	X
154	NI	ELECTRIC HEAT KIT (3KW)	X	X	X	X	X
1.000		INCLUDES:	Tall and a start of			and the second film	
155	NI	HEATER ASSY	X	X	X	X	X
1.50		INCLUDES:	and the second second	and the second second second second			
156	NI	ELEMENT ASSY	X	X	X	X	X
157	NI	CONTROL PANEL	X	X	X	X	X
158	NI	CIRCUIT BREAKER ASSY	X	X	X	X	X
		INCLUDES:				Survey and the second second	N. AND
159	NI	CIRCUIT BREAKER	X	X	X	X	X
160	NI	CIRCUIT BREAKER MOUNTING BASE	X	X	X	X	X
161	NI	ELECTRIC HEAT KIT (5KW)	X	X	X	X	· X
		INCLUDES:	OND CONTRACTOR				10
162	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:	and the second second			and a state of the	and produced in the
163	NI	ELEMENT ASSY	X	X	X	X	X
164	NI	CONTROL PANEL	X	X	X	X	X
165	NI	CIRCUIT BREAKER BOX ASSY	X	X	X	X	X
		INCLUDES:	A State of the second sec	C. C. R. L. Statement I.	C. P. State of the second		
166	NI	CIRCUIT BREAKER	X	X	X	X	X
167	NI	CIRCUIT BREAKER MOUNTING BASE	X	X	X	X	X
168	NI	FLECTRIC HEAT KIT ((8KW)	Y	X	X	X	X
100	1	INCLUDES:			Section 200	The second se	and the second of the
169	NI	HEATER ASSY	Y	X	X	X	X
100		INCLIDES:	~		A A A A A A A A A A A A A A A A A A A		The second second second
170	NI	ELEMENT ASSY	Y	Y	X	X	X
171	NI	CONTROL PANEL	Ŷ	X	X	X	X
172	NI	CIRCUIT BREAKER BOX ASSY	Ŷ	×	X	X	X
112	141	INCLUDES:	^	^			1
172	NI	CIPCI IIT BREAKER	Y	Y	X	X	X
174	NI	CIRCUIT BREAKEP MOUNTING PAGE	Ŷ	Ŷ	Ŷ	Ŷ	X
175	NI	LIMIT SWITCH	Y ···	× ×	Ŷ	Y	X
176	N	SECHENCED	Ŷ	Ŷ	Ŷ	X	X



Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.



### DIRECT EXPANSION FAN COIL



SIZE: 018-060

SERIES: 0

(Consel)			40YR048-700	40YR	060-300	40Y	R060-300AL	40Y	R060-300CG	40	YR060-700
TEM	1	PART DESCRIPTION	230-1-50	208/2	30-1-60	20	8/230-1-60	20	8/230-1-60	-	230-1-50
		ACCESSORY GROUP (CONT'D)				19 A.					•
177	NI	ELECTRIC HEAT KIT (10KW)	40YA900111		->		->	-	•>		->
		INCLUDES:				-	the second second		Contraction of the		Contraction of the second
78	NI	HEATER ASSY	3-05803-2		->	-	->	-	->	-	->
1		INCLUDES:				-				10	
79	NI	ELEMENT ASSY	(2) 2-05556-010	(2)	->	(2)	->	(2)	•>	(2)	->
80	NI	CONTROL PANEL	2-05773-6		->		->	-	->		->
81	NI	CIRCUIT BREAKER BOX ASSY	2-05805-1		->		->		->	-	->
		INCLUDES:								-	
82	NI	CIRCUIT BREAKER	HH83ZC007		->	1	->	-	->	and the second	-7
83	NI	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001		->	10	->	10	->	(2)	->
84	NI	LIMIT SWITCH	(2) HH19ZA950	(2)	->	(2)	->	(2)	->	1(2)	->
85	NI	SEQUENCER	HN67QC006		->		->	-	->	-	->
86	NI	ELECTRIC HEAT KIT (15KW)	40YA900161		•>		->	-	->	-	->
		INCLUDES:				-	Star Charles Starte Street		and the second sec		
87	NI	HEATER ASSY	3-05795-1		->		->		->	-	->
		INCLUDES:				10		(0)		(2)	->
88	NI	ELEMENT ASSY	(3) 2-05556-010	(3)	->	(3)	->	(3)	->	10)	
89	NI	CONTROL PANEL	2-05773-4	-	->		->		->	-	->
90	NI	CIRCUIT BREAKER BOX ASSY	2-05805-2		->		->		->		
_		INCLUDES:						(0)		(2)	
91	NI	CIRCUIT BREAKER	(2) HH83ZC007	(2)	•>	(2)	;->	(2)	->	(2)	
92	NI	LIMIT SWITCH	(3) HH19ZA930	(3)	->	(3)	->	(3)	->	101	
93	NI	SEQUENCER	HN62QC008	and the second	•>	-	->	-	.,	-	
94	NI	ELECTRIC HEAT KIT (20KW)	40YA900211		->		->		•>	-	
		INCLUDES:					And a second second	-		10000	
95	NI	HEATER ASSY	3-05796-1		->		->	-	->		->
_	-	INCLUDES:						14		10	->
96	NI	ELEMENT ASSY	(4) 2-05556-010	(4)	•>	(4)	->	(4)	->	(4)	->
97	NI	CONTROL PANEL	2-05773-5		->	-	->	-	->	-	->
98	NI	CIRCUIT BREAKER BOX ASSY	2-05805-2		->		•>		->	-	->
100	-	INCLUDES:				10				(2)	
99	NI	CIRCUIT BREAKER	(2) HH83ZC007	(2)	->	(2)	->	(2)	->	(2)	->
00	NI	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001	-	->		->	-	->	-	->
01	NI	LIMIT SWITCH	HH12HV145		->		->	-	->		-3
02	NI	LIMIT SWITCH	HH19ZA940		->		->		->		->
03	NI	LIMIT SWITCH	HH19ZA940		->		->		->		->
204	NI	SEQUENCER	HN6/QG005		->		->		->		
205	NI	ELETRIC HEAT KIT (15KW)	40YA900171		->		->			-	
	-	INCLUDES:	0.05704.0					-		-	->
06	NI	HEATER HEATER ASSY	3-05/91-2		->		->	-			-
	-	INCLUDES:	(0) 0.055550.010	(0)		(2)		(3)		(3)	->
10	INI	CONTROL DANE!	(3) 2-05556-010	(3)	->	13)		131	->		->
80	INI	CUNTHOL PANEL	2-05//3-4		->	-					->
:09	INI	FUSE BOX ASSY	2-05804-3		.>		.,	100.50		1	
	-	INCLUDES:		(0)		(2)		(2)	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	(2)	->
10	INI	FUSE	(2) FHN-H30	(2)	->	(2)	.>	(2)		(2)	
11	INI		(2) FHN-HOU	(2)	->	(2)	.>	12		12	->
12	N	FUSE BLOCK	HY11UM461	(0)	->	(2)	->	(2)		(3)	
213	IN	LIMITSWITCH	(3) HH19ZA930	(3)	->	(3)	->	13		10	



Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.



Replecement Components Division

### DIRECT EXPANSION FAN COIL

40YR/YRM

SIZE: 018-060

**SERIES: 0** 

1.03			40YR048-700	407	R060-300	40)	18060-300AL	404	R060-300CG	40	YR060-700
ITEM		PART DESCRIPTION	230-1-50	208	/230-1-60	2	08/230-1-60	20	08/230-1-60	1.1.1	230-1-50
		ACCESSORY GROUP (CONT'D)					Sector States				
215	NI	ELECTRIC HEAT KIT (20KW)	40YA900221	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	->		->	1.1.1	->		->
	1	INCLUDES:	and the second second	1000							Sector Sector
216	NI	HEATER ASSY	3-05792-2	and the second second	->		->		->		->
	1	INCLUDES:			Section Constants	1.1				a state	
217	NI	ELEMENT ASSY	(4) 2-05556-010	(4)	->	(4)	->	(4)	•>	(4)	->
218	NI	CONTROL PANEL	2-05773-5		->	all servers	->	Section .	->	10000	->
219	NI	FUSE BOX ASSY	2-05804-4		->	And the second	->		->	-	->
		INCLUDES:			A. B. Starter	Contraction of the			1 6 9	1.11	
220	NI	FUSE	(4) FRN-R60	(4)	->	(4)	->	(4)	->	(4)	->
221	NI	FUSE BLOCK	HY11UM601		->		->		->		->
222	NI	LIMIT SWITCH	HH19ZA940		->	Contraction of	->	1	->	100	->
223	NI	LIMIT SWITCH	HH19JA945		->	1.1.1	->		•>		->
224	NI	SEQUENCER	HN67QG005	1.	->		->		->	1. 19	->
225	NI	ELECTRIC HEAT KIT (24KW)	40YA900271		->		->	1.000	->	a second	->
12		INCLUDES:	and the second second second	- 1	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1				1. S. S. S. S. S.	- Andrews	
226	NI	HEATER ASSY	3-05693-3		->	S. Start	->		->		->
100-1-2		INCLUDES:		and the second				Carlos and	and the second	100	and the second
227	NI	ELEMENT ASSY	(6) 2-05556-009	(6)	->	(6)	->	(6)	->	(6)	->
228	NI	CONTROL PANEL	3-05782		->		->	1	->	- States	->
229	NI	FUSE	(6) FRN-R60	(6)	->	(6)	->	(6)	->	(6)	1->
230	NI	LIMIT SWITCH	(3) HH12HV151	(3)	->	(3)	•>	(3)	->	(3)	->
231	NI	SEQUENCER	HN67QC007		->		->	1	->	-	->
232	NI	TERMINAL BLOCK	HY11UC125		->		->	-	->	-	->
233	NI	BLOCK	HY11UM465		->	1 100	->	1	->		->
234	NI	ELECTRIC HEAT KIT (30KW)	40YA900281		->	1	->	-	->	10 million	->
1.		INCLUDES:				-	1. Sec. 1988. 1997	100	and the second second		
235	NI	HEATER ASSY	3-05793-4	Constant Section	->	1	->		->	-	->
		INCLUDES:			A Starte					1	
236	NI	ELEMENT ASSY	(6) 2-05556-010	(6)	->	(6)	->	(6)	->	(6)	->
237	NI	CONTROL PANEL	3-05782		->		->	1	->	1	->
238	NI	FUSE	(6) FRN-R60	(6)	->	(6)	->	(6)	->	(6)	->
239	NI	LIMIT SWITCH	(3) HH12HV151	(3)	->	(3)	->	(3)	->	(3)	->
240	NI	SEQUENCER	HN67QC007		->	2	->		->	1000	->
241	NI	TERMINAL BLOCK	HY11UC125	and the states	->		->	-	->		->
242	NI	BLOCK	HY11UM465		->		->	1	•>	1	->





Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.



### DIRECT EXPANSION FAN COIL

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40		7/	T	
-	- ALCE	40	an i	A -

SIZE: 018-060

SERIES: 0

		the second s	40YRM042-300	40YRM042-300AJ	40YRM042-300AL	40YRM042-300CG	40YRM042-700
TEM		PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50
		CASING GROUP					
1		WRAPPER	314912-401	->	->	*	->
2		INSULATION	314872-305	->	->	**	
3		LOWER WRAPPER	314913-401	->	->	.>	-7
4		INSULATION	314872-306	->	->	*	->
5	-	PANEL ASSY INSUL.	314988-703	•>	->	*	->
6		DOOR ASSY LOWER	314989-705	*>	->	*	->
7		DOOR ASSY UPPER	314990-705	->	->	->	->
8		DOOR ASSY FITTING	314991-702	->	->	*>	->
9		COIL SUPPORT SIDE	(2) 314958-402	(2) ->	(2) ->	(2) ->	(2) ->
10		COIL SUPPORT REAR	314957-203	->	->	->	-> .
11		BLOWER DECK	314896-404	->	->	->	->
12		DIFFUSER BAFFLE	(2) 314858-301	(2) ->	(2) ->	(2) ->	(2) ->
13		HEATER PLATE	314895-403	->	->	->	->
14		TIE ANGLE	314867-303	->	->	->	->
15		GROMMET NUT	(2) 61631D7	(2) ->	(2) ->	(2) ->	(2) ->
16		SPRING	314868-301	->	•>	->	->
17		FILTER DOOR ASSY	315903-703	->	->	->	->
18		HOUSING BRACKET	314900-203	->	->	->	->
19		FRONT BRACKET	(2) 314914-201	(2) ->	(2) ->	(2) ->	•>
20	H	REAR BRACKET	(2) 314915-201	(2) ->	(2) ->	(2) ->	->
21		FITTING DOOR CLIP	314999-201	->	->	->	->
22		BREAKER COVER	314981-201	->	->	->	->
22	NI	1060	312250-405	->	->	->	.>
20	141	EXTENSION TUBE SHEET	X	X	X	X	X
24		SUPPORT COIL	Y Y	X	X	X	X
20		BRACKET TYV	Ŷ	X	X	X	X
20		PRACKET TYV	Ŷ	X	X	X	X
21		BRACKET TOP COIL	Ŷ	X	X	X	X
28		CHIELD HEAT	215025 401	-		->	->
29		SHIELD, HEAT	313923-401				.>
30	NI	GROMMET	314903-301				->
31	NI	GROMMET	314987-201	->	- ···	Y	X
32		COIL BRACKET	A	A	10)	(2)	(2) ->
33		COIL BRACKET	(2) 3148/9-301	(2) ->	(2) ->	(2)	(2) ->
34		COIL BRACKE I	(2) 314879-302	(2) ->	(2) ->	Y Y	X
35		FILTER PLATE	X	X	×	÷	X
36		CHANNEL COND	X	X	Χ	^	<u> </u>
37	NI	DRAIN FITTING	316809-202	->	->	->	
38	NI	DRAIN FITTING	316809-201	.>	->	->	(0)
39	100	DRIP BAFFLE	(2) 316834-203	(2) ->	(2) ->	(2) ->	(2) ->
		ELECTRICAL GROUP					HT01BE220
41		TRANSFORMER	HT01BD208	->	->	->	HIVIBEZOV
42		PRINTED CIRCUIT BOARD	HK61GA001	.>	*>	->	->
43		GROUND LUG	HY90AZ021	->	.>	*	->
44		LOW VOLTAGE TERM.BOX	3-05772	->	.>	->	->
45		FUSE	ATC5	->	.>	•>	->
		FAN AND MOTOR GROUP					040004 700
46		BLOWER ASSY (COMPLETE)	316804-755	•>	->	->	316804-762
		INCLUDES:					A second second second
47		HOUSING ASSY	316803-754	•>	•>	->	->
48		BLOWER WHEEL	LA22LA034	->	•>	->	->
49		MOTOR, FAN	HC41AE200	->	->	->	HC41AE205
50	T	CAPACITOR	P291-1003	->	->	->	•>
51	1	PROTECTIVE BOOT	P281-0002	->	•>	->	->
52	T	STRAP,CAPACITOR	P281-0022	->	->	->	->
53		ARM MOTOR MOUNT	(3) HC98ZZ244	(3) ->	(3) ->	(3) ->	(3) ->
			DOL: 0070				->
54	T	BAND MTR MOUNT	P251-0078	->			

Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.







Replecement Components Division

## DIRECT EXPANSION FAN COIL

40YR/YRM

SIZE: 018-060

**SERIES: 0** 

	Π		40YRM042-300	40YRM042-300AJ	40YRM042-300AL	40YRM042-300CG	40YRM042-700	
TEM		PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-80	230-1-00	
		COIL AND PIPING GROUP						
56	+	COIL ASSY (COMPLETE)	316822-754	->	*			
	H	INCLUDES:	V V	×	Y	X	X	
57	$\square$	VALVE THERMO EXPANSION		^	-		->	
58	H	CONDENSATE TROUGH	EAU0000100	3			->	
59	H	CONDENSATE ASSY	216241-701	216241-703		->	>	
61	H	CONDENSATE TROUGH	316236-204	->	.>	.>	->	
62	H	CONDENSATE PAN SHIELD	314925-301		.>	->	->	
62	H	CONDENSATE PAN	314880-403		->	.>	->	
64	H	CONDENSATE PAN	315907-703		->	->	•>	
65	H	PLUG PLASTIC	(3) LF39RZ021	(3) ->	(3) ->	(3) ->	(3) ->	
66	NI	RETAINER	AU35QA272	->	->	->	->	
67	NI	PISTON	EA52PH082	->	->	->	->	
68	NI	PISTON BODY	300497-201	->	->	->	->	
69	NI	STRAINER	KH11HH066	->	->	.>	->	
		ELECTRIC HEAT GROUP						
70		HEATER ASSY (COMPLETE)	X	3-05791-1	3-05792-1	3-05802-2	X	
		INCLUDES:				A CONTRACTOR	A State Bridge	
71	NI	ELEMENT ASSY	X	(3) 2-05556-010	(4) ->	(2) ->	X	
72	NI	CONTROL PANEL	X	2-05773-4	2-05773-5	2-05773-6	X	
73	NI	LIMIT SWITCH	X	(3) HH19ZA930	HH19ZA940	(2) HH19ZA950	X	
74	NI	LIMIT SWITCH	X	X	HH19ZA940	X	X	
75	NI	LIMIT SWITCH	X	X	HH12HV145	X	X	
76	NI	SEQUENCER	X	HN67QG005	->	HN67QC006	X	
77	NI	PLUG HOUSING	X	HY06AM012	->	->	X	
78		FUSE BOX ASSY (COMPLETE)	X	2-05804-1	2-05804-2	X	X	
		INCLUDES:		18		and the state of the		
79	NI	COVER, FUSE	X	2-05784	->	X	X	
80	NI	FUSE	X	(2) FRN-R20	(2) NON-20	X	X	
81	NI	FUSE	X	(2) NON-20	(2) ->	X	X	
82	NI	FUSE BLOCK	X	HY11UM461	HY11UM601	X	X	
		FILTER GROUP					V	
83		FILTER RACK ASSY	X	X	X	X	<u> </u>	
		INCLUDES:	-	and the second				
84		FILTER	315914-403	->	->	·>	->	
85		GRILLE FILTER	X	X	X	×	× ×	
86		FILTER RACK	X	X	X	×	Ŷ	
87		RETAINER FILTER	X	X	X	×	^	
		ACCESSORY GROUP	101/1000051				~	
88	NI	TWO SPEED RELAY	40YA900351	->	->			
	-	INCLUDES:	LINICADIOOA			-		
89	NI	RELAY 2 SPEED	HN01PJU24	->	.3		->	
90	NI		401A900301	->				
01	-	DELAY TIME DELAY	UN670 1002				->	
91	NI	DISCONNECT KIT	40¥4000271				.>	
92	INI	INCLUDES:	401/00/03/1			and the last	States and states	
02	NI	DISCONNECT ASSY	2-05806-1			->	.>	
04	NI	DISCONNECT	HB6177001		.>	.>	->	
05	NI	DISCONNECT	HR6177002		.>	->	->	
96	NI	LATENT CAPACITY CONTROL	40YA900381	.>	.>	->	->	
	1	INCLUDES:		and the state for a second			State State	
97	NI	SWITCH.HUMIDISTAT	3-05464	->	->	->		
QR	NI	BELAY TWO SPEED	HN61PJ024	->	->	->	->	
99	N	ELECTRIC HEAT KIT (5 KW)	X	X	X	X	X	
	1	INCLUDES:	and the second second second second	with the second state		and an and a set	Same Same and	
100	N	ELEMENT ASSY "SEE HEAT SECT"	X	X	X	X	X	
101	N	ELECTRIC HEAT KIT (8KW)	40YA900081	->	->	->	->	
	T	INCLUDES:	4	La revenue de la companya de la comp	and the state of the state	a desire cash to she hittin	and the second	
102	N	ELEMENT ASSY "SEE HEAT SECT"	3-05802-1	->	->	->	->	

Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

Replacement Components Division State 1

### DIRECT EXPANSION FAN COIL

TEM		PART DESCRIPTION	40YRM042-300 208/230-1-60	40YRM042-300AJ	40YRM042-300AL 208/230-1-60	40YRM042-300CG 208/230-1-60	40YRM042-700 230-1-50
		ACCESSORY GROUP (CONT'D)		EVOLEDY 1 00			State Institution in the state
103	NI	ELECTRIC HEAT KIT (10KW)	40YA900101	·.	->	->	•>
100	-	INCLUDES:				and the second sec	Contraction of the
104	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05802-2	->	->	->	->
105	NI	FLECTBIC HEAT KIT (15KW)	40YA900151		.>	->	->
105		INCLUDES:	TOTABOUIDI			303	
106	NI	ELEMENT ASSY "SEE HEAT SECT"	2.05701.1		-		->
107	NI	ELECTRIC HEAT KIT (20KWA	40¥4000201			and the second second	
107	141	INCLUDES:	401A300201				
109	NI	ELEMENT ASSY "SEE HEAT SECT"	3.05702.1			->	
100	NI	ELEMENT AGGT GEL TIEAT GEOT	40¥4000201				->
109	141	INCLIDES.	401A900301		2		
110		HEATED ASSY	0.05901.1				
110	141	INCLUDES:	3-03001-1	-3			
444	All	ELEMENT ACCV	(0) 0.05555 0.00	(2)	(0)	(2)	(2)
110	NI		(3) 2-05556-008	(3) ->	(3) ->		
112	NI		2-05/73-4 (2) UU107A020	->	->	(2)	(3)
113	NI	SECHENCER	(3) HN670C005	(3) ->	(5) ->	(5) ->	->
114	NI	ELECTRIC HEAT KIT (15KMA)	40240000011	->	->		
115	INI		401A900311	->	->		
110	NU	INCLUDES.	0.05001.0				
110	NI	HEATER ASST	3-05801-2	->	->	•>	-,
		INCLUDES:		101	100	(0)	(0)
11/	NI	ELEMENTASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
118	NI	CONTROL PANEL	2-05//3-4	->	->	->	->
119	N	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
120	NI	SEQUENCER	HN67QG005	->	->	->	->
121	NI	ELECTRIC HEAT KIT (18KW)	40YA900321	->	->	->	->
		INCLUDES:	a fan i se statistister het se	the second second second	A STATE OF A STATE OF A STATE		
122	NI	HEATER ASSY	3-05798-1	->	->	->	->
		INCLUDES:			and the second second		Construction of the second
123	NI	ELEMENT ASSY	(6) 2-05556-008	(6) ->	(6) ->	(6) ->	(6) ->
124	NI	CONTROL PANEL	3-05782	->	->	->	->
125	NI	LIMIT SWITCH	(3) HH12HV151	(3) ->	(3) ->	(3) ->	(3) ->
126	NI	SEQUENCER	HN67QC007	->	->	->	->
127	NI	ELECTRIC HEAT KIT (24KW)	X	X	X	X	X
		INCLUDES:					
128	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:					
129	NI	ELEMENT ASSY	X	X	X	X	X
130	NI	CONTROL PANEL	X	X	X	X	X
131	NI	FUSE	X	X	X	X	X
132	NI	LIMIT SWITCH	X	X	X	X	X
133	NI	SEQUENCER	X	X	X	X	X
134	NI	TERMINAL BLOCK	X	X	X	X	X
135	NI	BLOCK	X	X	X	X	X
136	NI	ELECTRIC HEAT KIT (30KW)	X	X	X	X	X
		INCLUDES:				a second second second second	A CONTRACTOR OF
137	NI	HEATER ASSY	X	X	X	X	X
	1	INCLUDES:					
138	NI	ELEMENT ASSY	Y	Y	Y	X	X
139	N	CONTROL PANEL	Y Y	Ŷ	Y	Y	X
140	NI	FUSE	Ŷ	Ŷ	Ŷ	Y	X
141	NI	LIMIT SWITCH	Ŷ	Ŷ	Y	X	X
142	NI	SEQUENCER	Ŷ	Ŷ	X	X	X
143	NI	TERMINAL BLOCK	Y Y	Ŷ	Y	X	X
144	NI	BLOCK	Ŷ	Y	X X	X6	X
	1.4		A	A	1 ^	1	

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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Litho in U.S.A.





SIZE: 018-060

SERIES: 0



Replacement Components Division

### DIRECT EXPANSION FAN COIL

SIZE: 018-060

40YR/YRM

**SERIES: 0** 

ITEM		PART DESCRIPTION	40YRM042-300 208/230-1-60	40YRM042-300AJ 208/230-1-60	40YRM042-300AL 208/230-1-60	40YRM042-300CG 208/230-1-60	40YRM042-700 230-1-50
		ACCESSORY GROUP (CONT'D)					
145	NI	ELECTRIC HEAT KIT (3KW)	X	X	X	X	X
		INCLUDES:	a merican service and the service				1910
146	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:		and the second second second	1. C	1	
147	NI	ELEMENT ASSY	X	X	X	X	X
148	NI	CONTROL PANEL	X	X	X	X	X
149	NI	LIMIT SWITCH	X	X	X	X	X
150	NI	LIMIT SWITCH	X	X	X	X	X
151	NI	LIMIT SWITCH	X	X	X	X	X
152	NI	SEQUENCER	X	X	X	X	X
153	NI	PLUG HOUSING	X	X	X	X	X
154	NI	ELECTRIC HEAT KIT (3KW)	X	X	X	X	X
10		INCLUDES:	and the second second				
155	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:	Salar Street Street	and the second sec			
156	NI	ELEMENT ASSY	X	X	X	X	X
157	NI	CONTROL PANEL	X	X	X	X	X
158	NI	CIRCUIT BREAKER ASSY	X	X	X	X	X
1		INCLUDES:			and the second		
159	NI	CIRCUIT BREAKER	X	X	X	X	X
160	NI	CIRCUIT BREAKER MOUNTING BASE	X	X	X	X	X
161	NI	ELECTRIC HEAT KIT (5KW)	X	X	X	X	X
		INCLUDES:	and the second second		Sector States	1	
162	NI	HEATER ASSY	X	X	X	X	X
		INCLUDES:			Contraction of the second	A State of the second second	The Production of the second
163	NI	ELEMENT ASSY	X	X	X	X	X
164	NI	CONTROL PANEL	X	X	X	X	X
165	NI	CIRCUIT BREAKER BOX ASSY	X	X	X	X	X
13		INCLUDES:			The second second second	and a starting to the starting	The second second
166	NI	CIRCUIT BREAKER	X	X	X	X	X
167	NI	CIRCUIT BREAKER MOUNTING BASE	X	X	X	X	X
168	NI	ELECTRIC HEAT KIT ((8KW)	X	X	X	X	X
		INCLUDES:					and the second second
169	NI	HEATER ASSY	X	X	X	X	X
	1	INCLUDES:			1017	and section in	
170	NI	ELEMENT ASSY	X	X	X	X	X
171	NI	CONTROL PANEL	X	X	X	X	X
172	NI	CIRCUIT BREAKER BOX ASSY	X	X	X	X	X
		INCLUDES:	Barters and Constanting of the			· · · · · · · · · · · · · · · · · · ·	and the second
173	N	CIRCUIT BREAKER	X	X	X	X	X
174	NI	CIRCUIT BREAKER MOUNTING BASE	X	X	X	X	X
175	N	LIMIT SWITCH	X	X	X	X	X
176	N	SEQUENCER	X	X	X	X	X
177	N	ELECTRIC HEAT KIT (10KW)	40YA900111	.>	->	->	->
		INCLUDES:		A State & State State	and the second s		PERSONAL PROPERTY.
178	N	HEATER ASSY	3-05803-2	.>	->	->	->
	T	INCLUDES:			A CONTRACT OF A	in the second	and the second descent of the
179	N	ELEMENT ASSY	(2) 2-05556-010	(2) ->	(2) ->	(2) ->	(2) ->
180	N	CONTROL PANEL	2-05773-6	->	->	->	•>
181	N	CIRCUIT BREAKER BOX ASSY	2-05805-1	•>	->	->	->
		INCLUDES:		and the second s	And the second second	and the second	Administration of the State
182	N	CIRCUIT BREAKER	HH83ZC007	->	->	->	•>
183	N	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001	->	->	>	->
184	N	LIMIT SWITCH	(2) HH19ZA950	(2) ->	(2) ->	(2) ->	(2) ->
185	N	SEQUENCER	HN67QC006	->	->	->	->



#### Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

### Replacement Gomponents Division

### DIRECT EXPANSION FAN COIL

40YR/YRM SIZE: 018-060

SERIES: 0

		the second second second second second	40YRM042-300	40YF	M042-300AJ	40Y	RM042-300AL	40YF	M042-300CG	40)	RM042-700
ITEM		PART DESCRIPTION	208/230-1-60	20	8/230-1-60	2	08/230-1-60	20	08/230-1-60		230-1-50
		ACCESSORY GROUP (CONT'D)									
186	NI	ELECTRIC HEAT KIT (15KW)	40YA900161		->		->		->		->
		INCLUDES:					Stand Standard				
187	NI	HEATER ASSY	3-05795-1		->		->		->		->
		INCLUDES:					a la companya da series de la companya de la company				
188	NI	ELEMENT ASSY	(3) 2-05556-010	(3)	->	(3)	->	(3)	->	(3)	->
189	NI	CONTROL PANEL	2-05773-4		->		->		->		->
190	NI	CIRCUIT BREAKER BOX ASSY	2-05805-2		->		->		->		->
		INCLUDES:	and a farmer and the								
191	NI	CIRCUIT BREAKER	(2) HH83ZC007	(2)	->	(2)	->	(2)	->	(2)	->
192	NI	LIMIT SWITCH	(3) HH19ZA930	(3)	->	(3)	->	(3)	->	(3)	->
193	NI	SEQUENCER	HN62QC008		->		->		->		->
194	NI	ELECTRIC HEAT KIT (20KW)	40YA900211		->		->		->		->
		INCLUDES:									
195	NI	HEATER ASSY	3-05796-1		->	1.	->		->		->
		INCLUDES:	1								
196	NI	ELEMENT ASSY	(4) 2-05556-010	(4)	->	(4)	->	(4)	->	(4)	->
197	NI	CONTROL PANEL	2-05773-5		->		->		->		->
198	NI	CIRCUIT BREAKER BOX ASSY	2-05805-2		->		->		->		->
		INCLUDES:		-					a share	Same Sala	NAL AND AND A DATE
199	NI	CIRCUIT BREAKER	(2) HH83ZC007	(2)	->	(2)	->	(2)	->	(2)	•>
200	NI	CIRCUIT BREAKER MOUNTING BASE	HH94ZZ001		->	1-1-1	->		->		->
201	NI	LIMIT SWITCH	HH12HV145	-	->		->		->		->
202	NI	LIMIT SWITCH	HH19ZA940		->	a part a starter	->		->	and the second	->
203	NI	LIMIT SWITCH	HH19ZA940		->	No. Carrier	->		->	-	->
204	NI	SEQUENCER	HN67QG005	-	->	-	->		->	100000	->
205	NI	ELETRIC HEAT KIT (15KW)	40YA900171		->		->		->	1	->
		INCLUDES:						-	a second and		
206	NI	HEATER HEATER ASSY	3-05791-2		->		->	-	->		->
		INCLUDES:			1	-			CONTRACTOR OF STREET, S	-	
207	NI	ELEMENT ASSY	(3) 2-05556-010	(3)	->	(3)	->	(3)	->	(3)	->
208	NI	CONTROL PANEL	2-05773-4	100	->	101	->	1-1	->	1	->
209	NI	FUSE BOX ASSY	2-05804-3		->		->		->		->
		INCLUDES:						-		1	
210	NI	FUSE	(2) FRN-R30	(2)	->	(2)	->	(2)	->	(2)	->
211	NI	FUSE	(2) FRN-R60	(2)	->	(2)	->	(2)	->	(2)	->
212	NI	FUSE BLOCK	HY11UM461	1-4	->	1-1-1	->	1	->	1	->
213	NI	LIMIT SWITCH	(3) HH19ZA930	(3)	->	(3)	->	(3)	->	(3)	->
214	NI	SEQUENCER	HN67QG005	1-1-1	->	1-1-1	->	1.	->	1	->
215	NI	ELECTRIC HEAT KIT (20KW)	40YA900221		->		->		->		->
	T	INCLUDES:		1		1				1	
216	NI	HEATER ASSY	3-05792-2		->		->	1	->		->
		INCLUDES:		1				-		1	States and a second second
217	NI	ELEMENT ASSY	(4) 2-05556-010	(4)	->	(4)	->	(4)	->	(4)	->
218	NI	CONTROL PANEL	2-05773-5	1	->	1	->	1	->	1	->
219	NI	FUSE BOX ASSY	2-05804-4		->	1	->		->		->
- 50		INCLUDES:	and the second second second		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	-					
220	NI	FUSE	(4) FRN-R60	(4)	->	(4)	->	(4)	->	(4)	->
221	NI	FUSE BLOCK	HY11UM601	1	->	T	->	T	->	1	->
222	NI	LIMIT SWITCH	HH19ZA940	1	->		->		->		->
223	NI	LIMIT SWITCH	HH19JA945		->		->		->		->
224	NI	SEQUENCER	HN67QG005		->		->		->		->

Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.





Replecement Components Division

### DIRECT EXPANSION FAN COIL

# 40YR/YRM

SIZE: 018-060

**SERIES: 0** 

a la del			40YRM048-300		40YRM048-300AL	40YRM048-300CG	40YRM048-700
TEM		PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50
		CASING GROUP					
1		WRAPPER	314912-401	~>	*	->	314912=4-1
2		INSULATION	314872-305	->	->	->	->
3		LOWER WRAPPER	314913-401	->	->	->	.>
4		INSULATION	314872-306	->	->	->	->
5		PANEL ASSY INSUL.	314988-703	->	->	->	->
6		DOOR ASSY LOWER	314989-705	->	-> .	->	•>
7		DOOR ASSY UPPER	314990-705	->	->	->	->
8		DOOR ASSY FITTING	314991-702	->	->	•>	->
9		COIL SUPPORT SIDE	(2) 314958-402	(2) ->	(2) ->	(2) ->	(2) ->
10		COIL SUPPORT REAR	314957-203	->	->	->	->
11		BLOWER DECK	314896-404	->	->	->	->
12		DIFFUSER BAFFLE	(2) 314858-301	(2) ->	(2) ->	(2) ->	(2) ->
13		HEATER PLATE	314895-403	->	->	->	->
14		TIE ANGLE	314867-303	->	->	->	->
15	101	GROMMET NUT	(2) 61631D7	(2) ->	(2) ->	(2) ->	(2) ->
16		SPRING	314868-301	->	->	->	->
17	1	FILTER DOOR ASSY	315903-703	->	->	->	->
18	1	HOUSING BRACKET	314900-203	->	->	->	->
19		FRONT BRACKET	314914-201	->	->	->	->
20	1	BEAR BRACKET	314915-201	->	->	->	->
21	+	FITTING DOOR CLIP	314999-201	->	->	.>	->
22		BREAKEB COVER	314981-201	.>	->	•>	->
23	NI	1060	312250-405	->	->	->	•>
24	1	EXTENSION TUBE SHEET	X	X	X	X	X
25	+	SUPPORT COIL	x	X	X	X	X
26	+	BRACKET TXV	X	X	X	X	X
27	1	BRACKET TXV	X	X	X	X	X
28	1	BRACKET TOP COIL	Ŷ	X	X	X	X
20	+	SHIELD HEAT	315925-401	->	.>	->	.>
30	NI	GROMMET	314985-301		.>	->	->
21	NI	GROMMET	314987-201		->	.>	->
22	1		Y	X	X	X	X
32	+	COIL BRACKET	(2) 314879-301	(2)	->	(2) .>	(2) ->
24	+	COIL BRACKET	(2) 314879-302	(2)	->	(2) ->	(2) ->
25	+		(2) 514675-502 V	V V	Y	X	X
35	+		÷	X	X	X	X
30	NI	DRAIN EITTING	216900 202	^			.>
37	NI	DRAIN FITTING	216800.201				->
30	INI		016004-201				
39	1		310834-203	and the second se			
44		TRANSFORMER	HT01BD208				HT01BE230
41	+		HIG100200				->
42	+	CROUND LUC	HV00A7021				
43	+	LOW VOLTAGE TERM BOX	2 05772				.>
44	+	EUW VOLTAGE TERM.BOA	3-05/72				
40		FAN AND MOTOR CROUP	AIUS	.>	.,		
10		PLOWER ASSY (COMPLETE)	216904 756				316804-763
40	+	INCLUDES.	310004-730				
47	-		216000 764				.>
4/	-		1 4 2 2 4 0 2 4				->
40	+	MOTOD FAN	LAZZLAU34	.,		1	HC45AE203
49	+	CADACITOR		**	.,	+	->
50	+	DEDTECTIVE POOT	P291-1503	.,			
51	-	STRAP CAPACITOR	P281-0002	->	**		
52	+	STRAP, CAPACITOR	P281-0022	->	->	(2)	(3)
53	-		(3) HC9822244	(3) ->	(3) ->	(3) ->	
54	-	BAND MIR MOUNT	P251-0078	->	->	->	(2)
55	1	GROMMET	(3) P251-0079	(3) ->	(3) ->	(3) ->	10/ ->





Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

### Replacement Gomponents Division

and and

### DIRECT EXPANSION FAN COIL

40YR/YRM

SIZE: 018-060

SERIES: 0

ITEM	PART DESCRIPTION 40YRM04 208/230-		40YRM048-300 208/230-1-60	40YRM048-300AJ 208/230-1-60	40YRM048-300AL 208/230-1-60	40YRM048-300CG 208/230-1-60	40YRM048-700 230-1-50
50		COIL AND PIPING GROUP					
56		COIL ASSY (COMPLETE)	316822-755	->	->	->	->
-	-	INCLUDES:					A State State State State
5/		VALVE THERMO EXPANSION	X	X	X	X	X
58	-	DISTRIBUTOR	EA08QD008	->	•>	->	->
59		CONDENSATE TROUGH	316236-201	•>	->	->	->
60		CONDENSATE ASSY	316241-701	->	->	->	->
61		CONDENSATE TROUGH	316236-204	(2) ->	->	->	->
62	-	CONDENSATE PAN SHIELD	314925-301	->	->	->	->
63	-	CONDENSATE PAN	314880-403	->	->	->	->
64	-	CONDENSATE PAN	315907-703	->	->	->	->
65		PLUG,PLASTIC	(3) LF39RZ021	(3) ->	(3) ->	(3) ->	(3) ->
66	NI	RETAINER	AU35QA272	->	->	->	->
67	NI	PISTON	EA52PH084	->	->	•>	->
68	NI	PISTON BODY	300497-201	->	->	•>	->
69	NI	STRAINER	KH11HH066	->	->	•>	->
		ELECTRIC HEAT GROUP					
70		HEATER ASSY (COMPLETE)	X	3-05791-1	3-05792-1	3-05802-2	X
		INCLUDES:	A STATE OF A				the second second second
71	NI	ELEMENT ASSY	X	(3) 2-05556-010	(4) ->	(2) ->	X
72	NI	CONTROL PANEL	X	2-05773-4	2-05773-5	2-05773-6	X
73	NI	LIMIT SWITCH	X	(3) HH19ZA930	HH19ZA940	(2) HH19ZA950	X
74	NI	LIMIT SWITCH	X	X	HH197A940	X	X
75	NI	LIMIT SWITCH	X	X	HH12HV145	X	X
76	NI	SEQUENCER	X	HN67OG005		HN670C006	X
77	NI	PLUG HOUSING	X	HY06AM012		11110700000	Y Y
78	1	FUSE BOX ASSY (COMPLETE)	Ŷ	2.05804.1	205904.2		
10		INCLUDES:	<u> </u>	2-03004-1	2-03004-2	- ^	^
70	NI	COVER FUSE	×	0.05704			×
80	NI	EUSE	<u>^</u>	2-05/84	->	X	<u> </u>
00	NI	EUSE	×	(2) FRN-R20	(2) NON-20	×	
01	NI	EUSE BLOCK	× ×	(2) NON-20	(2) ->	X	X
02	INI	FUSE BLOCK	X	HY11UM461	HY11UM601	X	X
00		FILTER GROUP	N.	M		N.	M
83		FILTER HACK ASSY	X	X	X	X	X
-		INCLUDES:					
84		FILTER	315914-403	->	->	->	->
85		GRILLE FILTER	X	X	X	X	X
86		FILTER RACK	X	X	X	X	X
87	100	RETAINER FILTER	X	X	X	X	X
		ACCESSORY GROUP					
88	NI	TWO SPEED RELAY	40YA900351	->	•>	->	->
		INCLUDES:	and the state of the second second	the second s			
89	NI	RELAY 2 SPEED	HN61PJ024	->	->	->	•>
90	NI	TIME DELAY RELAY	40YA900361	->	->	->	->
		INCLUDES:				A Contraction	
91	NI	RELAY, TIME DELAY	HN67GJ002	->	->	->	->
92	NI	DISCONNECT KIT	40YA900371	->	->	->	>
- Al		INCLUDES:	and the second sec				
93	NI	DISCONNECT ASSY	2-05896-1	->	->	->	->
94	NI	DISCONNECT	HR61ZZ001	.>	->	->	.>
95	NI	DISCONNECT	HR61ZZ002	->		->	.>
96	NI	LATENT CAPACITY CONTROL	40YA900381	.>	->	->	.>
		INCLUDES:					
97	NI	SWITCH, HUMIDISTAT	3-05464	•>	->	-> .	.>
98	NI	RELAY, TWO SPEED	HN61PJ024			->	
99	NI	ELECTRIC HEAT KIT (5 KW)	X	X	X	X	X
		INCLUDES:			1	~	1
100	NI	FLEMENT ASSY "SEE HEAT SECT"	Y	Y	Y	Y	Y
101	NI	ELECTRIC HEAT KIT (8KM)	407400081	^	<u>^</u>	1	^ 
	1	INCLUDES:					
102	NI	FLEMENT ASSY "SEE HEAT SECT"	2.05902.1	1			
IUL	1141	LELMENT AGOT SEE REAT SECT	3-05002-1	->	->	->	->

Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.



### DIRECT EXPANSION FAN COIL

# 40YR/YRM

SIZE: 018-060

SERIES: 0

1.92			40YRM048-300	40YRM048-300AJ	40YRM048-300AL	40YRM048-300CG	40YRM048-700
TEM		PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50
		ACCESSORY GROUP (CONT'D)					
103	NI	ELECTRIC HEAT KIT (10KW)	40YA900101	->	->	-> 666	->
		INCLUDES:	and the second second	A CARRY - THE PARTY CART		Charles Charles and	
104	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05802-2	->	->	->	->
105	NI	ELECTRIC HEAT KIT (15KW)	40YA900151	->	•>	->	->
	-	INCLUDES:		Contraction of the second s			
106	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05/91-1	->	->		
107	NI	ELECTRIC HEAT KIT (20KW)	40YA900201	->	**		
100		INCLUDES:	0.05700.1				·>
108	NI	ELEMENT ASST SEE HEAT SECT	3-03/92-1	.,			.>
109	INI	INCLUDES:	401A900301	->			1000
110	NI	HEATED ASSY	2.05901.1			.>	->
110	INI	INCLUDES:	3-03001-1		the second second		Contraction and the
111	NI	ELEMENT ASSV	(2) 2.05556.008	(3)	(3) ->	(3) ->	(3) ->
112	NI	CONTROL PANEL	2-05773-4	101 ->	->	->	->
112	NI	LIMIT SWITCH	(3) HH1974930	(3) ->	(3) ->	(3) ->	(3) ->
114	NI	SEQUENCER	HN670G005	->	->	->	.>
115	NI	FLECTRIC HEAT KIT (15KW)	40YA900311		->	->	->
	1	INCLUDES:	10111000011			State Street	1922. 1
116	NI	HEATER ASSY	3-05801-2	->	->	->	-> ->
110	1	INCLUDES:		and the second of	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1.74
117	NI	ELEMENT ASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
118	NI	CONTROL PANEL	2-05773-4	->	->	->	-> ML
119	NI	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
120	NI	SEQUENCER	HN67QG005	->	->	->	-> 10
121	NI	ELECTRIC HEAT KIT (18KW)	40YA900321	->	->	->	.>
1		INCLUDES:	a second and the second		A CONTRACTOR OF THE OWNER	A State of the second	Constant State Price
122	NI	HEATER ASSY	3-05798-1	->	->	->	->
		INCLUDES:			a star of the		Salar Balan
123	NI	ELEMENT ASSY	(6) 2-05556-008	(6) ->	(6) ->	(6) ->	(6) ->
124	NI	CONTROL PANEL	3-05782	->	->	->	->
125	NI	LIMIT SWITCH	(3) HH12HV151	(3) ->	(3) ->	(3) ->	(3) ->
126	NI	SEQUENCER	HN67QC007	->	->	->	->
127	NI	ELECTRIC HEAT KIT (24KW)	40YA900251	->	->	->	•>
		INCLUDES:				C. Standing of the	Sector and sectors
128	NI	HEATER ASSY	3-05793-1	->	->	->	->
		INCLUDES:		Carlos Constantes - 19	and the second	a construction of the second se	
129	N	ELEMENT ASSY	(6) 2-05556-009	(6) ->	(6) ->	(6) ->	(6) ->
130	N	CONTROL PANEL	3-05782	->	->	->	->
131	N	FUSE	(6) FRN-R60	(6) ->	(6) ->	(6) ->	(6) ->
132	N	LIMIT SWITCH	(3) HH12HV151	(3) ->	(3) ->	(3) ->	(3) ->
133	N	SEQUENCER	HN67QC007	•>	->	->	->
134	NI	TERMINAL BLOCK	HY11UC125	->	->	->	*>
135	NI	BLOCK	HY11UM465	->	->	->	*
136	NI	ELECTRIC HEAT KIT (30KW)	40YA900261	•>	->	->	->
	-	INCLUDES:					
137	N	HEATER ASSY	3-05793-2	->	->	.>	.,
100	-	INCLUDES:		(0)	(6)	(6)	(6)
138	N	ELEMENT ASSY	(6) 2-05556-010	(6) ->	(6) ->	(0) ->	->
139	N	CONTROL PANEL	3-05782	->	->	->	(6)
140	N	FUSE	(6) FRN-R60	(0) ->	(0) ->	(0) ->	(3)
141	N		(3) HH12HV151	(3) ->	(3) ->	(3) ->	
142	N	SEQUENCER	HN6/QC007	•>	->	.>	
143	N	TERMINAL BLOCK	HY11UC125	->	->	->	.>
144	N	BLOCK	HY11UM465	->	->	->	



#### Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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#### Replacement Components Division

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### DIRECT EXPANSION FAN COIL

40YR/YRM SIZE: 018-060

SERIES: 0

Bill

ACCESSORY GROUP (CONT'D)         145       NI       ELECTRIC HEAT KIT (3KW)       X       X       X         INCLUDES:	YRM048-300CG 208/230-1-60	40YRM048-700 230-1-50
145NIELECTRIC HEAT KIT (3KW)XXXXINCLUDES: </th <th></th> <th></th>		
INCLUDES:XXX146NIHEATER ASSYXXXINCLUDES:	X	X
146NIHEATER ASSYXXXINCLUDES:INCLUDES:INCLUDES:INCLUDES:147NIELEMENT ASSYXXX148NICONTROL PANELXXX149NILIMIT SWITCHXXX150NILIMIT SWITCHXXX151NILIMIT SWITCHXXX152NISEQUENCERXXX153NIPLUG HOUSINGXXX154NIELECTRIC HEAT KIT (3KW)XXX155NIHEATER ASSYXXX155NIHEATER ASSYXXX		
INCLUDES:XXX147NIELEMENT ASSYXXX148NICONTROL PANELXXX149NILIMIT SWITCHXXX150NILIMIT SWITCHXXX151NILIMIT SWITCHXXX152NISEQUENCERXXX153NIPLUG HOUSINGXXX154NIELECTRIC HEAT KIT (3KW)XXX155NIHEATER ASSYXXX155NIHEATER ASSYXXXINCLUDES:	X	X
147NIELEMENT ASSYXXX148NICONTROL PANELXXX149NILIMIT SWITCHXXX150NILIMIT SWITCHXXX151NILIMIT SWITCHXXX152NISEQUENCERXXX153NIPLUG HOUSINGXXX154NIELECTRIC HEAT KIT (3KW)XXX155NIHEATER ASSYXXX155NIHEATER ASSYXXX1NCLUDES: </td <td></td> <td></td>		
148NICONTROL PANELXXX149NILIMIT SWITCHXXX150NILIMIT SWITCHXXX151NILIMIT SWITCHXXX151NILIMIT SWITCHXXX152NISEQUENCERXXX153NIPLUG HOUSINGXXX154NIELECTRIC HEAT KIT (3KW)XXX155NIHEATER ASSYXXX155NIHEATER ASSYXXX1NCLUDES: </td <td>X</td> <td>X</td>	X	X
149         NI         LIMIT SWITCH         X	XX	X
150NILIMIT SWITCHXXX151NILIMIT SWITCHXXX152NISEQUENCERXXX153NIPLUG HOUSINGXXX154NIELECTRIC HEAT KIT (3KW)XXX155NIHEATER ASSYXXX155NIHEATER ASSYXXX10CLUDES:INCLUDES:INCLUDES:INCLUDES:INCLUDES:	X	X
151         NI         LIMIT SWITCH         X         X         X           152         NI         SEQUENCER         X         X         X           153         NI         PLUG HOUSING         X         X         X           154         NI         ELECTRIC HEAT KIT (3KW)         X         X         X           154         NI         ELECTRIC HEAT KIT (3KW)         X         X         X           155         NI         HEATER ASSY         X         X         X           155         NI CLUDES:         INCLUDES:         INCLUDES:         INCLUDES:	X	X
152         NI         SEQUENCER         X         X         X         X         X         153         NI         PLUG HOUSING         X </td <td>X</td> <td>X</td>	X	X
153         NI         PLUG HOUSING         X         X         X           154         NI         ELECTRIC HEAT KIT (3KW)         X         X         X         X           154         NI         ELECTRIC HEAT KIT (3KW)         X         X         X         X           155         NI         HEATER ASSY         X         X         X         X           155         NI         HEATER ASSY         X         X         X         X	X	X
154         NI         ELECTRIC HEAT KIT (3KW)         X         X         X         X         X         Image: Constraint of the state of the s	X	X
INCLUDES:	X	X
155 NI HEATER ASSY X X X INCLUDES:		CAR CONTRACTOR
INCLUDES:	X	X
		and the second stands
156 NI ELEMENTASSY X X X	X	X
157 NI CONTROL PANEL X X X	X	X
158 NI CIRCUIT BREAKER ASSY X X X	Х	X
INCLUDES:		
159 NI CIRCUIT BREAKER X X X	X	X
160 NI CIRCUIT BREAKER MOUNTING BASE X X X X	Х	X
161 NI ELECTRIC HEAT KIT (5KW) X X X	X	X
INCLUDES:	The second of the second second	and the second sec
162 NI HEATERASSY X X X	X	X
INCLUDES:		And the bound of the second
163 NI ELEMENTASSY X X X	X	X
164 NI CONTROL PANEL X X X X	x	X
165 NI CIRCUIT BREAKER BOX ASSY X X X X	X	X
INCLIDES:	Network Connector Length	Personal and a second se
165 NI CIBCUIT BREAKER X X X	X	X
167 NI CIBCUIT BREAKER MOUNTING BASE X X X	X	X
168 NI ELECTRIC HEAT KIT (/8KW) X X X	X	X
169 NI HEATER ASSY X X X	X	X
INCLUDES:		
170 NI ELEMENTASSY X X X	x	X
	X	X
	X	X
	<u>N</u>	
173 NI CIRCUIT BREAKER Y Y X X	X	X
174 NI CIBCUIT BREAKER MOUNTING BASE X X X	X	X
175 NI LIMIT SWITCH	X	X
	X	X
	->	->
		and the second
178 NI HEATER ASSY 3.05803.2	->	->
	and the second	1
170 NI ELEMENTASSY (2) 2.05556.010 (2)	->	(2) ->
	->	->
141 NI CIDCITE DE AKER BOY ASSY 2,05905-1		
122 NI CIRCUIT REFAKER HH827C007		
	->	->
	->	->
195 NIL SECUENCER HNS7CC006 ->	-> ->	->

Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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### licplecement Components Division

### DIRECT EXPANSION FAN COIL

SIZE: 018-060

40YR/YRM

**SERIES: 0** 

			40YRM048-300	40YRM048-300AJ	40YRM048-300AL	40YRM048-300CG	40YRM048-700
ITEM		PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50
		ACCESSORY GROUP (CONT'D)					
186	NI	ELECTRIC HEAT KIT (15KW)	40YA900161	->	•>	•>	*
		INCLUDES:		A CONTRACTOR OF CONTRACTOR	Second and the second second	and the second states of the second	and the second
187	NI	HEATER ASSY	3-05795-1	->	->	->	•>
1		INCLUDES:	and the second second				
188	NI	ELEMENT ASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
189	NI	CONTROL PANEL	2-05773-4	->	•>	->	•>
190	NI	CIRCUIT BREAKER BOX ASSY	2-05805-2	->	->	•>	->
		INCLUDES:					141
191	NI	CIRCUIT BREAKER	(2) HH83ZC007	(2) ->	(2) ->	(2) ->	(2) ->
192	NI	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
193	NI	SEQUENCER	HN62QC008	->	->	->	*>
194	NI	ELECTRIC HEAT KIT (20KW)	40YA900211	->	*	->	->
105	-	INCLUDES:	0.05700.4				-
195	NI	HEATERASSY	3-05/96-1	->	->	->	.>
100	-	INCLUDES:	(4) 0.05555.040	143	14	(4)	(1)
190	NI		(4) 2-05556-010	(4) ->	(4) ->	(4) ->	(4) -3
100	NI		2-05/73-5	->	->		
190		INCLUDES:	2-03003-2	.>			
100	NI		(2) 110270007	(2)	(2)	(2)	(2) ->
200	NI	CIRCUIT BREAKER MOUNTING BASE	(2) HH032C007	(2) ->		->	->
200	NI		HH12HV145			.>	
201	NI		HH1070000				The second
202	NI		UU107A040				and the second sec
203	NI	SEQUENCER	HN670G005				
204	NI	ELETRIC HEAT KIT (15KW)	40¥4900171			.>	
200	1	INCLUDES:	4017300171	1		The second second second second	
206	NI	HEATER HEATER ASSY	3-05791-2	-		.>	.>
200	1	INCLUDES:	000/01/2				and the second second
207	NI	FLEMENT ASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->	(3) ->
208	NI	CONTROL PANEL	2-05773-4	->	->	->	->
209	NI	FUSE BOX ASSY	2-05804-3	.>	.>	.>	.>
	1	INCLUDES:	2 00001.0			1	
210	NI	FUSE	(2) FRN-R30	(2) ->	(2) ->	(2) ->	(2) ->
211	NI	FUSE	(2) FRN-R60	(2) ->	(2) ->	(2) ->	(2) ->
212	NI	FUSE BLOCK	HY11UM461	->	->	->	•>
213	NI	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->	(3) ->
214	NI	SEQUENCER	HN67QG005	->	->	->	->
215	NI	ELECTRIC HEAT KIT (20KW)	40YA900221	->	->	->	->
		INCLUDES:	and the second				
216	NI	HEATER ASSY	3-05792-2	->	->	->	•>
		INCLUDES:				e galati ngan oleh bili bili bili bi	
217	NI	ELEMENT ASSY	(4) 2-05556-010	(4) ->	(4) ->	(4) ->	(4) ->
218	NI	CONTROL PANEL	2-05773-5	->	•>	->	->
219	NI	FUSE BOX ASSY	2-05804-4	->	->	->	->
		INCLUDES:		a the formation	and the second second		
220	NI	FUSE	(4) FRN-R60	(4) ->	(4) ->	(4) ->	(4) ->
221	NI	FUSE BLOCK	HY11UM601	->	->	->	->
222	NI	LIMIT SWITCH	HH19ZA940	->	->	->	->
223	NI	LIMIT SWITCH	HH19JA945	->	•>	->	->
100.1							



Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.



SIZE: 018-060

40YR/YRM

SERIES: 0

1000		and the second second	40YRM048-300	40YRM048-300AJ	40YRM048-300AL	40YRM048-300CG	40YRM048-700
TEM		PART DESCRIPTION	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	230-1-50
		ACCESSORY GROUP (CONT'D)		A PERSONAL PROPERTY AND INC.			
225	NI	ELECTRIC HEAT KIT (24KW)	40YA900271	.>		->	->
LLU	-	INCLUDES:					
226	NI	HEATER ASSY	3-05693-3	->	•>	->	->
		INCLUDES:					
227	NI	ELEMENT ASSY	(6) 2-05556-009	(6) ->	(6) ->	(6) ->	(6) ->
228	NI	CONTROL PANEL	3-05782	->	.>	->	->
229	NI	FUSE	(6) FRN-R60	(6) ->	(6) ->	(6) ->	(6) ->
230	NI	LIMIT SWITCH	(3) HH12HV151	(3) ->	(3) ->	(3) ->	(3) ->
231	NI	SEQUENCER	HN67QC007	->	->	->	->
232	NI	TERMINAL BLOCK	HY11UC125	->	->	->	->
233	NI	BLOCK	HY11UM465	->	.>	•>	->
234	NI	ELECTRIC HEAT KIT (30KW)	40YA900281	->	->	->	->
		INCLUDES:		and the second second		and the second second	
235	NI	HEATER ASSY	3-05793-4	->	->	->	->
		INCLUDES:					
236	NI	ELEMENT ASSY	(6) 2-05556-010	(6) ->	(6) ->	(6) ->	(6) ->
237	NI	CONTROL PANEL	3-05782	->	->	->	->
238	NI	FUSE	(6) FRN-R60	(6) ->	(6) ->	(6) ->	(6) ->
239	NI	LIMIT SWITCH	(3) HH12HV151	(3) ->	(3) ->	(3) ->	(3) ->
240	NI	SEQUENCER	HN67QC007	->	->	->	->
241	NI	TERMINAL BLOCK	HY11UC125	->	->	->	->
242	NI	BLOCK	HY11UM465	•>	->	->	->
				and the second second second second	an the second second second second		
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-	+			the second second second			

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.







SERIES: 0

101318	1	and the second	199	40YRM060-300 40YRM060-300AL		40Y	40YRM060-300CG		40YRM060-700	
ITEM		PART DESCRIPTION	and the second	208/230-1-60	12.	208/230-1-60	2	08/230-1-60		230-1-50
				214012 401				->		->
1				314912-401		->	2 . 194	->		•>
2			and the second	314913-401		.>	1000	->		->
3				314872-306	-			->		->
5	$\square$	PANEL ASSY INSU		314988-703	-	•>		->		->
6	$\vdash$	DOOR ASSY LOWER		314989-705		->	0.000	->		->
7		DOOR ASSY LIPPER	- 100 Dec. 100	314990-705		->		->		->
8		DOOR ASSY FITTING	1.052	314991-702		->		->		->
9		COIL SUPPORT SIDE	(2)	314958-402	(2)	->	(2)	•>	(2)	->
10		COIL SUPPORT REAR		314957-203		->		->	1000	->
11		BLOWER DECK		314896-404		->		->	1.1	->
12		DIFFUSER BAFFLE	(2)	314858-301	(2)	->	(2)	->	(2)	->
13		HEATER PLATE		314895-403		->	200	->	- 心脏水。	->
14		TIE ANGLE	Carl Hole	314867-303		->		->	1 1 1	->
15		GROMMET NUT	(2)	61631D7	(2)	->	(2)	->	(2)	->
16		SPRING		314868-301	a herein	->	in the second	->		•>
17		FILTER DOOR ASSY		315903-703	and the second	->		->	-	->
18		HOUSING BRACKET		314900-203		->		->		->
19		FRONT BRACKET		314914-201		->	- Alteria	->		->
20		REAR BRACKET		314915-201		->		->	1. 16	->
21		FITTING DOOR CLIP		314999-201		->	Sec. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	->	14	->
22		BREAKER,COVER		314981-201	1257	->	and here is a second	->	1.112	->
23	NI	LOGO		312250-405		->		->	100	->
24		EXTENSION, TUBE SHEET	ship and	X		X		X	and the	X
25		SUPPORT, COIL	100	X	12	Х		X	1	X
26		BRACKET,TXV		X	1	X		X	Sec. Sec.	X
27		BRACKET,TXV	1.1	X		X		X	1. 18	X
28		BRACKET, TOP COIL	E.	X		X	24	X		X
29		SHIELD, HEAT	1	315925-401		->		->		•>
30	NI	GROMMET		314985-301	and the second	->		->	_	->
31	NI	GROMMET	12. Carton	314987-201	State La	->	S. Barris	->		->
32	T	COIL BRACKET		X		X		X	and the second	X
33		COIL BRACKET		314879-301	1.0	->		->	1 2 3	->
34		COIL BRACKET		314879-302		->	per partie	->	100	->
35		FILTER PLATE		X		X	1.1	X		X
36		CHANNEL COND		X		X		X	-	X
37	N	DRAIN FITTING	ALC: NO.	316809-202	1.1	->		->		->
38	N	DRAIN FITTING		316809-201	- danis	->	1.	->		•>
39		DRIP BAFFLE	(2)	316834-204	(2)	->	(2)	->	(2)	*
		ELECTRICAL GROUP								LITALD CODA
41		TRANSFORMER		HT01BD208		->	101 (1952)	->	-	H101BF230
42		PRINTED CIRCUIT BOARD	A States	HK61GA001	and the second	•>		->	_	->
43		GROUND LUG		HY90AZ021		->	and the second	->	-	->
44		LOW VOLTAGE TERM.BOX		3-05772	Sec. all	->	1.1	->		->
45		FUSE		ATC5		->		->		->
		FAN AND MOTOR GROUP								010001 701
46		BLOWER ASSY (COMPLETE)		316804-757		->	States.	->		316804-764
		INCLUDES:		alter and the second	State of the second	1. J. W. St. 199				- The particular in
47		HOUSING ASSY	Sec. 19 Stort	316803-755		->		->		->
48		BLOWER WHEEL	A STREET	LA22LA094	S. Sales	->	1.	->		->
49		MOTOR, FAN	4	HC45AE202	1.1	->		->		HC45AE204
50		CAPACITOR		P291-1503		->		->	-	->
51		PROTECTIVE BOOT	Section and the	P281-0002		->		->	_	->
52		STRAP, CAPACITOR	And the second	P281-0022	and waters	->	101	->	10	->
53		ARM MOTOR MOUNT	(3)	HC98ZZ250	(3)	->	(3)	->	(3)	.>
54		BAND MTR MOUNT		P251-0078	See Sector	->		->	(0)	.>
55	T	GROMMET	(3)	P251-0079	(3)	->	(3)	->	(3)	->



#### Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.



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## DIRECT EXPANSION

FAN COIL

40YR/YRM SIZE: 018-060

SERIES: 0

ITEM	10	PART DESCRIPTION	40YRM060-300 208/230-1-60	40YRM060-300AL 208/230-1-60	40YRM060-300CG 208/230-1-60	40YRM060-700 230-1-50
		COIL AND PIPING GROUP		Statistics of the state of the state of the		
56		COIL ASSY (COMPLETE)	316822-756	->	->	->
		INCLUDES:		in a state and a state of		
57		VALVE THERMO EXPANSION	×	X	X	X
58		DISTRIBUTOR	EA08QD114	->	->	->
59		CONDENSATE TROUGH	316236-201	->	->	->
60		CONDENSATE ASSY	316241-702	->	->	->
61		CONDENSATE TROUGH	316236-202	(2) ->	->	->
62		CONDENSATE PAN SHIELD	(2) 314925-301	(2) ->	(2) ->	(2) ->
63		CONDENSATE PAN	314880-403	->	->	->
64		CONDENSATE PAN	315907-703	->	->	->
65		PLUG,PLASTIC	(3) LF39RZ021	(3) ->	(3) ->	(3) ->
66	NI	RETAINER	AU35QA272	->	->	->
67	NI	PISTON	EA52PH098	->	->	->
68	NI	PISTON BODY	300497-201	->	->	->
69	NI	STRAINER	KH11HH066	->	->	->
70		ELECTRIC HEAT GROUP		0.05700.1	0.05000.0	×
70		HEATER ASSY (COMPLETE)	×	3-05/92-1	3-05802-2	^
74	-	ELEMENT ACOV		(4) 0.055550.040	(0)	×
70	NI	CONTROL DANE	÷	(4) 2-05556-010	(2) ->	
72	NI	LINE SWITCH	X	2-05/73-5	2-05/73-0	÷
73	NI			HH19ZA940	(2) HH192A950	÷
75	NI		×	HH19ZA940	~~~~~	÷
75	NI	SEQUENCED		HH12HV145		÷
70	NI		÷	HNB/QG005	HNO/QC000	
70	INI	FLOG HOUSING	÷	HTUDAMU12	->	Ŷ
10		INCLUDES:	^	2-03804-2	^	^
70	NI	COVER FUSE	×	2.05784	×	X
80	NI	FUSE		(2) NON-20	Ŷ	Ŷ
81	NI	FLISE	Ŷ	(2) NON-20	× ×	Ŷ
82	NI	FUSE BLOCK	Ŷ	HY11LIM601	x	X
0L		FILTER GROUP		THIT I DINGOT		and the second
83		FILTER RACK ASSY	X	X	X	X
		INCLUDES:				
84		FILTER	315914-403	->	->	->
85		GRILLE FILTER	X	X	X	X
86		FILTER RACK	X	X	X	X
87		RETAINER FILTER	X	X	X	X
		ACCESSORY GROUP		the second later we will be the fact the second		
88	NI	TWO SPEED RELAY	40YA900351	->	->	->
		INCLUDES:		the second s	The second second in the second second second second	
89	NI	RELAY 2 SPEED	HN61PJ024	->	->	->
90	NI	TIME DELAY RELAY	40YA900361	->	->	->
		INCLUDES:				
91	NI	RELAY, TIME DELAY	HN67GJ002	->	•>	->
92	NI	DISCONNECT KIT	40YA900371	->	->	->
		INCLUDES:			and the second state of th	in the second
93	NI	DISCONNECT ASSY	2-05896-1	->	->	->
94	NI	DISCONNECT	HR61ZZ001	->	->	->
95	NI	DISCONNECT	HR61ZZ002	.>	->	->
96	N	LATENT CAPACITY CONTROL	40YA900381	->	->	->
	1	INGLUDES:				-
9/	NI	SWITCH, HUMIDISTAT	3-05464	->	->	
98	INI	RELAT, IWO SPEED	HN61PJ024	->	->	->->
99	INI	INCLIDES:	X		^	
100	All	ELEMENT ASSY HEEL LEAT OF OTH		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
100	NI	ELEMENT ASST SEE HEAT SECT	40¥4000091	×	^	
101	IN	INCLUDES:	401A900001		.,	
102	NI	FI FMENT ASSY "SEE HEAT SECT"	3-05802-1		· · · ·	د.
LIVE	1141	LELINE HOUT OLL ILAI JEUT	0.0002-1			

Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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40YR/YRM SIZE: 018-060

SERIES: 0

	14	- Normania	40YRM060-300	40YRM060-300AL	40YRM060-300CG	40YRM060-700
TEM		PART DESCRIPTION	208/230-1-60	208/230-1-60	206/230-1-60	250-1-50
	ACCESSORY GROUP (CONT'D)					
03	NI	ELECTRIC HEAT KIT (10KW)	40YA900101	->		
	-	INCLUDES:	0.05000.0			
04	NI	ELEMENT ASSY "SEE HEAT SECT"	3-05802-2	->		->
05	N	ELECTRIC HEAT KIT (15KW)	40YA900151	->		
		INCLUDES:	0.05701.1			
06	INI	ELEMENT ASSY SEE HEAT SECT	3-05/91-1		->	->
07		ELECTRIC HEAT KIT (20KW)	401A900201			a later be standed in
00	1.11	ELEMENT ACCY "CEE HEAT CECT"	2.05702.1		->	->
00	NI	ELEMENT ASST SEE HEAT SECT	4074900301		->	•>
09	1	INCLUDES:	4017300001			e
10	NI	HEATER ASSY	3-05801-1	->	->	->
10	1	INCLUDES:	0000011	The second s	1 marting	
11	NI	FLEMENT ASSY	(3) 2-05556-008	(3) ->	(3) ->	(3) ->
12	NI	CONTROL PANEL	2-05773-4	->	->	->
13	NI	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->
14	NI	SEQUENCER	HN67QG005	->	->	->
15	NI	ELECTRIC HEAT KIT (15KW)	40YA900311	->	->	->
	1	INCLUDES:			The second second second	and the second second
16	NI	HEATER ASSY	3-05801-2	->	->	->
		INCLUDES:		The second second second	and the set of the second s	CARLE IA LOUGH COMMENT
17	NI	ELEMENT ASSY	(3) 2-05556-010	(3) ->	(3) ->	(3) ->
18	NI	CONTROL PANEL	2-05773-4	->	->	->
19	NI	LIMIT SWITCH	(3) HH19ZA930	(3) ->	(3) ->	(3) ->
20	NI	SEQUENCER	HN67QG005	->	->	->
21	NI	ELECTRIC HEAT KIT (18KW)	40YA900321	->	->	*
		INCLUDES:		the state of the second second		1
22	N	HEATER ASSY	3-05798-1	->	->	->
		INCLUDES:		A CONTRACTOR OF	and the second	
23	N	ELEMENT ASSY	(6) 2-05556-008	(6) ->	(6) ->	(6) ->
24	N	CONTROL PANEL	3-05782	->	->	->
25	N	LIMIT SWITCH	(3) HH12HV151	(3) ->	(3) ->	(3) ->
26	N	SEQUENCER	HN67QC007	->	->	->
27	N	ELECTRIC HEAT KIT (24KW)	40YA900251	->	->	
		INCLUDES:	A State of the second s			
28	N	HEATER ASSY	3-05793-1	->	->	->
3		INCLUDES:	and the second			10
29	N	ELEMENT ASSY	(6) 2-05556-009	(6) ->	(6) ->	(6) ->
30	N	CONTROL PANEL	3-05782	->	->	->
131	N	FUSE	(6) FRN-R60	(6) ->	(6) ->	
32	N	LIMIT SWITCH	(3) HH12HV151	(3) ->	(3) ->	
33	N	SEQUENCER	HN67QC007	->		
34	N	I TERMINAL BLOCK	HY11UC125			
35	N		HT11UM465	*		
36	N	ELECTRIC HEAT KIT (30KW)	401A900261	->		State State of
07	-	INGLUDES:	2.05702.0			->
3/	IN	INCLUDES:	3-05/93-2			A AND STORES
00	-	ELEMENT ASSY	(6) 2,05556,010	(6)	(6) ->	(6) ->
30	N		2-0550-010			.>
39	N		(6) EBN-B60	(6) .>	(6) ->	(6) ->
40	N	LIMIT SWITCH	(3) HH12HV151	(3) ->	(3) ->	(3) ->
41	N	SEQUENCER	HN670C007	->	->	->
42	N	TERMINAL BLOCK	HY11UC125		->	->
	- NI	BLOCK	HY1111M465	->	.>	->



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Catalog No.: 40.024 (9-90)

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

## Beplacement Components Division

# DIRECT EXPANSION

SIZE: 018-060

40YR/YRM

SERIES: 0

		and the second second second		40YRM060-300	40	YRM060-300AL	40)	RM060-300CG	4	0YRM060-700
ITEM		PART DESCRIPTION		208/230-1-60		208/230-1-60		208/230-1-60	and the second second	230-1-50
		ACCESSORY GROUP (CONT'D)	the state							
145	NI	ELECTRIC HEAT KIT (3KW)		X		X		X		X
		INCLUDES:								
146	NI	HEATER ASSY		X		X		X		X
		INCLUDES:				and the second second		and the second second		
147	NI	ELEMENT ASSY		X		X	1.1	Χ.	-	X
148	NI	CONTROL PANEL		X		X		X	-	X
149	NI	LIMIT SWITCH	-	X		X	a state of the	X		X
150	NI	LIMIT SWITCH		X		X	_	X		<u>X</u>
151	NI	LIMIT SWITCH		X	and the second	X	and strengthered	X	-	X
152	NI	SEQUENCER		X		X		X	_	X
153	NI	PLUG HOUSING	-	<u>X</u>		X		X		X
154	NI	ELECTRIC HEAT KIT (3KW)	-	X		X	S. Jackson	X		<u>X</u>
1		INCLUDES:				en al anna an a				Constant Section 19
155	NI	HEATER ASSY		X	_	X	at an air	X	-	<u>X</u>
-		INCLUDES:	-				- Aller		and the second	and the second second
156	NI	ELEMENT ASSY		X		X		X		X
157	NI	CONTROL PANEL	-	X		X	No. Part and	X	_	X
158	NI	CIRCUIT BREAKER ASSY		X		X		X	at from the second	<u>X</u>
and the second		INCLUDES:		a la sur de la serie de la					- Charles	Contraction of the second
159	NI	CIRCUIT BREAKER		X		X		X		X
160	NI	CIRCUIT BREAKER MOUNTING BASE		X		X		X		X
161	NI	ELECTRIC HEAT KIT (5KW)		X	Constantine State	X		<u>X</u>		<u>X</u>
-		INCLUDES:						The operation of the second	and the state of the	and the second second
162	NI	HEATER ASSY		X		X	and the second of	X	Contraction of the	X
		INCLUDES:			1000	A STREET			and the second second	a gala a constante
163	NI	ELEMENT ASSY		X		X		X		X
164	NI	CONTROL PANEL		X		X		X	_	X
165	NI	CIRCUIT BREAKER BOX ASSY		X	Section of the section of the section	X	WARRAND STREET, ST	X		X
		INCLUDES:					-			
166	NI	CIRCUIT BREAKER		X		X		X	Section of the	X
167	NI	CIRCUIT BREAKER MOUNTING BASE		X		<u>X</u>		X		X
168	NI	ELECTRIC HEAT KIT ((8KW)		X X	1000	X		X		X
		INCLUDES:								
169	NI	HEATER ASSY		X	1	X	19 1. 19 19 19 19 19 19 19 19 19 19 19 19 19	X		X
	-	INCLUDES:								
170	NI	ELEMENTASSY		X		X		<u>X</u>	-	<u>X</u>
1/1	NI	CONTROL PANEL		X	_	X	-	X		<u>X</u>
172	NI	CIRCUIT BREAKER BOX ASSY	-	X		X		X		Χ
	-	INCLUDES:							1.	v
173	NI	CIRCUIT BREAKER		X		<u> </u>		<u>X</u>		<u>X</u>
1/4	NI	CIRCUIT BREAKER MOUNTING BASE		X		X		<u>X</u>		<u>×</u>
1/5	NI	LIMITSWITCH		<u>X</u>		<u> </u>		<u>X</u>		<u>X</u>
1/6	NI	SEQUENCER	1.000	X	and the second second	<u>X</u>		<u>×</u>		^
1//		ELECTRIC HEAT KIT (10KW)		40YA900111		->		->		•>
170	1	INCLUDES:		0.05000.0					-	
1/8	NI	INCLUDES:	-	3-05803-2		->		->		
170		ELEMENT ACCV	10	0.05556.040	10		(0)		(0)	
1/9	N	CONTROL DANIEL	(2)	2-05556-010	(2)	->	(2)	->	(2)	*>
180	NI	CIDCUIT DE AVEC DOV ACOV		2-05//3-6		->		->		->
181	INI	INCLUDES:	-	2-05805-1		->		->		•>
100	h		2	1110070007	•		-			
102	NI			HH0477004		->		.,		
103	INI	LIMIT SWITCH	10	HH9422001	10	->	(0)	->	(2)	.,
104			(2)	HNG70C000	(2)	->	(2)	~>	12	.>
105	LINI	SEQUEINGEN	1			•>		.,		-/

Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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# DIRECT EXPANSION



SERIES: 0

	1	NUMBER OF THE SECTION		40YRM060-300		40YRM060-300AL		40YRM060-300CG		40YRM060-700	
ITEM		PART DESCRIPTION	1. 1. 1. 1.	208/230-1-60		208/230-1-60	the south of	208/230-1-60	C. S. S. S. S.	230-1-50	
		ACCESSORY GROUP (CONT'D)									
186	NI	ELECTRIC HEAT KIT (15KW)		40YA900161		->	and the state	*		->	
		INCLUDES:			-				_		
187	NI	HEATER ASSY		3-05795-1		->	_	->	-	•>	
		INCLUDES:						1011			
188	NI	ELEMENT ASSY	(3)	2-05556-010	(3)	->	(3)	•>	(3)	*	
189	NI	CONTROL PANEL	and the second	2-05773-4	(12) (12) (12) (12) (12) (12) (12) (12)	->	-	•>		*>	
190	NI	CIRCUIT BREAKER BOX ASSY	100000	2-05805-2	e de construire	->	-	->		*>	
		INCLUDES:						Array Array (Array)	(0)	and the second second second	
191	NI	CIRCUIT BREAKER	(2)	HH83ZC007	(2)	•>	(2)	->	(2)	~>	
192	NI	LIMIT SWITCH	(3)	HH19ZA930	(3)	->	(3)	->	(3)	->	
193	NI	SEQUENCER	-	HN62QC008	_	->	-	->		->	
194	NI	ELECTRIC HEAT KIT (20KW)	1. 1.	40YA900211		->		*	-	->	
		INCLUDES:	1		_						
195	NI	HEATER ASSY		3-05796-1		->	-	->	-	->	
100		INCLUDES:	1.0			in the second second	10	and the second second	(4)		
196	NI		(4)	2-05556-010	(4)	•>	(4)	->	(4)		
197	NI	CONTROL PANEL		2-05//3-5		->		->			
198	NI	CIRCUIT BREAKER BOX ASSY		2-05805-2	1.	->	1. 191	.,			
100			(0)	UU0070007	(2)		(2)	~	(2)		
199	NI		(2)	HH832C007	1(2)	->	(2)		14		
200	NI	LINIT SWITCH				-7		~			
201	NI			HH1074040						•>	
202	NII		-	HH1074040	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)			->			
203	NI	SECHENCER	-	HN670G005			-	.>	C	•>	
204	NII			100700000		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	-	->	10.10	->	
205		INCLUDES:		4017300171		State of the local state of the					
206	NI	HEATED HEATED ASSY		2.05701.2		~		->	Constant of the second	->	
200	1 M	INCLUDES:		5-05751-2	10.1 10.000			CARGE CONTRACTOR	1.15	Section and the section of the	
207	NI	ELEMENT ASSY	(3)	2-05556-010	(3)	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	(3)	->	(3)	•>	
208	NI	CONTROL PANEL	10	2-05773-4	10/			->	1-1	->	
209	NI	FUSE BOX ASSY		2-05804-3		->	1	->	Call State State	->	
200		INCLUDES:	1000	2 0000 + 0			and the set	State State State	and the second s	- Andrewski - A	
210	NI	FUSE	(2)	FBN-B30	(2)	->	(2)	->	(2)	->	
211	NI	FUSE	(2)	FRN-R60	(2)	->	(2)	->	(2)	->	
212	NI	FUSE BLOCK	1-1	HY11UM461		->		->		->	
213	NI	LIMIT SWITCH	(3)	HH19ZA930	(3)	->	(3)	->	(3)	->	
214	NI	SEQUENCER		HN67QG005		->	1	->	Constraint and	->	
215	NI	ELECTRIC HEAT KIT (20KW)	a series	40YA900221	and the second	->		->		->	
1.35		INCLUDES:	and the	and the second of the	J. A. Strand	and the state of the		Constant and the second	_		
216	NI	HEATER ASSY		3-05792-2	The second second	->		->		->	
Soletona		INCLUDES:									
217	NI	ELEMENT ASSY	(4)	2-05556-010	(4)	->	(4)	->	(4)	->	
218	NI	CONTROL PANEL		2-05773-5	Sec. Sec.	->		->		->	
219	NI	FUSE BOX ASSY		2-05804-4		->	1 1 1 1 1	->	-	•>	
		INCLUDES:				Sec. 10 Sec.	10-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	and the second		and the second	
220	NI	FUSE	(4)	FRN-R60	(4)	->	(4)	->	(4)	*>	
221	NI	FUSE BLOCK		HY11UM601	11000	->	1.	->		->	
222	NI	LIMIT SWITCH		HH19ZA940		->		->		->	
223	NI	LIMIT SWITCH	-	HH19JA945	-	->		->	-	•>	
224	NI	SEQUENCER	1000	HN67QG005		->		->	1	•>	



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Note: See "Catalog Notes " on last page for explanation of symbolism.



### DIRECT EXPANSION FAN COIL

## 40YR/YRM SIZE: 018-060 SERIES: 0

	123	and the second second second second	et apply and the	40YRM060-300	40	YRM060-300AL	40	YRM060-300CG	4	0YRM060-700
ITEM		PART DESCRIPTION		208/230-1-60		208/230-1-60		208/230-1-60		230-1-50
		ACCESSORY GROUP (CONT'D)			15. MAR					
225	NI	ELECTRIC HEAT KIT (24KW)		40YA900271		->		->		->.
		INCLUDES:				an all start and a start and a start a			and and the	and the second second
226	NI	HEATER ASSY		3-05693-3		->		•>		->
		INCLUDES:				internation and the second		a section and the section of the sec	and the second	Second Street Street
227	NI	ELEMENT ASSY	(6)	2-05556-009	(6)	->	(6)	->	(6)	->
228	NI	CONTROL PANEL		3-05782		->		->		->
229	NI	FUSE	(6)	FRN-R60	(6)	->	(6)	->	(6)	->
230	NI	LIMIT SWITCH	(3)	HH12HV151	(3)	->	(3)	->	(3)	->
231	NI	SEQUENCER		HN67QC007	11.10	->		->	and the second	>
232	NI	TERMINAL BLOCK		HY11UC125		->		•>		->
233	NI	BLOCK		HY11UM465		->		*>		->
234	NI	ELECTRIC HEAT KIT (30KW)		40YA900281		->		•>	A State	->
		INCLUDES:								10 10 10 10 10 10 10 10 10 10 10 10 10 1
235	NI	HEATER ASSY	in the second	3-05793-4		->		->	. Allenand	->
		INCLUDES:						A REAL PROPERTY.	_	A State State
236	NI	ELEMENT ASSY	(6)	2-05556-010	(6)	->	(6)	->	(6)	->
237	NI	CONTROL PANEL		3-05782		->		->	a shared be	->
238	NI	FUSE	(6)	FRN-R60	(6)	->	(6)	->	(6)	->
239	NI	LIMIT SWITCH	(3)	HH12HV151	(3)	->	(3)	->	(3)	->
240	N	SEQUENCER		HN67QC007		->		->		->
241	NI	TERMINAL BLOCK	•	HY11UC125		->		->		->
242	NI	BLOCK		HY11UM465		->		->		->

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Supersedes: NEW

Note: See "Catalog Notes " on last page for explanation of symbolism.

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#### ORDERING INSTRUCTIONS

- 1. All orders should include the complete model and serial number of the unit on which the parts are to be used, and the part number and description of each part.
- 2. Dealers should forward orders to their Carrier distributor.

#### **GENERAL NOTES**

- 1. This catalog contains those items most commonly required for replacement purposes. If parts other than those cataloged are required, please provide the model number and serial number of the unit on which the parts are to be used and a complete description including references to items which are cataloged.
- 2. Casing parts and panels are not normally stocked, but are available upon request while in production. Requests for casing parts and panels for units no longer in production must be cleared for availability prior to submitting an order.
- Complete "Accessory Packages" of "F.I.O.P.'s" (Factory-Installed Option Plan) are not normally stocked or supplied by the Replacement Components Division. (Refer to Master Price Pages and order from your normal source for finished goods.)

Accessory packages and F.I.O.P.'s are listed in this catalog only for reference and to assist in the selection and ordering of replacement components.

 The replacement parts listed in this catalog are RCD "Factory-Authorized Parts" and, as a result of "standardization," may not be identical to the original part furnished on the equipment.

#### CATALOG NOTES

- 1. The part number in the model column indicates the part number required for that model, size and/or voltage.
- 2. An arrow  $\rightarrow$  in the model column indicates that the model, size, and/or voltage uses the same part number as the part number shown to the left.
- 3. An X in the model column indicates that the part is not used on that model, size and/or voltage.
- 4. A number in parenthesis before the part number indicates the quantity required for that model, size, and/or voltage. Part number only in the column indicates a quantity of one.
- 5. The notation "NI" following the item number indicates that the item is not illustrated in the catalog.



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ECHNOLOGIES ARRIER



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## **TAB PLACEMENT HERE**

## **DESCRIPTION:**

38AEO12



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## Installation, Start-Up and Service Instructions

Carrier Corporation . Syracuse, N.Y. 13221

# **Air-Cooled Condensing Units**

#### INSTALLATION

#### Step 1 — Complete Pre-Installation Checks

**Uncrate Unit** — Remove unit packaging except for the top skid assembly, which should be left in place until after the unit is rigged into place.

**Inspect Shipment** — File claim with shipping company if shipment is damaged or incomplete.

#### **Consider System Requirements**

• Consult local building codes and National Electrical Code (NEC) for special installation requirements.

- Allow sufficient space for airflow clearance, wiring, refrigerant piping, and servicing unit. See Fig. 1.
- Locate unit so that condenser airflow is unrestricted on all sides and above.
- Unit may be mounted on a level pad directly on the base channels or mounted on raised pads at support points. See Table 2 for weight distribution based on recommended support points.

NOTE: If vibration isolators are required for a particular installation, use the data in Table 2 to make the proper selection.



### Fig. 1 — Physical Data and Dimensions (ft-in.)

588

#### → Table 1 — Physical Data

UNIT 38AE	012	014	016
OPER WEIGHT (Ib)	732	779	789
REFRIGERANT*	22	22	22
COMPRESSOR	Recipr	ocating Hermetic 6 Cylinder; 17	50 Rpm
Model No.	06DD824	06DD328	06DD537
Oil (pts)	10	10	10
Crankcase Heater Watts Unloader Setting	75	75	75
Load	70 ± 1 psig	70 ± 1 psig	70 ± 1 psig
Unload	60 ± 2 psig	60 ± 2 psig	60 ± 2 psig
OUTDOOR AIR FANS	And the second second second second second	Axial Flow; Direct Drive	and the second second second
NoRpm	21075	21075	21075
Diameter (in.)	24	24	24
Motor Hp (NEMA)	1/2	1/2 -	1/2
Nominal Cfm Total	8800	8800	8800
CONDENSER COIL			
Face Area (sq ft)	29.2	29.2	29.2
Storage Capacity (Ib)†	27.2	40.3	39.8
CONTROLS	A state of the second second second		at the second standard the
Pressurestat Settings	205 + 10	005 1 40 1	
High Cutout	395 ± 10 psig	395 ± 10 psig	395 ± 10 psig
Cut-In		295 ± 10 psig	295 ± 10 psig
Low Cutout		29 I 4 psig	$29 \pm 4$ psig
Cut-in	$60 \pm 0^{15}$ psig	60 ± <sup>15</sup> <sub>0</sub> psig	$60 \pm 0^{15}$ psig
FUSIBLE PLUG	200 F	200 F	200 F

\*Unit is factory supplied with holding charge only.

+Storage capacity is measured at liquid saturated temperatures of 125 F for 38AE012; 123 F for 38AE014; and 130 F for 38AE016.





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2

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Table 2 — Weight Distribution



Step 2 — Rig and Mount the Unit

CAUTION: Be sure unit panels are securely in place prior to rigging.

**Rigging** — These units are designed for overhead rigging only. For this purpose, the transverse base channels extend beyond the sides of the unit, with holes provided in end plates to attach cables or hooks. Rig with top skid packaging assembly in place to prevent unit damage by the rigging cable. As further protection for the coil faces, plywood sheets may be placed against the sides of the unit, behind the cables. Run the cables to a central suspension point so that the angle from the horizontal is not less than 45 degrees. Raise and set the unit down carefully.

If it is necessary to roll the unit into position, mount the unit on longitudinal rails, using a minimum of 3 rollers. APPLY FORCE TO THE RAILS, NOT THE UNIT. If the unit is to be skidded into position, place it on a large pad and drag it by the pad. DO NOT APPLY ANY FORCE TO THE UNIT.

Raise from above to lift unit from the rails or pad when unit is in final position.

**Compressor Mounting** — As shipped, the compressor is held tightly in place by self-locking bolts. BEFORE STARTING UNIT, LOOSEN SELF-LOCKING BOLTS UNTIL THE FLANGED WASHER IS STILL SNUG BUT CAN BE MOVED SIDEWAYS WITH FINGER PRES-SURE. DO NOT REMOVE SHIPPING BOLTS.

## Step 3 — Complete Refrigerant Piping Connections

**Size Refrigerant Lines** — Consider the length of piping required between condensing unit and evaporator, the amount of liquid lift, and compressor oil return. See Table 3 and also refer to Part 3 of Carrier System Design Manual for design details and line sizing. Refer to evaporator installation instructions for additional information. Table 3 — Liquid Line Data

	MAX		LIQUID LIN	E second and second
UNIT 38AE	ALLOW. LIQUID LIFT (ft)	Max Allow. Press. Drop (psi)	Max Allow. Temp Loss (F)	Filter Drier and Sight Glass Flare Conn.* (in.)
012	52	7	2	5/8
014	67	7	2	5/8
016	82	7	2	5/8

\*Inlet and outlet.

NOTE: Figures shown are for units operating at  $45 \,\text{F}$  saturated suction and  $95 \,\text{F}$  entering air.

Use Filter Drier and Moisture Indicator — Every unit should have a filter drier and liquidmoisture indicator (sight glass). Various types of filter driers are available, and because of different preferences, they are not factory supplied. Select the filter drier for maximum unit capacity and minimum pressure drop. Install the filter drier in the common liquid line just before the expansion valves. Install a field-supplied moisture-indicating sight glass just after the unit liquid line shutoff valve.

**Do Not Use a Receiver** — No receiver is provided with the unit. It is recommended that one NOT be used.

**Make Piping Connections** — Do not remove plastic dust plugs from suction and liquid line stubs in the compressor compartment until piping connections are ready to be made. Pass nitrogen or other inert gas through piping while brazing to prevent formation of copper oxide.

Install field-supplied thermostatic expansion valve(s) to evaporator section. If 2 thermostatic expansion valves are installed for 2-step cooling, install field-supplied liquid line solenoid valve ahead of the second expansion valve.

**Provide Safety Relief** — A fusible plug is located on the compressor crankcase (Fig. 3). Do not cap this plug. If local code requires additional safety devices, install them as directed.



Fig. 3 — Location of Fusible Plug

#### Step 4 — Complete Electrical Connections

**Power Wiring** — Unit is factory wired for voltage shown on nameplate. Provide adequate fused disconnect switch within sight of unit, readily accessible, but out of the reach of children. Provision for locking switch open (off) is advisable to
prevent power from being turned on while unit is being serviced. Disconnect switch, fuses, and field wiring must comply with National Electrical Code and local code requirements.

Route power wires through opening in unit end panel to connection in unit control box as shown on unit label diagram and Fig. 4. Unit must be grounded.

Affix crankcase heater warning sticker to unit disconnect switch.





---- Field Wiring

Fig. 4 — Main Power Supply Wiring

**Control Circuit Wiring** — Control voltage is 24 volts. See Fig. 5 and unit label diagram for field-supplied wiring details. Route control wires through

opening in unit end panel to connection in unit control box.





#### LEGEND

C — Compressor Contactor

- HD Heating Device
- IFC Indoor Fan Contactor
- LLSV Liquid Line Solenoid Valve R — Relav

---- Field Wiring

#### NOTES:

- 1. Combination LLSV plus IFC
- va should not exceed 30 va. 2. Do not exceed 5 va (24 vac)

per coil.

Use accessory relay — transformer package 38AE900001 if these va values must be exceeded.

### Fig. 5 — Remote Thermostat Wiring

COMPR UNIT FAN MOTORS (1-Ph) Volts FLA (ea) **38AE** MOCP Total Fan No. Supplied\* MCA RLA LRA kW Model (Fuse) Fans Nameplate 2 Min Max 1 253 62.5 100 43.6 4.3 3.7 501 208-230 187 170 20.0 528 2 1.41 012 601 460 414 29.1 40 77 2.3 1.9 101 575 518 660 22.8 35 15.7 62 1.8 1.8 208-230 187 253 69.3 100 49.3 191 4.3 3.7 501 014 601 460 414 528 31.7 50 22.1 80 2 2.3 1.9 1 41 575 518 660 25.6 40 17.9 69 1.8 1.8 101 87.5 125 63.6 266 3.7 187 253 4.3 501 208-230 460 414 528 40.7 60 29.3 120 2 2.3 1.9 1.41 016 601 518 660 33.0 50 23.8 96 1.8 101 575 1.8

Table 4 — Electrical Data (3-Ph/60 Hz)

FLA — Full Load Amps (fan motors)

kW - Total Fan Motor Power Input (kilowatts)

LRA — Locked Rotor Amps

MCA - Minimum Circuit Amps per NEC Section 430-24

**MOCP** — Maximum Overcurrent Protection

RLA — Rated Load Amps (compressor)

\*Units are suitable for use on electrical systems where voltage supplied to the unit terminals is not below or above the listed limits.



### START-UP

**Evacuate and Dehydrate** the entire refrigerant system by either of the methods described in Carrier Standard Service Techniques Manual, Chapter 1, Section 1-7.

Leak Test the entire refrigerant system by the pressure method described in Carrier Standard Service Techniques Manual, Chapter 1, Section 1-6. Use R-22 at approximately 25 psig backed up with an inert gas to a total pressure not to exceed 245 psig.

Before starting the unit, the crankcase heaters must be on for 24 hours to be sure all the refrigerant is out of the oil. To energize the crankcase heaters, proceed as follows: set the space thermostat above ambient so there will be no demand for cooling. Close the field disconnect and turn the fan circuit breaker on. Leave the compressor circuit breakers off. The crankcase heaters are now energized.

Before Starting Unit check the following:

- 1. Compressor oil level must be at least within sight in the compressor sight glass. Add oil if necessary (see Table 1 and Oil Charge).
- 2. Compressor holddown bolts must be snug but not tight. Refer to Compressor Mounting and tag on compressor foot.
- 3. All internal wiring connections must be tight; all barriers and covers must be in place.
- 4. Electrical power source must agree with unit nameplate rating.
- 5. All service valves must be open.
- 6. Crankcase heater must be firmly locked into the compressor crankcase.

**Preliminary Charge** — Refer to Carrier Standard Service Techniques Manual, Chapter 1, Section 1-8. By the liquid charging method and charging by weight procedure, charge the units with approximately the following amounts of R-22: 38AE012, 22 lb; 38AE014, 23 lb; 38AE016, 23 lb. See Table 5.

Table 5 — Charging Data (R-22)

UNIT 38AE	REFRIGERANT	REFRIGERANT CHARGE (Ib)					
	Required Charge Above Clear Sight Glass	Cond Unit Total Charge (Approx)	TEMP DURING CHARGING (F)				
012	3.0	22	125				
014	4.8	23	123				
016	3.4	23	130				

**Start the Unit** — The field disconnect is closed, the fan circuit breaker is closed and the space thermostat is set above ambient so that there is no demand for cooling. Only the crankcase heaters are energized. After the heaters have been on for 24 hours, the unit can be started.

Close the compressor circuit breakers, and then reset the space thermostat *below* ambient, so that a call for cooling is ensured. **Energize Branch Circuit** — Set room thermostat above ambient. Close field disconnect switch. Be sure that compressor crankcase heaters are operating. Allow crankcase heaters to operate a minimum of 24 hours before starting unit.

**To Start Unit** set room thermostat below ambient. After starting unit there will be a delay of at least 15 seconds before compressor starts.

→ Oil Charge (Table 1) — Allow unit to run for about 20 minutes. Stop unit and check compressor oil level. Add oil only if necessary to bring oil into view in sight glass. Use only Carrier-approved compressor oil. Approved oils are:

Witco Chemical Corp.		 	 		Sı	inis	50	3GS
Texaco, Inc	 	 					W	F32
Shrieve Chemical Co.		 				Ze	rol	150
					(5	Svr	th	etic)

Do not reuse drained oil or use any oil that has been exposed to atmosphere. Procedures for adding or removing oil are given in Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants.

If oil is added, run unit for additional 10 minutes. Stop unit and check oil level. If level is still low, add oil *only after* determining that piping system is designed for proper oil return and that the system is not leaking oil.

**Check Operation** of all safety controls. Replace all service panels. *Be sure that control panel cover is closed tightly.* 

# SERVICE

**Capacity Control** — A suction pressure-actuated unloader controls 2 cylinders and provides capacity control. Unloaders are factory set (see Table 1), but may be field adjusted:

CONTROL SET POINT (cylinder load point) is adjustable from 0 to 85 psig. To adjust, turn control set point adjustment nut (Fig. 6) clockwise to its bottom stop. In this position, set point is 85 psig. Then, turn adjustment counterclockwise to desired control set point. Every full turn counterclockwise decreases set point by 7.5 psig.

PRESSURE DIFFERENTIAL (difference between cylinder load and unload points) is adjustable from 6 to 22 psig. To adjust, turn pressure differential adjustment screw (Fig. 6) counterclockwise to its back stop position. In this position, differential is 6 psig. Then, turn adjustment clockwise to desired pressure differential. Every full turn clockwise increases differential by 1.5 psig.

Head Pressure Control by means of fan cycling is a standard feature of 38AE012 through 016 units. The No. 2 fan cycles in response to changes in liquid pressure. The switch cycles the fan off at  $126 \pm 4$ psig as pressure decreases, and cycles back on at 257 (+15, -0) psig.





DIFFERENTIAL SCREW SEALING CAP (CAP MUST BE REPLACED TO PREVENT REFRIGERANT LEAKAGE)

# Fig. 6 — Compressor Capacity Control Unloader

**Time Guard®** Circuit provides for a delay of approximately 5 minutes before restarting compressor after shutdown from safety device action.

On start-up, the Time Guard timer causes a delay of approximately 15 seconds after thermostat closes.

On compressor shutdown, the timer recycles for approximately 5 minutes. During this time, the compressor cannot restart.

Refer to Fig. 7 — Timer Sequence Chart and also to label diagram on unit.



Fig. 7 — Timer Sequence Chart

**Crankcase Heater** prevents refrigerant migration and compressor oil dilution during shutdown whenever compressor is not operating.

Both compressor service valves must be closed whenever crankcase heater is de-energized for more than six hours.

CONDENSER FANS — Each fan is supported by a formed-wire mount bolted to the fan deck and covered with a wire guard. The exposed end of the motor shaft is covered with a rubber boot. In case a fan motor must be repaired or replaced, be sure the rubber boot is put back on when the fan is reinstalled and be sure the fan guard is in place before starting the unit. Figure 8 shows the proper position of the mounted fan. Fan motors have permanently lubricated bearings.



Fig. 8 — Condenser Fan

# Lubrication

FAN MOTORS have sealed lubrication bearings. No provisions for lubrication are made.

COMPRESSOR has its own oil supply. Loss of oil due to a leak in the system should be the only reason for adding oil after the system has been in operation. See Oil Charge.

**Cleaning Coils** — The coils can be cleaned with a vacuum cleaner, washed out with water, blown out with compressed air, or brushed *(do not use wire brush)*. Fan motors are drip proof but not waterproof.

Clean coil annually or as required by location or outdoor air conditions. Inspect coil monthly, and clean as required. Fins are not continuous through coil sections. Dirt and debris may pass through first section, become trapped between the 2 rows of fins (38AE012) or 3 rows of fins (38AE014, 016) and restrict condenser airflow. Use a flashlight to determine if dirt or debris has collected between coil sections. Clean coil as follows:

- 1. Turn off unit power.
- 2. Remove screws holding rear corner posts and top cover in place. Pivot top cover up 12 to 18 in. and support with a 2 x 4. See Fig. 9.
- 3. Remove clips securing tube sheets together at the return bend end of the coil. Carefully spread the ends of the coil rows apart by moving the outer sections. See Fig. 10.
- 4. Using a water hose, or other suitable equipment, flush down between the sections of coil to remove dirt and debris.
- 5. Clean the remaining surfaces in the normal manner.
- 6. Reposition outer coil sections. Reinstall clips which secure tube sheets, and replace top cover and rear corner posts.





Fig. 9 — Pivot and Support Top Cover



Fig. 10 — Coil Cleaning





## **TROUBLESHOOTING GUIDE**

# COMPRESSOR DOES NOT RUN

#### **Contactor Open**

Power off - restore power.

Fuses blown — replace with correct fuses after finding cause and correcting.

Transformer dead — replace transformer if primary windings are receiving power.

Thermostat circuit open — check thermostat setting.

Timer motor defective — replace timer.

Circuit breaker tripped — check for excessive compressor current draw (140% FLA maximum allowable).

Low-pressure switch open — check for refrigerant undercharge or obstruction of indoor airflow.

High-pressure switch open — check for refrigerant overcharge or obstruction of outdoor airflow.

Connections loose - tighten all connections.

Compressor stuck - see 06D service literature.

Compressor motor thermostat open — check for excessive motor temperature.

#### **Contactor Closed**

Compressor leads loose — check connections. Motor windings open — see 06D compressor service

literature.

Single phasing — replace blown fuse.

#### COMPRESSOR CYCLES ON HIGH-PRESSURE SWITCH

**Condenser Fan On** 

High-pressure switch faulty - replace switch.

Airflow restricted - remove obstruction.

Air recirculating - clear airflow area.

Noncondensables in system — purge and recharge as required.

Refrigerant overcharge - purge as required.

Line voltage incorrect — *consult power company.* Refrigerant system restrictions — *check or replace filter drier, expansion valve, etc.* 

#### **Condenser Fan Off**

Fan slips on shaft — *tighten fan hub setscrews.* Motor not running — *check power and capacitor.*  Motor bearings stuck — replace bearings. Motor overload open — check overload rating. Check for fan blade obstruction. Motor burned out — replace motor.

notor burned out — replace motor.

# COMPRESSOR CYCLES ON LOW-PRESSURE SWITCH

#### **Evaporator Air Fan Running**

Filter drier plugged — replace filter drier. Expansion valve power head defective — replace power head. Low refrigerant charge — add charge. Check lowpressure switch setting.

#### **Airflow Restricted**

Coil iced up — check refrigerant charge. Coil dirty — clean coil fins. Air filter dirty — clean or replace filters. Dampers closed — check damper operation and position.

#### **Evaporator Air Fan Stopped**

Electrical connections loose — *tighten all connections.* Fan relay defective — *replace relay.* Motor overload open — *power supply.* Motor defective — *replace motor.* Fan belt broken or slipping — *replace or tighten belt.* 

an belt broken of suppling — replace of tighten belt.

## COMPRESSOR RUNS BUT COOLING INSUFFICIENT



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Refrigerant charge low — add refrigerant. Head pressure low — check refrigerant charge. Check condenser air fan thermostat settings. Air filters dirty — clean or replace filters. Expansion valve power head defective — replace power head.

Evaporator coil partially iced — check low-pressure setting.

Evaporator airflow restricted - remove obstruction.

#### **Suction Pressure High**

Compressor valves defective — see 06D service literature. Heat load excessive — check for open doors or windows.



#### For replacement items use Carrier Specified Parts.

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.



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PC111



Carrier Corporation • Syracuse, N.Y. 13221

Carrier

# Air-Cooled Condensing Units (60 Hz)

	ELECTRICAL CHARACTERISTICS	ELECTRICAL SCHEMATIC COMPON RACTERISTICS DIAGRAM ARRANGE		LABEL DIAGRAM NO. 38AE	REV
JOAL	V-PH-HZ	Fig.	Fig.	(On Unit)	
012	208/230-3-60	1	2	501984	6.73
014	208/230-3-60	1	2	501984	M
016	208/230-3-60	1	2	501984	1. 1. 3
012	380-3-60	1	2	501984	Contra Sugar
014	380-3-60	1	2	501984	M
016	380-3-60	and the second second second second	2	501984	Parson and
012	460-3-60	3	4	501994	Star 1
014	460-3-60	3	4	501994	M
016	460-3-60	3	4	501994	
012	575-3-60	3	4	501994	
014	575-3-60	3	4	501994	M
016	575-3-60	3	4	501994	

## INDEX

#### **OPERATING SEQUENCE**

**Cooling** — When the first stage (TC1) of the cooling thermostat closes, the timer starts. After approximately 15 seconds, the timer activates the compressor and fan motor no. 1 contactor. When the liquid pressure builds to approximately 257 psig, fan motor no. 2 is energized.

On demand for additional cooling capacity, the second stage (TC2) of the cooling thermostat closes, energizing a field-supplied liquid line solenoid valve (LLS) which opens. This increases the suction pressure, causing the compressor to operate at higher capacity.

When fan switch is set at AUTO., the indoor air fan cycles with the compressor. When the switch is set at CONT, the indoor air fan runs continuously.

At shutdown, the Time Guard<sup>®</sup> timer prevents the compressor from restarting for approximately 5 minutes. **Crankcase Heater** is wired into the control circuit so that it cycles with the compressor, being *off* when the compressor is running and *on* when the compressor cycles off. *The crankcase heater is operable as long as the control circuit is energized.* 

**Heating** — The heating thermostat (TH) energizes a field-supplied relay which operates heating controls and energizes the indoor fan relay. When the fan switch is set at AUTO., the indoor air fan cycles with the heating control. The indoor air fan runs continuously when the fan switch is set at CONT.

**Fan Cycling** is employed for head pressure control. The no. 2 fan responds to liquid line pressure, cycling on at approximately 257 psig and off at approximately 126 psig.

Winter Start Control (if required) — Install Accessory Package 38AE900021. See Fig. 8.



# NOTES

- 1. Compressor(s) and fan motor(s) are thermally protected. Three-phase motors are protected against primary single-phasing conditions.
- 2. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
- 3. Terminal block 2 (TB2) is for field external control connections, Class 2 wiring: Supply voltage at TB2 is 24 vac Maximum power available at TB2 is 31.5 va

4. Field-supplied component ratings:

IFC sealed coil rating (24 vac) 12 va maximum. LLS sealed coil rating (24 vac) 13 va maximum.

Minimum thermostat electrical rating is 120 va (5 amp @ 24 vac).

Minimum fan switch electrical rating is 60 va (2.5 amp @ 24 vac).

- 5. LLS, liquid line solenoid, controlled by TC2, activates one-half of evaporator for capacity control feature.
- 6. Use copper, copper-clad aluminum or aluminum conductors for field power supply only.
- 7. For 208-volt units, remove blue wire from 230volt tap and connect it to 200-volt tap. Insulate unused lead when changing tap for 208-volt usage.

# LEGEND Contactor Compress

С	-	Contactor, Compressor
Cap.		Capacitor
CB	-	Circuit Breaker
CH	-	Crankcase Heater
Comp	-	Compressor
CR	-	Control Relay
Equip Gnd	-	Equipment Ground
FCPS	-	Fan Cycling Pressurestat
Fu	-	Fuse
HPS	-	High-Pressure Switch
IFC	-	Indoor Fan Contactor
IP	-	Internal Protector
LLS		Liquid Line Solenoid
LPS	-	Low-Pressure Switch
OFC		Outdoor Fan Contactor
OFM	-	Outdoor Fan Motor
OFR	-	Outdoor Fan Relay
TB	-	Terminal Block
TC		Thermostat — Cooling
IM	-	Timer
	-	Timer Relay
Tran		Transformer
Q1		Quadruple Terminal
		Terminal Block Connection
0		Terminal (Unmarked)
$\circ$		Terminal (Marked)
A		Field Splice
•••		Splice (Marked)
		Factory Wiring
	-	Factory Splice
	-	Field Control Wiring
	-	Field Power Wiring
	-	To indicate common potential only, not to represent wire.





Fig. 1 — Power and Control Circuit Schematics; 38AE012,014,016; 208/230; 380-3-60

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Fig. 2 - Component Arrangement; 38AE012,014,016; 208/230; 380-3-60

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Fig. 3 - Power and Control Circuit Schematics; 38AE012,014,016; 460/575-3-60

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Fig. 4 - Component Arrangement; 38AE012,014,016; 460/575-3-60

6



--- FIELD WIRING

#### NOTES:

- 1. Combination LLSV plus IFC va should not exceed 30 va.
- 2. Do not exceed 5 va (24 vac) per coil.

Use accessory relaytransformer package 38AE900001 if these va values must be exceeded.

12





## NOTES:

 Combination LLSV plus IFC va should not exceed 30 va.
 Do not exceed 5 va (24 vac) per coil. Use accessory relaytransformer package 38AE900001 if these va values must be exceeded.

# Fig. 6 — Remote Thermostat Wiring; 2-Step Cooling/2-Step Heating

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Fig. 8 — Connection Points, Time-Delay Relay Accessory Winter Start Package 38AE900021

# **MOTORMASTER® INSTALLATION**

Motormaster control maintains proper head pressure at ambient temperatures down to -20 F. Use the following procedures, plus installation instructions packaged with 32LT Motormaster, to install Motormaster solid-state head pressure control on 38AE units. Modify 38AE units as follows:

# **Power Wiring**

WARNING: Wire Motormaster control in series with fan motor.

Power wiring must comply with all local and national requirements. Units 38AE012,014 and 016, 208-230 and 575-volts, use Motormaster control, Carrier Part No. 32LT900300. The 460-volt units use Motormaster control, Carrier Part No. 32LT900610.

208-230-, 460/3/60 UNITS — For these units, without special transformer, wire Motormaster control to condenser fan motor circuit as shown in Fig. 9.

575/3/60 UNITS — Wire special transformer and Motormaster control to fan motor as shown in Fig. 10.

Winter Start Control — Order package 38AE-900021 for 38AE012 through 016 units.

**Motormaster Control Location** — Using template provided in 32LT Installation Instructions, mount Motormaster control box as shown in Fig. 12.

CAUTION: When drilling holes, be careful not to damage return coil bends inside unit.

**Sensor Location** — Locate Motormaster sensors as shown in Fig. 11. Route sensor wire from bottom of Motormaster control to specified location. Roll up excess wire and tape to unit.

Wind Baffle — Wind baffle is required for Motormaster control application to 38AE units to prevent wind cross currents from causing abnormal operation as fan speed control is modulated. Construct wind baffle as shown in Fig. 13. Be careful not to damage coil when drilling holes for baffles.

### **Component Changes Required for Motormaster**

UNIT	UNIT VOLTAGE	SPECIAL FAN MOTOR	SPECIAL RUN CAPACITOR	SPECIAL TRANSFORMER
38AE012,014,016	208-230,460	Not Required	Not Required	Not Required
38AE012,014,016	575	HC44VL610 ½ Hp (208-230 volt motors)	Not Required	HT01AH959* (1 KVA, 600 v)

\*As of January 1981, new transformer number will be HT01AH859.





BLU HANS CAP BLU BLU YEL TRANS YEL WHT BLU BLK HANS BLK BLK BLK	PHASE MAIN
BURL 230 VOLT	MOTORS FOR
TO 1	208-, 230-VOLT
MOTORMASTER RATED	OPERATION
CONTROLLER 3211 MOTORMASTER	SENSOR





Fig. 11 — Location of Motormaster Sensors — 38AE012,014,016











Fig. 13 — Wind Baffle Details



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Form 38AE-9W New Printed in U.S.A. 4-84

Catalog No. 563-844

PC111







CATALOG NO. 38.024 (1-84) SUPERSEDES CATALOG NO. 553-871

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ITEM NO.	PART NAME	LDC	REPLACEMENT PART NUMBER	38AE 012	38AE	38AE 016
	CASING GROUP					
NI/1	FAN DECK	NS	38AE-502634	1	1	1
NI/2	CORNER POST - L.H. R.H. RFAR	NS NS	38AE-501614 38AE-501634 38AE-502103	1 1 2	1 1 2	1 1 2
NI/3	PANEL, REMOVABLE	NS	38AE-402423	1	1	1
NI/4	SOUND SHIELD ASSEMBLY	NS	38AE-403982	1	1	1
NI/5	PARTITION, FAN	NS	38AE-503533	1	1	1
NI/6	FAN GUARD ASSEMBLY	AC	50PQ-400584	2	2	2
NI/7	BASE PAN	NS	38AE-501644	1	1	1
NI/8	CARRIER NAMEPLATE	AC	99NA-501102	1	1	1
NI/9	TOUCH-UP PAINT - SEAA SPRAY GREEN - 16 OZ.	MP		AS	REQUI	RED
	COMPRESSOR AND MOUNT	ING GROUP				
10	COMPRESSOR ASSEMBLIES 200-3-60 230-3-60 460-3-60 230-3-50 380-3-60 COMPRESSOR ASSEMBLIES 200-3-60 230-3-60 230-3-60 230-3-50 380-3-60 COMPRESSOR ASSEMBLIES 200-3-60 230-3-60 230-3-60 230-3-60 230-3-60 230-3-50 380-3-60 COMPRESSOR ASSEMBLIES 200-3-60 230-3-60 230-3-50 380-3-60 COMPRESSOR ASSEMBLIES 200-3-60 230-3-50 2	AC AC AC AC AC AC AC AC AC AC AC AC AC A	06DX8246AC0400 06DX8246AC0500 06DX8246AC0500 06DX8246AC0600 06DX8246AC0800 06DX8246AC0800 06DX8246AC1300 06DX3286BC0400 06DX3286BC0500 06DX3286BC0500 06DX3286BC0500 06DX3286BC0600 06DX3286BC1300 06DX5376BC0400 06DX5376BC0500000000000000000000000000000000000		1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
11	COMPRESSOR MOUNTING SPRING	MP	50-K121231	4	4	4
12	COMPRESSOR MOUNTING BOLT - #3/8 - 16 X 1 1/4 #3/8 - 16 X 1 3/4	AC AC		1 2	1 2	1 2
13	COMPRESSOR MOUNTING SPRING CUP	AC	50-K41221	2	2	2
NI/14	COMPRESSOR MOUNTING SLEEVE	AC	KK75QW-005	4	4	4
NI/15	SNUBBER (COMPRESSOR MOUNT)	AC	-6-D732241	3	3	3
NI/16	WASHER, PLATE - #3/8	AC MP		97	97	97





				US	ED ON	ON	
ITEM NO.	PART NAME	LDC	REPLACEMENT PART NUMBER	38AE 012	014	38AE	
	COMPRESSOR AND MOUNTING GROUP	(CON	(d'1)				
17	CRANKCASE HEATER - 208/230/380/575-3-60;230/400-3-50 460-3-60	AC AC	HT36NS-477 HT36NS-377	1 1	1	1	
NI/18	FUSIBLE TEE	AC	EK55JC-051	1	1	1	
NI/19	SPEED CLIP (CRANKCASE HEATER)	AC	AS81VF-056	1	1	1	
NI/20	COMPRESSOR OIL - (PP33-2); 150 VISCOSITY			AS I	REQUIE	RED	
	ELECTRICAL GROUP			and a state			
21	COMPRESSOR CONTACTOR	AC		2	2	2	
22	PRESSURE SWITCH - HIGH (203 MODEL) HIGH	AC AC	HK02ZA-395 HK02ZA-430	1 1 1 1	1 1 1	1 1 1	
23	LOW	AC			1		
24	CIRCUIT BREAKER 380-3-60 208/230-3-60 460-3-60;400-3-50 575-3-60 230-3-50 208/230-3-60 460-3-60;400-3-50 575-3-60 230-3-50 380-3-60 460-3-60;400-3-50 575-3-60 230-3-50 380-3-60 230-3-50 380-3-60 TERMINAL BLOCK - #1 #2	AC AC AC AC AC AC AC AC AC AC AC AC AC A	HH83XB-420 HH83XB-410 HH83XB-419 HH83XB-315 HH83XB-305 HH83XB-452 HH83XB-451 HH83XB-430 HH83XB-430 HH83XB-410 HH83XB-410 HH83XB-314 HH83XB-314 HH83XB-314 HH83XB-314 HH83XB-314 HH83XB-314 HY11UC-125 HY84EG-002		1 1 1 1 1 1	1 1 1 1 1 1 1 1 1	
26	TIMER MOTOR - 50/60HZ	AC	HK25RC-012	1	1	1	
27 NI/28	TRANSFORMER - #1 - 208/230/460/575-3-60 #2 - 460-3-60 #2 - 575-3-60 #1 - 380-3-60;230/400-3-50 FUSE HOLDER & FUSE ASSEMBLY	AC AC AC AC	HT01BD-235 HT01BZ-150 HT01BE-225 HT01BB-200 HY12FU-032	1 1 1 1	1 1 1 1 1 1 1	1 1 1 1	
29	CAPACITOR 7.5 MFD, 370V, 60HZ 7.5 MFD, 370V, 50HZ 7.5 MFD, 440V, 50HZ	AC AC AC	HC91CA-007 HC90AB-007 HC90BB-007	2 1 1	2 1 1	2 1 1	
30	RELAY-OUTDOOR FAN-208/230-3-60;230/400-3-50;380-3-60 OUTDOOR FAN-460/575-3-60 OUTDOOR FAN CONTROL-208/230-3-60;230/400-3-50;380-3-60 OUTDOOR FAN CONTROL-460/575-3-60 CONTROL -460/575-3-60;380-3-60 TIMER-208/230-3-60;230/400-3-50;380-3-60	AC AC AC AC AC	HN61KQ-120 HN52KC-051 HN61KK-911 HN52KC-051 HN61KK-324 HN61KK-324	1 1 1 2 1	1 1 1 2 1	1 1 1 2 1	





-			and the second	U	SED O	Ŋ
ITEM	PART NAME	LDC	REPLACEMENT PART NUMBER	38AE	38AE	38AE
110.	FAN SECTION			Strig.		
31	FAN MOTOR - (ALL REQUIRE HC99SL-015 RAINSHIELD) 1/2 HP;208/230-1-60;1075 RPM, R.H. 1/2 HP;460-1-60;1075 RPM, R.H. 1/2 HP;575-1-60;1075 RPM, R.H. 1/2 HP;230-1-50;925 RPM, R.H. 1/2 HP;208/230-1-60;1075 RPM, L.H. 1/2 HP;460-1-60;1075 RPM; L.H. 1/2 HP;200/230-1-50;975 RPM, L.H. * FACING ACCESS PANEL	AC AC AC AC AC AC AC	*HC43VL-600 *HC43VL-460 HC43VE-575 *HC43VL-232 *HC44VL-852 *HC44VL-465 *HC44VL-250	1 1 2 1 1 1 1	1 1 2 1 1 1 1	1 1 2 1 1 1 1
32	MOTOR MOUNT	AC	38AE-403493	2	2	2
33	HUB CAP	AC	50DA-510042	2	2	2
34	FAN	AC	-LA01LA-024	2	2	2
NI/35	FAN CYCLING SWITCH	AC	НК02ZB-126	1	1	1
	COIL AND PIPING G	ROUP				
36	COIL ASSEMBLY (COPPER)	AC AC	38AE-402494 38AE-402504	1	1	1
37	DISCHARGE SHUT-OFF VALVE	AC	-EN07AA-284	1	1	1
NI/38	DISCHARGE SHUT-OFF VALVE GASKET	MP	-6-D401131	1	1	1
39	MUFFLER	AC	38BA-400603	1	1	1
40	SUCTION SHUT-OFF VALVE	AC AC	EN07AA-348 EN07EA-039	1	1	1
NI/41	SUCTION SHUT-OFF VALVE GASKET	MP MP	-6-D401131 -6-D681131	1	1	1
NI/42	LIQUID SHUT-OFF VALVE	AC	EP21BH-211	1	1	1
NI/43	FUSIBLE PLUG	MP	EK02JA-203	1	1	1
NI/44	SCHRADER VALVE CORE	MP MP	EC39DM-062 EC39DM-061	1	1	1
	ACCESSORY GROU	IP				
NI/45	TRANSFORMER RELAY PACKAGE (38AE900001) INCLUDES: TRANSFORMER (1)HT01BD-235 RELAY (2)HN61KK-324	AP AC AC	NOT STOCKED	1	1	1
NI	GRILLE ASSEMBLY PACKAGE INCLUDES: GRILLE - 29.90 (1)38AE-503633 36.50 (1)38AE-503643 67.50 (1)38AE-503653	AP NS NS	38AE-900011	1	1	1





#### **ORDERING INSTRUCTIONS**

- A. All orders and inquiries should include the complete model and serial number of the unit on which the parts are to be used, and the part number and description of each part.
- B. Dealers should forward orders to their Carrier Distributor.

#### **GENERAL NOTES**

- Casing parts and panels are not normally stocked, but are available upon request while in production. Requests for casing
  parts and panels, for units no longer in production, must be cleared for availability prior to submitting an order.
  Certain "sheet metal" parts are omitted in the interest of simplicity as orders for them are so infrequent that a simple description
  of the part, plus the model and serial number of the unit, will be acceptable.
- 2. Complete "Accessory Packages" or "F.I.O.P.'s" (Factory-Installed Option Plan) are not normally stocked or supplied by the Parts Center. (Refer to "Master Price Pages" and order from your normal source for finished goods.

Accessory Packages and F.I.O.P.'s are listed in this catalog only for reference and to assist in the selection and ordering of components.

- 3. The replacement parts listed in this catalog are "Carrier Specified Parts" and, as a result of "standardization," may not be identical to the original part furnished on the equipment.
- 4. Letter designations (appearing in the LDC column preceding the part number column) are used throughout this catalog to represent the classification of those parts. These letter designations are listed below for ease of interpretation and identification. LDC designation in effect when original catalog is issued. Contact your Order Correspondent for latest parts availability.
- AC Available Component
- AP Accessory Package
- CD Contact your authorized Carrier Distributor for procurement information.
- FIOP Factory-Installed Option Plan
- FF Field Fabricate
- FG Finished Goods
- MP Multiple Package Order sufficient number of packages to meet the unit requirements listed in the "Used On" column. Refer to Price Pages for order quantity.
- NI Not Illustrated
- NA Part is Not Available
- NPS New Part or Item that is Stocked
- NPN New Part or Item that is Not Stocked
- NS Not Stocked
- NSS Not Sold Separately Order complete assembly
- SM1 Sheet Metal 1. Current production unit. Available production component. Normal lead times. Order will be placed on factory for delivery after next production run.
- SM2 Sheet Metal 2. Obsolete production unit. May be supplied on a special order basis for a period up to two years following last production run. Longer lead times than SM1. Price and delivery will be supplied to the customer for his approval before placing the order. Where customer does not want to place an order because of excessive cost, we will supply drawings, if he so requests.
- SM3 Obsolete production unit: Tooling is not available, or fabrication cost excessive. Part no longer available. Drawings of these parts will be made available on request.

# **TAB PLACEMENT HERE**

# **DESCRIPTION:**

40RRØ12



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Confidential Records Management, Inc. New Bern, NC 1-888-622-4425 9/08





# 40RR008-034 Fan-Coil Units

# Installation, Start-Up and Service Instructions

# SAFETY CONSIDERATIONS

Installing, starting-up and servicing this equipment can be hazardous due to system pressures, electrical components and equipment location (roofs, elevated structures, etc.).

Only trained, qualified installers and service mechanics should install, start-up and service this equipment.

Untrained personnel can perform basic maintenance functions such as cleaning coils, cleaning and replacing filters. All other operations should be performed by trained service personnel.

When working on the equipment, observe precautions in the literature and on tags, stickers and labels attached to the equipment.

- Follow all safety codes.
- Wear safety glasses and work gloves.
- Use care in handling, rigging and setting bulky equipment.

# A WARNING

Be sure power to equipment is shut off before performing maintenance or service.

# INSTALLATION

**General** — Allow 2-1/2 ft at front and side of unit for service clearance and airflow. Be sure floor, wall or ceiling can support unit weight (Table 1).

**Uncrating** — Move unit as near as possible to final location before removing shipping skid.

Remove metal banding from carton and base skid and remove shipping carton. Examine unit for shipping damage. If shipping damage is evident, file claim with transportation agency. Remove base skid just prior to actual installation.

Check nameplate information against available power supply.

**Accessories** — Refer to instructions shipped with each accessory for specific information.

#### **Refrigerant Piping**

UNITS 40RR008 AND 012 — Pipe sizes are shown in Fig. 1 and 2. It is recommended that all internal solder joints be made before unit is placed in position to simplify making upside down joints on suction stubs.

No piping holes are provided in unit panels. Cut holes for liquid and suction line piping to size and location as desired. Do not interfere with internal moving parts or area where heating coil accessory might be added at a later date.

UNITS 40RR014 THROUGH 034 — Refrigerant lines are brought into unit through holes provided in unit end panels as shown in Fig. 2.

Thermal expansion valves are not provided with these units. Mount field-supplied expansion valves directly to distributor. Refer to Table 2 for the correct expansion valve outlet size and distributor nozzle information. Nozzles included with units are sized for use with R-22. Nozzles are mounted in distributors by means of snap rings and are changeable. Use of other refrigerants in these units is permissible with the proper selection of nozzles and expansion valves.

Locate expansion valve remote bulb on suction line as close to suction manifold as possible. *Never attach bulb to suction manifold*.

Clamp bulb to suction line at least 45° above bottom of a horizontal line. Never locate bulb on a trapped portion of suction line.

External TXV equalizer connections are provided by crimped-end tubes located on coil suction manifolds. Cut off crimped end of these connections and route a line from equalizer stub to respective TXV equalizer connection. All equalizer stubs are 1/4 inch. Connect equalizer line to expansion valve using a 1/4-in. SAE flare nut.

**Condensate Deflector Assembly** (Units 40RR 008 and 012) — Remove return air filters. See Return Air Filters.

Condensate deflector assembly is held to bottom of evaporator coil with sheet metal screws. Deflector is factory installed for vertical installation as shown in Fig. 5. It must be rotated 180° to permit condensate to drain into condensate trough on horizontal installations.

TO ROTATE DEFLECTOR ASSEMBLY remove unit lower front panel. Remove top and bottom sheetmetal screws holding each side of deflector to evaporator coil. Center screw holds evaporator coil to unit frame. Rotate deflector so that deflector drip guides point downward into condensate trough.

Refasten deflector to evaporator coil.

Rotate the deflector before placing the unit.

**Condensate Drain** — Install a trapped condensate drain line to unit connection as shown in Fig. 3. Install clean-out plugs in traps. Without a trap, air will be drawn up drain line until water level in condensate pan becomes equal to static pressure created by fans. Conditions will worsen if filters become blocked.

With a trap, the static pressure of fans is balanced in trap. Water can drain completely from pan into trap.

Do not use drain line smaller than size shown. Pitch drain downward to an open drain or sump. Provide service clearance around drain line to permit removal of unit panels. Observe all local sanitary codes.

 Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

 Book 1
 4
 PC 111
 Catalog No. 534-058
 Printed in U.S.A.
 Form 40RR-16SI
 Pg 1
 1-89
 Replaces: 40RR-14SI

 Tab
 3c
 2e
 For replacement items use Carrier Specified Parts.
 For the second parts.



# Table 1 — Physical Data

UNIT 40RR	008	012	014	016	024	028	034
OPER WT (lb) Base Unit Plenum	340 97	475 115	640 140	685 140	670 140	1110	1150
FANS No. of Wheels Nominal Cfm Cfm Range	2 3000 2200-3800	2 4000 3000-5000	2 5000 3750-6250	2 6000 4500-7500	2 8000 6000-10,000	2 10,000 7700-12,500	2 12,000 9000-12,600
REFRIG Total Chg (lb)	3	3	4	5	7	9	10
FILTERS, Type*	and the states	Low	Velocity			High Velocity	
NoSize (in.)	216x20x1 216x25x1	616x20x1 or 616x20x2†	316x25x1 320x25x1 or 316x25x2 320x25x2†	316x25x1 320x25x1 or 316x25x2 320x25x2†	316x25x1 320x25x1 or 316x25x2 320x25x2†	820x20x2	620x25x2 216x20x2
DIMENSIONS	1.000						
(ft-in.) A (ft-in.) B C D E F G ** H J K L M N ACCESSORY SUBBASE HEIGHT (in )	4-0 2-1-5/8 4-2-3/8 8-1-7/8 3-9 1-7-3/4 1-1-1/8 1-1-7/8 0-3-1/4 0-6 0-9-7/8 - 2-0-1/4 Not R-	5- 2-1/2 2- 1-5/8 4- 3-3/8 8- 2-7/8 4-11-1/2 1- 7-3/4 1-3 1- 4-1/2 0-9 1- 2-3/8 	6-8 2- 5-1/4 5- 8-1/2 7-10-1/8‡ 6- 3-3/4 2-10-1/4 1- 5-1/4 1- 7-1/4 0- 1-7/8 1-7 1- 4-1/8 3- 3-1/2 	6-8 2- 5-1/4 5- 8-1/2‡ 7-10-1/8‡ 6- 3-3/4 2-10-1/4 1- 5-1/4 1- 7-1/4 0- 1-7/8 1-7 1- 4-1/8 3- 3-1/2 	6-8 2- 5-1/4 5- 8-1/2‡ 7-10-1/8‡ 6- 3-3/4 2-10-1/4 1- 5-1/4 1- 7-1/4 0- 1-7/8 1-7 1- 4-1/8 3- 3-1/2 	7- 9-5/8 2-11-3/4 6- 9-1/8 	7- 9-5/8 2-11-3/4 6- 9-1/8 
CONN. NoSize (in.) Refrig – Suct M Distr N N1	1-1/8 ODM 5/8 Flare —	27/8 ODM 27/8 ODM	21-3/8 ODF 27/8 ODM —	21-3/8 ODF 27/8 ODM —	21-3/8 ODF 27/8 ODM —	21-3/8 ODM 21-3/8 ODM —	21-3/8 ODM 21-3/8 ODM —
Condensate P	3/4 FPT	3/4 FPT	1 FPT	1 FPT	1 FPT	1-1/4 MPT	1-1/4 MPT

\*Filters are factory supplied on units 40RR008 and 012; field supplied on units 40RR014 through 034. †Filter rack spacer must be removed to install 2-in. filters.

‡Including subbase.
\*\*Two discharge air openings on all sizes.
††Subase is standard for 028, 034 units, see Fig. 2.



\*Located on left end on units 40RR028 through 034. †See Table 1 for subbase height.

Certified dimension drawings available on request.

Fig. 1 — Dimensions; Units 40RR008 through 034

8.







Fig. 3 — Condensate Drains

Table 2 — Factory-Supplied Nozzle and Distributor Data

FAN-COIL UNIT	EVAP	COIL FACE AREA (sq ft)	NOZZLE	DISTRIBUTOR* CONN. (in.)
40RR008	Upper	7.22	J5	5/8 Flare
40RR012	Upper Lower	5.35 5.35	G5 G5	7/8
40RR014	Upper Lower	8.40 8.40	G5 G5	7/8
40RR016	Upper Lower	8.40 8.40	G5 G5	7/8
40RR024	Upper Lower	9.60 8.44	G8 G8	7/8
40RR028	Upper Lower	14.50 8.13	C10 C8	1-3/8
40RR034	Upper Lower	14.50 12.40	C10 C10	1-3/8

\*Distributors are factory installed and require Sporlan nozzles.

**Unit Isolation** (all units) — Where extremely quiet operation is essential, install isolators between floor and base of unit, or between ceiling and top section of unit.

Be sure that unit is level and adequately supported. In leveling, use channels at front and sides of unit for reference points.

Positioning Fan Section (Units 40RR008 and 012)

VERTICAL AIR DISCHARGE — Units are shipped with fan section mounted on top of coil section (vertical air discharge). If unit is suspended from ceiling, no changes need to be made to fan section. See Fig. 4.



ACCESSORY LINE
 ALTERNATE AIR
 INTAKE AND DISCHARGE
 AIR INTAKE AND
 DISCHARGE

NOTE: Units 40RR008 and 012 are shipped assembled for straight-thru vertical discharge. Units 40RR014 through 034 are shipped in the vertical arrangement with vertical discharge.

Fig. 4 — Typical Standard Arrangements

HORIZONTAL AIR DISCHARGE — Units are shipped with fan section set for vertical air discharge. Relocate top panel for front or back horizontal discharge as follows:

- 1. Remove top, front and back panels of unit.
- 2. Remove fan belt.
- 3. Remove the 6 self-tapping screws holding top plate to base frame.
- 4. Mount top plate in place of removed front or back panel, as applicable. Fan discharge should be at top of unit when properly mounted for horizontal air discharge. See Fig. 4.
- 5. Replace fan belt and adjust belt tension (see SERVICE, Fan Shaft Position Adjustment).

**Installing Fan Section** (Units 40RR014 through 034) — Units are shipped with fan section mounted on top of coil section for vertical air discharge. See Fig. 4 for other discharge arrangements.

For horizontal discharge, proceed as follows:

- 1. Remove back panels from coil section. Remove front and rear panels from fan section (014, 016 and 024); remove front and side panels from fan section (028 through 034).
- 2. Remove machine bolts holding fan section to top of coil section.
- 3. Rotate fan section 180° end for end, and mount on coil section as shown.
- 4. Rear panel of coil section will now be used as top panel on coil section.



Fig. 5 — Components Location 40RR008,012 (Front View)



Fig. 6 — Fan Motor Mounting Units 40RR008 and 012

5. Proceed with motor mounting, wiring, and fan drive adjustments before replacing panels.

Units 40RR014, 016 and 024 may also be mounted for horizontal discharge as shown. For this application, the horizontal fan discharge accessory panels are used.

# **A** CAUTION

Before attempting to install fan motors or motor mounts, place a piece of plywood over the evaporator coil to prevent damage to coil. UNITS 40RR014, 016 and 024 are offered with factoryinstalled fan motors and drives, or without fan motors and drives. Unit 40RR016 is available with a 208-230/ 460-3-60 triple voltage 2-hp motor. Unit 40RR024 is available with either a 208-3-60 or a 230/460-3-60 dualvoltage 3-hp motor. Motor and frame size data is listed in Table 3.

Fan motors are mounted in slotted unit channels provided. Place fan motor in channels. Line up motor frame holes with slots and secure (Fig. 9).

To adjust motor, loosen mounting bolts and slide motor to front or back of unit as required.

A fastener package is included with unit in which should be found all necessary hardware for mounting fan motor.



Fig. 7 – 40RR014, 016 and 024 Fan Section (Rear Panels Removed)

UNITS 40RR028 and 034 — Fan motors are not supplied with these larger units. Motor mounting assembly and fan drive package (shipped separately from unit) are provided. Motor mounting assembly will accommodate motor frame sizes as shown in Table 3. Install motor mounting assembly after fan section frame has been placed in position on coil section.

9

UNIT 40RR	008	012	014	016	024	028 and 034
FAN MOTOR Speed (rpm) Horsepower Frame (NEMA) Shaft Diameter (in.) Pulley Pitch Diameter (in.)	1725 1 143T* 7/8* 3.4-4.4	1725 2 145T 7/8 2.8-3.8	1725 2 56† 7/8 .2.8-3.8	1725 2 56† 7/8 3.4-4.4	1725 3 182T 1-1/8 4.0-5.0	1725 3 or 5 182T or 184T 1-1/8 4.3-5.3
Pulley Factory Setting Full Turns Open	2-1/2	2-1/2	5	5	5	
FAN DRIVE Pulley Pitch Diameter (in.) Pulley Bore (in.) Belt NoSection Belt Pitch Length (in.)	7.0 3/4 14L 44.0	7.0 1 14L 47.3	11.0 1 14L 45.3	11.0 1 14L 47.3	10.0 1 24L 44.3	12.4/11.0 1-11/16 2B —
FAN SPEEDS (rpm) Factory Setting Range Max Allowable Change per 1/2 turn of moveable mtr pulley flange	960 835-1088 1100 25.3	825 700-950 1100 25.0	430 430-583 1100 15.3	522 522-675 1100 15.2	745 700-875 1100 17.5	600-738/ 676-830 1100
MAX FULL TURNS FROM CLOSED POSITION	5	5‡	5‡	5‡	5	-
SHAFTS CENTER DISTANCE (in.)	13.4-15.1	15.3-16.8	9.4-11.8	9.4-11.8	9.4-11.8	28.5-32.0

Table 3 - I	Fan Motor	and Drive	Data	(60 Hz)
-------------	-----------	-----------	------	---------

\*On single-phase units frame size is 56 (NEMA); shaft diameter is 5/8 inch. †Motor is special frame 56 with long shaft.

8:

When applied with 40RT electric heaters, the maximum number of turns open is 2 for 40RR014, 016; and 4-1/2 for the 40RR012 unit.



Fig. 8 — Fan Mounting (028, 034 Units)







Fig. 10 — Assembled Fan Motor Adjusting Screw

NOTE: Place plywood over evaporator coil to prevent damage while installing motor and mounts.

To install motor:

- Fasten motor mounting angle bracket to fan section. Use Fig. 8 for position reference and Fig. 9 for assembly guidance. Be sure that lips of angle brackets wrap around fan section frame and that slots for motor mounting plate face each other.
- 2. Position motor on motor plate (Fig. 9) and fasten with fasteners provided.
- 3. Lift motor-plate assembly and slide into motor mounting angles as shown in Fig. 9. Plate fits in angle slots. On vertical mounts, the motor mounting assembly can be lowered to bottom of motor support channels while the 4 mounting bolts are inserted.
- Assemble and install motor adjusting screws as shown in Fig. 10. Drive roll pins into screws to prevent the screws from backing out during motor position adjustment.
- 5. Adjust motor position. Fasten motor position. Fasten motor mounting plate to mounting angles.

**Installing Fan Drives** — Drive packages as shown in Table 3 are shipped separate from unit (except for 40RR 014, 016 and 40RR024).

- The drive packages consist of:
  - One adjustable motor pulley
  - One fan pulley
  - One fan belt for 40RR016 unit
  - Two matched belts for 40RR024 through 034 units One instruction tag

INSTALL PULLEYS, UNITS 40RR014 THROUGH 034

- 1. Remove protective grease and tape from fan shaft being careful not to lose key from shaft keyway. Clean shaft with a light solvent, and apply a thin coat of grease to facilitate removal of pulley should it ever become necessary.
- Slide pulleys on shafts. On 40RR014 and 016, install adjustable motor pulley with fixed flange towards motor.



	MOTO	MOTOR		MOTOR PULLEY			FAN PULLEY		BETWEEN		Service States	
UNIT 40RR Hp	Ho	NEMA	PDR (in.)	Bore (in.)	Turns Open from Fully Closed Position		PPD	Bore	SHAFT CTRS		BELTS	FSR (Born)
	np	Size			Min Pitch Diameter	Max Pitch Diameter	(in.)	(in.)	(in Min	n.) Max	NoSection/ Lgth (inside)	(npm)
	1 (S)	56*	3.4-4.4	5/8	5	0	7.0	3/4	13.4	15.1	1-4L/46	835-1088
000	1 (S)	143T†	3.4-4.4	7/8	5	0	7.0	3/4	13.4	15.1	1-4L/46	835-1088
008	2 (FS) 2 (FS)	56‡ 145T	_	7/8		ne n <u>E</u> nergi	=	3/4 3/4	13.4 13.4	15.1 15.1	-	NT.
	2 (S)	145T	2.8-3.8	7/8	5	0	7.0	1	15.3	16.8	1-4L/46	700- 950
012	3 (FS)	56**		7/8	Charles and		-	1	15.3	16.8	-	_
	3 (FS)	182T	-	1-1/8	-	-		1	15.3	16.8	-	-
	2 (S)	56**	2.8-3.8	7/8	5	0	11.0	1	9.4	11.8	1-4L/44	430- 583
014	2 (FS)	145T		7/8	_	-	-	1	8.3	10.7	_	-
014	3 (FS)	182T		1-1/8		-	-	1	9.4	11.8		
	5 (FS)	184T		1-1/8	-		-	1	9.4	11.8	-	-
a second and	2 (S)	56‡	3.4-4.4	7/8	5	0	11.0	1	9.4	11.8	1-4L/46	522- 675
016	2 (FS)	145T	-	7/8	-		-	1	8.3	10.7	along the second	
010	3 (FS)	182T	-	1-1/8	-		-	1	9.4	11.8	and the state of the second	
	5 (FS)	184T	and the second second	1-1/8	-		-	1	9.4	11.8	-	
1	2 (S)	56‡	4.0-5.0	1-1/8	5	0	10.0	1	9.4	11.8	2-4L/43	700-875
024	3 (FS)	182T	-	1-1/8	-	-		1	9.4	11.8	Sec	1. S. S. S. S S. S. S.
024	5 (FS)	184T		1-1/8		-	-	1	9.4	11.8	and the second second	-
1.8.8.1.8.19	7-1/2 (FS)	213T	-	1-3/8	-	Section - Sectio	-	1	9.4	11.8	-	-
	3 (A)	182T	4.3-5.3	1-1/8	6	1	12.4	1-11/16	28.5	32.0	2-B/88	600-738
028	5 (A)	184T	4.3-5.3	1-3/8	6	1	12.4	1-11/16	28.5	32.0	2-B/88	676-830
020	7-1/2 (FS)	213T	-	1-3/8	-	-	-	1-11/16	28.8	34.0	in the the second	-
	10 (FS)	2151	-	1-3/8	-	distant.	-	1-11/16	28.8	34.0	and the state of the	and the second second
	3 (A)	182T	4.3-5.3	1-1/8	6	1	11.0	1-11/16	28.5	32.0	2-B/88	600-738
034	5 (A)	184T	4.3-5.3	1-1/8	6	1	11.0	1-11/16	28.5	32.0	2-B/88	676-830
034	7-1/2 (FS)	213T	-	1-3/8		-	-	1-11/16	28.8	34.0	-	-
	10 (FS)	2151	alasta - analas	1-3/8		-		1-11/16	28.8	34.0	aliter - angel	

Table 4 — Fan Motors and Drives (1750 Rpm)

- Standard

(S)

PDR — Pitch Diameter Range Pulley Pitch Diameter PPD -

\*\*Factory available for 3-Hp, 208-230/460-3-60 motor. NOTE: The No. 56 frame, 1-Hp, motor shaft is 5/8 in. diameter x 1-15/16 in. long. The No. 143T frame, 1-Hp, motor shaft is 7/8 in. diameter x 2-1/4 in. long. The No. 56 frame, 2- and 3-Hp motors have special shaft diameter and length.

Power Supply and Wiring - Provide a separate fused disconnect switch of adequate size to provide adequate fan motor starting current. See Table 5 for unit electrical data.

Install disconnect switch, accessory fan contacts and power wiring in accordance with all applicable codes.

Fan motors are shipped with 40RR008, 012, 014, 016 and 024 models only. Indoor fan contacts are available as an accessory. To wire the holding coil of the accessory fan contactor into the condensing unit control circuit, refer to Fig. 11.

#### See Table 5 for unit electrical data.

NOTE: Fan motors labeled 230/460 v or 208-230/460 v, 3-ph, 60-Hz are wired for the lower voltage when shipped from the factory. For 460-v, 3-ph, 60-Hz, rewire in accordance with motor connection diagram on unit. All field-wiring connections to fan coil are made inside motor terminal box.

See SERVICE, Fan Rotation, for correct fan direction.

UNIT 40RR	VOLTS/ PH/HZ	VOLT.* LIMITS	FULL LOAD AMPS	WIRE SIZE (AWG)	MAX WIRE LGTH (ft)	MOCP (amps)	
008	200/230 -1-60	180-253	7.7/7.0	12 10	71/ 90 112/142		
	208-230/ 460-3-60†	207-253 416-528	3.8 1.9	12	212/849		
012	208-230/ 460-3-60†	187-253	6.3	12 10	99 157		
		414-528	3.1	12	521		
014	208-230/	187-253	6.2	12 10	99 157	15	
<b>016</b> 460-3-6	460-3-60†	414-528	3.1	12 10	500 800		
024	200-3-60	180-220	10.8	12 10	65 107	ali ali	
	208-230/	207-253	10.1	12	80		
	460-3-60†	416-528	5.1	10	127		

Table 5 – Electrical Data

**MOCP** — Maximum Overcurrent Protection (fuse only)

\*Motors are designed for satisfactory operation at ±10% of voltages shown. Voltages should not exceed the allowable limits indicated.

†Must be field wired for 460 volts

NOTES:

- 1. Fan motors are field supplied on 40RR028 through 034 units.
- 2. Wire sizes, lengths, fuse sizes and dual element fuse sizes shown are for the branch circuit between the disconnect switch and the unit.
- 3. The branch circuit wire sizes and the corresponding maximum wire lengths will result in a 1% voltage drop of the nameplate full load amperage. Wire sizes and maximum fuse sizes are in accordance with the National Electrical Code.
- 4. All 3-phase motors on 40RR008 through 024 units are triple voltage (208-230/460-3-60).



Fig. 11 — Sample Control Diagram, Line Voltage Thermostat Control

**To Connect Ductwork** — Refer to The System Design Manual for the recommended design and layout of ductwork.

DISCHARGE CONNECTION — Connect flanged discharge openings to supply duct, utilizing a canvas connection to prevent vibration. It is important that this connection be properly fabricated to prevent high friction losses and air noise.

RETURN CONNECTION — Route return air duct to filter rack through a canvas connection to prevent transmission of unit vibration.

When a duct blocks off access panel, provide a slip joint in the ductwork to permit removal for servicing.

OUTDOOR AIR INLET CONNECTION — Connect outdoor air duct to return air ductwork. Install a damper in the outdoor air duct to permit control of outdoor air volume.

**Return Air Filters** — Type and size filters are shown in Table 1.

40RR008 AND 012 (see Fig. 5 for installation) — High velocity filters of sizes shown in Table 1 may be used if required.

40RR014, 016 AND 024 — Filters may be installed from either side or through front of unit. Remove access channel held to right-hand center of filter frame with wing nuts. Insert filters in tracks. While holding last 2 filters in place with one hand, replace access channel and tighten wing nuts with other hand.

To install filters from either side, remove screws holding filter access panel to unit. Remove access panel and slide filters into channels (3 filters in each rack). Replace access panel and tighten all screws.

40RR028 THROUGH 034 — Remove screws holding filter access panel to end of unit. Also loosen screws holding side panel to unit frame. Remove access panel and slide filters into channels. Replace access panel and tighten all screws.

# START-UP

Before starting unit, check the following:

- 1. Is unit solidly supported?
- 2. Is fan adjusted for speed and pulley alignment?
- 3. Are there any loose parts that will rattle or vibrate?
- 4. Is condensate drip connector (if fitted) correctly positioned?

- 5. Is water condensate diameter pitched for correct drainage?
- 6. Are motor vibration isolator mount hold-down bolts (if fitted) loosened?
- 7. Be sure coil baffle plates (if fitted) are tight against coil to prevent air bypass.
- 8. Are all panels securely fastened?
- 9. Check all electrical connections.
- 10. Refer to condensing unit instructions.

### SERVICE

Inspection and maintenance should be performed at regular intervals and should include the following:

- 1. Complete cleaning of cabinet, fan wheel, cooling coil, condensate pan or drain, heating coils and return air grille (if used).
- 2. Inspection of panels and sealing of unit against air leakage.
- 3. Adjustment of fan motor, belt, bearings, wheels.
- 4. Cleaning or replacement of filters.
- 5. Testing for cooling/heating system leaks.
- 6. Checking all electrical connections.

**Panels** — Panels are fastened to unit frame with selftapping screws. Fan and coil compartment must be sealed tightly to prevent air leakage which will bypass cooling coil.

**Fan Motor Lubrication** — Fan motor supplied with unit is factory lubricated and requires no lubrication. Field-installed fan motors should be checked for lubrication instructions as furnished with motor.

**Fan Shaft Bearings** are factory lubricated, rubber mounted ball bearings and require no further lubrication.

**Centering Fan Wheel** — If fan and fan shaft assembly are not properly centered, blades may scrape against scroll or may create an objectionable whistling noise. It may be necessary to adjust individual fan wheels or move entire fan shaft.

**Fan Shaft Position Adjustment** — Loosen setscrew on locking collar of each fan shaft bearing. Slide shaft into proper position and replace locking collar. To replace locking collar, push collar up against inner face of bearing. Turn collar in direction of fan rotation until tight, and tighten setscrew (Fig. 12). Tightening locking collar in direction of fan rotation will result in further tightening of collar should setscrew work itself loose.



Fig. 12 — Fan Shaft Bearing

### Individual Fan Wheel Adjustment

UNITS 40RR008 THROUGH 034 — Loosen the 2 locking bolts holding fan wheel hub to shaft. Position fan wheel in center of the fan housing and tighten locking bolts. Clearance between wheel and housing should be the same on both sides.

**Fan Belts** — Motor mounting plate and motor support angles are slotted to permit both vertical and horizontal adjustment.

Adjust belt so that it can be depressed approximately 1 in. with one finger midway between fan and motor pulleys.

**Fan Rotation** — Correct fan rotation in respect to fan outlet is shown in Fig. 13.



Fig. 13 — Fan Rotation

To reverse the direction of rotation of a 3-phase fan motor, reverse any 2 of the power leads. Refer to the connection diagram on the inside of motor terminal box cover for proper reversing procedure of single-phase motor.

- 1. Line up pulleys by eye, and tighten setscrews on fan pulley to lock it in place.
- 2. Slip belts on the pulleys.

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- 3. Use the methods outlined in Fig. 14 to check proper pulley alignment.
- If pulleys are not in correct alignment, slide the motor axially until the pulleys are aligned.
- 5. Tighten motor hold-down bolts.



Fig. 14 — Fan Pulley Adjustments

**Pulleys and Drive Adjustment** — To obtain desired fan speed, adjust fan motor pulley as follows:

- 1. Remove belt from fan motor pulley after loosening motor from motor base.
- 2. Loosen setscrew in movable flange of pulley. Screw movable flange toward fixed flange to increase the fan speed and away from fixed flange to reduce speed. Before tightening setscrew, make certain that setscrew is over nearest flat surface of pulley hub (Fig. 14).

# A CAUTION

Increasing fan speed will produce a greater load upon motor. Do not exceed rated capacity of motor.

**Condensate Drains** — Keep condensate drains free of dirt and foreign matter. Check strainer located at rear right-hand side of condensate pan to prevent water from being trapped in condensate pan and overflowing on floor.

**Return Air Filters** — Refer to INSTALLATION, Return Air Filters section for filter accessibility and removal. Replace with clean filters as listed in Table 1.

**Coil Removal** — Remove unit panels as required. Disconnect coil connections and remove fastening screws. Remove coil through top section of unit.

**Cleaning Cooling Coil** — Remove return air filters. Remove any heavy dirt that may have accumulated on underside of coil. Coil may be more easily cleaned with a stiff brush, vacuum cleaner or compressed air when it is dry. If coil is wet or if water is to be used for cleaning, guard against splashing water on electrical components or damaging surrounding area. Clean coil baffles as applicable and check for tight fit to be sure air does not bypass coil.



# A CAUTION

Do not operate unit without air filters.



for Multiple Fan Units





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CATALOG NO. 554-062 (2-83) SUPERSEDES CATALOG NO. 554-040

Litho in U.S.A.

PAGE 1



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# FAN COIL UNIT

40RR,RS

``		T	and a state of the state of the	USED ON 40		
EM	PART NAME AND DESCRIPTION	LDC	REPLACEMENT PART NUMBER	RR         RS           0         0         0         0         0           0         1         0         1         1         1           8         2         8         0         2         4		
)	CASING SECTION	I .		and the set of		
1	CHASSIS ASSEMBLY (COMPLETE)	SM1 SM1 SM1 SM1	38RR-400874 38RR-400944 40RS-400434 40RS-400444			
2	END PANEL - R.H.	SM1 SM1	40RR-401483 40RR-401493	1 1 1 1 1 1		
3	END PANEL - L.H.	SM1	40RR-401473	1 1 1 1 1 1		
4	PLATE, PANEL SEALING	SM1 SM1	40RR-502712 40RR-502722			
5	ACCESS PANEL AND SEALING ASSEMBLY	SM1 SM1	38-R8323 38-R12323	1 1 1 1 1 1		
6	TOP PANEL, FAN MOUNTING	SM1 SM1	40RR-401593 40RR-401603	1 1 1 1 1 1		
7	PANEL & INSUL. ASSY UPPER FRONT & REAR; LOWER FRONT	SM1 SM1	38-R8663 38-R12663	3 3 3 3 3 3 3		
	END COVER	SM1	40RR-502702	1 1		
	PAINT, TOUCH UP	MP	PH23GL-012	AS REQUIRED		
1/9	ELECTRICAL SEC	TION				
10	CONTACTOR, FAN MOTOR 200/230-3-60; 230-3-50 460/575-3-60; 400-3-50	AC NS	HN53AB-251 HN53AB-252	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
	FAN AND MOTOR S	ECTION				
11	FAN HOUSING - L.H.	AC AC	38-R8324 40RR-400574	1 1 1 1		
12	FAN HOUSING - R.H.	NS AC	40RR-400544 40RR-400564	1 1 1 1 1 1		
13	FAN SHAFT	AC AC	38-R81292 50-N152522	1 1 1 1 1		
14	BLOWER WHEEL	AC AC	LA22LA-118 LA22LA-124	2 2 2 2 2		
15	BEARING - PILLOWLOCK 3/4" DIA. 1" DIA.	AC AC	KT63AA-038 KT61DA-080	2 2 2 2 2		
16	MOTOR MOUNTING PLATE	AC	40RR-500743	. 11111		
NI/17	$\begin{array}{r} \text{KEY} &= 3/16 \ \text{X} \ 3/16 \ \text{X} \ 1 \ 1/2 \ \text{LG}. \\ &= 1/4 \ \text{X} \ 1/4 \ \text{X} \ 1 \ 1/2 \ \text{LG}. \end{array}$	NS MI	SAW01DA-055 PAW01DA-095			
18	SUPPORT BRACKET, BEARING	SM	1 38-R81812 C 48DA-415592	2 2 2 2 2 2		


### FAN COIL UNIT



1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -				USED ON 40				
TEM NO	PART NAME AND DESCRIPTION	LDC	REPLACEMENT PART NUMBER	RR 000 01 82	008	RS 0 1 0	012	0 1 4
	FAN AND MOTOR SECTIO	ON (CONT	'D)					
19	BRACKET ASSEMBLY, MOTOR MOUNTING	AC SM1	40RR-501502 40RR-501512	111	1	1	1	1 1
20	FAN MOTOR 1HP; 115/208/230-1-60; 1725RPM 1HP; 230/460-3-60; 1800 RPM 1HP; 115/230-1-50; 1425 RPM 2HP; 200/208/230/460-3-60; 1800 RPM 2HP; 230/460-3-60; 1725 RPM 2HP; 230-3-50; 1425 RPM 2HP; 400-3-50; 1425 RPM	AC AC AC AC AC AC AC	HC52DL-233 HD52DX-651 HC52DL-752 HD56DX-215 HD56DL-851 HD56DL-232 HD56DL-442	1 1 1 1 1 1 1 1 1	1111	1 1 1	111111	1 1 1 1
21	PULLEY, FAN - "A" GROOVE 7" PD; 3/4" BORE 6.4" PD; 3/4" BORE 7" PD; 1" BORE 6.4" PD; 1" BORE	CD CD CD CD CD CD CD CD CD CD CD CD CD C	PROCURE LOCALLY PROCURE LOCALLY PROCURE LOCALLY PROCURE LOCALLY	1 1 1 1 1	1	1	1 1	1 1
22	PULLEY, MOTOR "A" GROOVE-3.4-3.7PD; "E" GROOVE 3.7-4.7PD; 5/8" BORE "A" GROOVE-3.4-3.7PD; "B" GROOVE 3.7-4.7PD; 5/8" BORE	CD	PROCURE LOCALLY	1	1	1	1	1
	"A" GROOVE-2.8-3.8PD; "B" GROOVE 3.1-4.1PD; 7/8" BORE	CD	PROCURE LOCALLY	1	ľ			
23	FAN BELT 45" INDUSTRY P/N 4L450 48" GATES P/N A46 46" INDUSTRY P/N 4L460	CD CD CD CD CD	PROCURE LOCALLY PROCURE LOCALLY PROCURE LOCALLY	1	1	1	1	1

EVAPORATOR SECTION

24	EVAP CCIL ASSEMBLY	AC	38RR-400924	.1
25 25	DISTRIBUTOR - $(1)$ -EA08AD-268 NOZZLE - $(1)$ -EA19CW-906	NS AC		
	EVAP COIL ASSEMBLY	AC	40RR-400704	1
25	DISTRIBUTOR - $(1)$ EA07YC-397 NOZZLE - $(1)$ EA19CY-905	AC		
and the second	EVAP COLL ASSEMBLY	AC	3888-400894	
	INCLUDES:			
25	DISTRIBUTOR - UPPER - $(1)$ -EA19C2-251 - LOWER - $(1)$ -EA07JC-405	AC		
25	*NOZZLE (1)EA19CY-904 *(CTY, 1 FOR EACH DISTRIBUTOR)	AC		
	EVAD COTI ASSEMELY	AC	1082-10030h	
	EVAF COIL ASSEMBLI	AC	40RS-400414	1
		AC AC	40RS-400404 40RS-400424	
NI/26	CORE VALVE	MP	EC39DM-062	2222
NI/27	CAP, VALVE	MP	DD-19CA-061	2222



### FAN COIL UNIT



				USED ON 40
ITEM	PART NAME AND DESCRIPTION	LDC	REPLACEMENT PART NUMBER	RR     RS       0     0     0     0     0       0     1     0     1     1     1       8     2     8     0     2     4
Consector	EVAPORATO	DR SECTION (CONT'D)		
28	DEFLECTOR ASSEMBLY	AC AC	38-R	1 1 1 1 1 1
29	CONDENSATE TROUGH - LOWER	SM1 AC SM1 SM1 SM1	38RR-504322 38-R121762 38-R81762 64-D81222 80DD-500002	
30	CONDENSATE TROUGH - UPPER	SM1 AC SM1 SM1 SM1 SM1	38RR-504312 38-R121462 40RS-500242 64-D81212 40RS-500252 80DD-500103	
NI/31	FRAME ASSEMBLY - COIL	SM1 SM1 SM1 SM1 SM1	38-R8243 38-R12243 40RS-400133 40RS-400143	
32	FRAME, FILTER	SM1	40RR-501263	222222
33	FILTER - 16 X 25 X 1 - 16 X 20 X 1	CD CD	en series de la composition de la compo Composition de la composition de la comp	2 2 2 2 2 2 6 6
34	CLAMP, FILTER	AC	38-R82051	121122
35	RETAINER, FILTER	SM1	40RR-5C2602	121122
36	BAFFLE, FILTER	SM1 SM1	40RR-502762 40RR-502772	1 1 1 1 1 1

ACCESSORY SECTION

NI/37	BASE PACKAGE ASSEMBLY			AP -	38-R8424	
a e estado de la composición de la comp	INCLUDES: ANGLE, CORNER PANEL, BASE END PANEL, ACCESS	(4) (2) (2)	38-R81202 38-R81203 38-R8323	SM1 SM1 SM1		
	EASE PACKAGE ASSEMBLY INCLUDES: ANGLE, CORNER PANEL, BASE END PANEL, ACCESS	(4) (2) (2)	38-R121202 38-R81203 38-R12323	AP SM1 SM1 SM1	38-R12424	1 1 1
NI/38	PLENUM PACKAGE ASSEMBLY INCLUDES: ACCESS PANEL PANEL, FRONT GRILLE, OUTLET END PANEL DEFLECTOR ASSY, REAR ANGLE, FRONT CORNER ANGLE, REAR CORNER	(2) (1) (1) (2) (1) (1) (1)	38-R8223 38-R8153 38-R81302 38-R8163 38-R8183 38-R8152 38-R8162	AP SM1 SM1 SM1 SM1 SM1 SM1 SM1	38-R8144	

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#### INCORPORATED SPECIALISTS IN HEAT TRANSFER & COIL DESIGN OPERATING & MAINTENANCE INSTRUCTIONS

An Air Handling Unit, as with any mechanical equipment, requires periodic maintenance. The following is a recommended "check list" to be used as a guide in establishing a maintenance program.

#### PERIODIC INSPECTION

- 1. Fan motor and fan shaft bearings should be checked to see that they are adequately lubricated. Fan shaft bearings are sealed type and do not require periodic lubrication. If shaft tends to bind, lubricate gently. Caution must be exercised against over lubrication as excessive pressure will destroy bearing seal. Keystone 84-H Light Grease or its equivalent is recommended.
- After first 30 days check to see if bearing locking collars are firm. Retighten when necessary.
- 3. Belts should be checked for proper tension and alignment at least once every six months. If tension is proper, each belt can be depressed approximately one inch with normal pressure of one finger. Replace when they show evidence of wear.
- 4. Pulleys and blowers should be checked at least once every six months to make certain that setscrews are properly tightened.
- 5. Filters must be properly maintained in order to insure proper air cleaning efficiency. Dirty filters will reduce the air volume handled by the unit which will result in reduced unit capacity. The length of time between the replacement of throwaway filters or cleaning of permanent type filters is dependent upon the condition of the recirculated air. A six week cycle is normal, however more frequent servicing may be required. Check filter manufacturer's recommendation.
- 6. Coil fin surfaces should be washed down to eliminate dirt, lint or other foreign matter. If there is a particularly heavy accumulation of material, more frequent replacement or cleaning of filters is indicated.
- 7. Motor and fan shaft bearings should be checked for evidence of wear. Motor should be checked for proper running voltage and amperage.
- 8. Drain pan and drain line should be checked to see that condensate is being properly drained without evidence of restrictions in the line, or excessive dirt accumulation in the pan.



400 W. WALNUT STREET . GARDENA, CALIFORNIA 90248 . PHONE : [213] 321-3050

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Bath Fans



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### CARNES MODELS VCDB 020 & VCDB 030 CEILING VENTILATOR

## **READ AND SAVE THESE INSTRUCTIONS**

1. ALL ELECTRICAL WORK MUST BE DONE IN AC-CORDANCE WITH LOCAL AND/OR NATIONAL ELEC-TRICAL CODE AS APPLICABLE. FOR SAFETY, THIS PRODUCT MUST BE GROUNDED. IF YOU ARE UN-FAMILIAR WITH METHODS OF INSTALLING ELEC-TRICAL WIRING, SECURE THE SERVICES OF A QUALIFIED ELECTRICIAN.

2. TURN OFF POWER AT SERVICE ENTRANCE BEFORE INSTALLING, WIRING OR SERVICING THIS PRODUCT. 3. Use only metal duct. DO NOT USE PLASTIC DUCT! Tape all duct connections.

4. CAUTION: Always vent this product to the outside -NOT into spaces within walls or cellings, attics, crawl spaces, garages, etc.

TYPICAL MOUNTING

1. Provide Frame - This unit is designed to fit within joists on 16" centers. If ceiling joists are on larger centers, frame in housing location. Provide a solid frame to assure lowest sound levels. See Figure 1 for typical installation.

5

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Brackets are factory set for %" ceiling thickness. Make sure that housing will be flush with finished ceiling.

Figure 1

## TYPICAL WIRING

SAFETY WARNING TURN OFF PROPER 120 VOLT CIRCUIT AT THE SERVICE ENTRANCE BEFORE WIRING THE VENTILATOR.

ALL ELECTRICAL CONNECTIONS MUST BE MADE IN ACCORDANCE WITH LOCAL CODES, ORDINANCES, AND NATIONAL ELECTRICAL CODE. IF YOU ARE UNFAMILIAR WITH METHODS OF INSTALLING ELECTRICAL WIRING, SECURE THE SERVICES OF A QUALI-FIED ELECTRICIAN.

4. Wire Unit - Remove wiring adapter plate, which is located on top of housing (See Fig. 9), and attach

5. To avoid motor bearing damage and noisy and/or unbalanced impellers, keep drywall spray, construction dust, etc. off power unit.

6. Fireplaces, gas furnaces, water heaters and the like, require proper flow of combustion air and exhaust. Make sure this flow is not altered when using any exhaust fan. 7. Please read specification label on product for further information and requirements.

This unit is designed to adapt to many different installation requirements. Plan your installation carefully. For various ducting, mounting, and wiring options, see pages 2 and 3. This page shows the most common installation.

2. Trace Keyhole Slots - Hold unit against joists and trace keyhole slots in mounting brackets onto joists. Start wood screws provided in same end of all traced keyhole openings. Leave about 3/8" of screws projecting from joists. (Fig. 2)



3. Hang Unit - Tighten mounting screws as firmly as possible to assure lowest sound levels. For additional support, fasten unit to joists with nail or screw through hole in center of each mounting bracket.

electrical cable with appropriate electrical connector. Fasten incoming ground wire (bare or green wire) to adapter plate with green ground screw provided. Connect white wire to white, black wire to black. (Fig. 3) Replace wiring adapter plate so that tab on housing slides through slot on plate. (See Fig. 9)



FORM 11206, Page 1

SUPERSEDES 40872



## INSTALLATION OPTIONS

Mounting brackets may be adjusted and/or moved for various types of installations shown below.

To adjust bracket position, loosen 7/16" hex nuts and move brackets up or down. Re-tighten hex nuts securely. (Fig. 5)



Adjustable for various ceiling thicknesses

Figure 5

To move brackets, remove 7/16" hex nuts. Re-position brackets on different set of slots. Replace hex nuts and tighten securely. (Fig. 6)





Figure 6B

ork run

**Reverse brackets** to give approximately 1" more clearance. Remove hex nuts, flip brackets over, and replace hex nuts. Tighten nuts securely. (Fig. 7)



Installation with suspended ceiling.



Figure 7A

Figure 7B

For in-line installations, remove 7/16" hex nuts. Reposition brackets so that housing opening is at the side instead of the bottom. (Fig. 8)



## WIRING OPTIONS

If you do not have adequate access to wiring compartment from outside housing, wire unit from inside. Remove blower (described in "Vertical Ducting" section below.) Wiring compartment cover is fastened with two sheet metal screws.

Wiring may enter the unit from top or side. To change wiring adapter plate position, remove sheet metal screws, flip plate over, and replace screw. Make sure that tab on housing slides through slot on plate. (Fig. 9)







## DUCTING OPTIONS

To duct ventilator vertically, change blower as follows: a.) Remove and install damper on top of unit with damper bushings as shown. (Fig. 11)



Figure 11



c.) Remove 7/16" hex nuts holding blower in place. d.) Lift out blower and line up blower dishcarge with vertical opening. See Figure 13. Do not grasp blower by blower wheel, as wheel may be damaged.



b.) Unplug electrical connector from blower. Do not pull on plug wires. (Fig. 12)

e.) Replace hex nu f.) Plug in blower.

FORM 11206, Page 3

Key No.	Part No.	Description	Qty.
1	97005594	Damper Assembly	1
2	99170245	No. 8B x 3/8" Screw	14
3	97006018	Housing Assembly	1
4	99420466	Insulation Mounting Clip	4
5	98005512	Wiring Adapter Plate	1
6	99150471	No. 10-32 x 1/2" Ground Screw (Green)	2
7	97006039	Wiring Harness	1
8	97006061	Mounting Bracket Assembly	2
9	99260477	1/4 - 20 Whiz Nut	6
10	99420470	Grille Nut	2
11	98005513	Outlet Box Cover	1
12	99400035	Strain Relief Bushing	1
13	99500317	Wrapper Insulation	1
14	99500316	Side Insulation	2
15	99150417	No. 8A x 1/4" Screw	6
16	98006714	Venturi Ring	. 2
17	99020014	Blower Wheel, Clockwise	1
18	98005533	Motor Cup	2
19	97007315	Blower Assembly	1
20	99100412	Motor Mounting Rubber	2
21	99080151	Motor (VCDB20)	1
	99080152	Motor (VCDB30)	1
22	99020015	Blower Wheel - Counterclockwise	1
23	97006323	Grille Assembly	1
24	99150472	No. 8 - 18 x 1-1/4" Screw	2

#### PARTS LIST - MODELS VCDB 020 & VCDB 030





448 South Main Street Verona, WI. 53593 Phone: 608-845-6411 Telex: 26-5410 Fax: 608-845-6470 CARNES MODEL VCDB45

# VENTILATOR

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## **READ AND SAVE THESE INSTRUCTIONS**

1. ALL ELECTRICAL WORK MUST BE DONE IN AC-CORDANCE WITH LOCAL AND/OR NATIONAL ELEC-TRICAL CODE AS APPLICABLE. FOR SAFETY, THIS PRODUCT MUST BE GROUNDED. IF YOU ARE UN-FAMILIAR WITH METHODS OF INSTALLING ELEC-TRICAL WIRING, SECURE THE SERVICES OF A QUALIFIED ELECTRICIAN.

2. TURN OFF POWER AT SERVICE ENTRANCE BEFORE INSTALLING, WIRING OR SERVICING THIS PRODUCT. 3. Use only metal duct. DO NOT USE PLASTIC DUCT! Tape all duct connections.

4. CAUTION: Always vent this product to the outside -NOT into spaces within walls or ceilings, attics, crawl spaces, garages, etc.

TYPICAL MOUNTING

1. **Provide Frame** - Provide a solid frame to assure lowest sound levels. See Figure 1 for typical installation.

5. To avoid motor bearing damage and noisy and/or unbalanced impellers, keep drywall spray, construction dust, etc. off power unit.

6. Fireplaces, gas furnaces, water heaters and the like, require proper flow of combustion air and exhaust. Make sure this flow is not altered when using any exhaust fan. 7. Please read specification label on product for further information and requirements.

This unit is designed to adapt to many different installation requirements. Plan your installation carefully. For various ducting, mounting, and wiring options, see pages 2 and 3. This page shows the most common installation.

2. Trace Keyhole Slots - Hold unit against frame and trace keyhole slots in mounting brackets onto frame. Start wood screws provided in same end of all traced keyhole openings. Leave about 3/8" of screws projecting from frame. (Fig. 2)



3. Hang Unit - Tighten mounting screws as firmly as possible to assure lowest sound levels. For additional support, fasten unit to frame with nail or screw through hole in center of each mounting bracket.

cable with appropriate electrical connector. Fasten incoming ground wire (bare or green wire) to adapter plate with green ground screw provided. Connect white wire to white, black wire to black. (Fig. 3) Replace wiring adapter plate so that tab on housing slides through slot on plate. (See Fig. 9) WIRING



Make sure that housing will be flush with finished ceiling.



## TYPICAL WIRING

SAFETY WARNING TURN OFF PROPER 120 VOLT CIRCUIT AT THE SERVICE ENTRANCE BEFORE WIRING THE VENTILATOR. ALL ELECTRICAL CONNECTIONS MUST BE MADE IN ACCORDANCE WITH LOCAL CODES.

ORDINANCES, AND NATIONAL ELECTRICAL CODE. IF YOU ARE UNFAMILIAR WITH METHODS OF INSTALLING ELECTRICAL WIRING, SECURE THE SERVICES OF A QUALI-FIED ELECTRICIAN.

4. Wire Unit - Remove wiring adapter plate, which is located on top of housing (See Fig. 9), and attach electrical

## TYPICAL DUCTING

5. Connect Ductwork - Connect ductwork to damper/duct connector. (Fig. 4) Tape all joints with duct tape.



NOTE

MAKE SURE THAT BLOWER DISCHARGE OPENING MATCHES DAMPER POSITION ON VENTILATOR HOUSING.

HOUSING SHOULD BE FLUSH WITH FINISHED CEILING. SEE "To adjust brackets" IN "INSTAL-LATION OPTIONS" SECTION.

## GRILLE MOUNTING

6. Install grille using screws provided. Do not over-tighten.

## INSTALLATION OPTIONS

Mounting brackets may be adjusted and/or moved for various types of installations shown below.

To adjust bracket position, loosen 7/16" hex nuts and move brackets up or down. Re-tighten hex nuts securely. (Fig. 5)



To move brackets, remove 7/16" hex nuts. Re-position brackets on different set of slots. Replace hex nuts and tighten securely. (Fig. 6)



Figure 6

**Reverse brackets** to give approximately 1" more clearance. Remove hex nuts, flip brackets over, and replace hex nuts. Tighten nuts securely. (Fig. 7)







For in-line installations, remove 7/16" hex nuts. Reposition brackets so that housing opening is at the side instead of the bottom. (Fig. 8)



## WIRING OPTIONS

Figure 10.

If you do not have adequate access to wiring compartment from outside housing, wire unit from inside. Remove blower (described in 'Vertical Ducting'' section below.) Wiring compartment cover is fastened with two sheet metal screws.

Wiring may enter unit from top or side. To change wiring adapter plate position, remove sheet metal screws, flip plate over, and replace screws, Make sure that tab on housing slides through slot on plate. (Fig. 9)





Unit may be installed with a variable speed switch to

control fan speed and noise levels. Wire unit as shown in

## **DUCTING OPTIONS**

To duct ventilator vertically, change blower as follows: a.) Remove and install damper on top of unit with damper bushings as shown. (Fig. 11)



Figure 11

b.) Unplug electrical connector from blower. Do not pull on plug wires. (Fig. 12)



c.) Remove 7/16" hex nuts holding blower in place. d.) Lift out blower and line up blower dishcarge with vertical opening. See Figure 13. Do not grasp blower by blower wheel, as wheel may be damaged.



Figure 13

e.) Replace hex nuts and tighten securely.

f.) Plug in blower.

## •

#### PARTS LIST - VCDB45

KEY NO.	PART NO.	DESCRIPTION	QTY
1	97006043	Damper Assembly Complete	1
2	99760002	Damper Flap Magnet	1
3	99150415	#8B x 1/4" Screw	6
4	97006019	Housing Assembly	1
5	99420466	Insulation Mounting Clip	4
6	98005512	Wiring Adapter Plate	1
7	99150471	#10-32 x 1/2" Green Ground Screw	2
8	97170245	#8B x 3/8" Screw	4
9	97006081	Wiring Harness	1
10	97006062	Mounting Bracket Assembly	2
11	98005513	Outlet Box Cover	1
12	99400035	Strain Relief Bushing	1
13	99260477	1/4 - 20 Whiz Nut	11
14	99420470	Grille Nut	4
15	99500320	Side Insulation	2
16	99500318	Wrapper Insulation	1
17	99150499	1/4 - 20 x 1/4 SL TR HD Screw	3
18	99100429	Motor Mounting Rubbers	3
19	99080178	Motor	1
20	97007073	Scroll Assembly	1
21	97007072	Blower Assembly Complete	1
22	98005405	Blower Mounting Channel	1
23	99020146	Blower Wheel - Counter Clockwise	1
24	98005410	Venturi Ring	1
25	99150417	#8A x 1/4" Screw	3
26	98005531	Grille	1
27	99150472	#8 - 18 x 1-1/4" Screw	4

COMPANY 448 South Main Street Verona, WI. 53593 Phone: 608-845-6411 Telex: 26-5410 Fax: 608-845-6470







## **READ AND SAVE THESE INSTRUCTIONS**

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1. ALL ELECTRICAL WORK MUST BE DONE IN AC-CORDANCE WITH LOCAL AND/OR NATIONAL ELEC-TRICAL CODE AS APPLICABLE. FOR SAFETY, THIS PRODUCT MUST BE GROUNDED. IF YOU ARE UN-FAMILIAR WITH METHODS OF INSTALLING ELEC-TRICAL WIRING, SECURE THE SERVICES OF A QUALIFIED ELECTRICIAN.

2. TURN OFF POWER AT SERVICE ENTRANCE BEFORE INSTALLING, WIRING OR SERVICING THIS PRODUCT. 3. Use only metal duct. DO NOT USE PLASTIC DUCT! Tape all duct connections.

4. CAUTION: Always vent this product to the outside -NOT into spaces within walls or ceilings, attics, crawl spaces, garages, etc.

## TYPICAL MOUNTING

1. **Provide Frame** - Provide a solid frame to assure lowest sound levels. See Figure 1 for typical installation.

5. To avoid motor bearing damage and noisy and/or unbalanced impellers, keep drywall spray, construction dust, etc. off power unit.

6. Fireplaces, gas furnaces, water heaters and the like, require proper flow of combustion air and exhaust. Make sure this flow is not altered when using any exhaust fan. 7. Please read specification label on product for further information and requirements.

This unit is designed to adapt to many different installation requirements. Plan your installation carefully. For various ducting, mounting, and wiring options, see pages 2 and 3. This page shows the most common installation.

2. Trace Keyhole Slots - Hold unit against frame and trace keyhole slots in mounting brackets onto frame. Start wood screws provided in same end of all traced keyhole openings. Leave about 3/8" of screws projecting from frame. (Fig. 2)



3. Hang Unit - Tighten mounting screws as firmly as possible to assure lowest sound levels. For additional support, fasten unit to frame with nail or screw through hole in center of each mounting bracket.

cable with appropriate electrical connector. Fasten incoming ground wire (bare or green wire) to adapter plate with green ground screw provided. Connect white wire to white, black wire to black. (Fig. 3) Replace wiring adapter plate so that tab on housing slides through slot on plate. (See Fig. 9) WIRING



Make sure that housing will be flush with finished ceiling.

### TYPICAL WIRING

SAFETY WARNING TURN OFF PROPER 120 VOLT CIRCUIT AT THE SERVICE ENTRANCE BEFORE WIRING THE VENTILATOR. ALL ELECTRICAL CONNECTIONS MUST BE

MADE IN ACCORDANCE WITH LOCAL CODES, ORDINANCES, AND NATIONAL ELECTRICAL CODE. IF YOU ARE UNFAMILIAR WITH METHODS OF INSTALLING ELECTRICAL WIRING, SECURE THE SERVICES OF A QUALI-FIED ELECTRICIAN.

4. Wire Unit - Remove wiring adapter plate, which is located on top of housing (See Fig. 9), and attach electrical

Figure 1

## **TYPICAL DUCTING**

5. Connect Ductwork - Connect ductwork to damper/duct connector. (Fig. 4) Tape all joints with duct tape.



NOTE MAKE SURE THAT BLOWER DISCHARGE OPENING MATCHES DAMPER POSITION ON VENTILATOR HOUSING.

HOUSING SHOULD BE FLUSH WITH FINISHED CEILING. SEE "To adjust brackets" IN "INSTAL-LATION OPTIONS" SECTION.

## **GRILLE MOUNTING**

6. Install grille using screws provided. Do not over-tighten.

Mounting brackets may be adjusted and/or moved for various types of installations shown below.

To adjust bracket position, loosen 7/16" hex nuts and move brackets up or down. Re-tighten hex nuts securely. (Fig. 5)



Figure 5

To move brackets, remove 7/16" hex nuts. Re-position rackets on different set of slots. Replace hex nuts and ghten securely. (Fig. 6)









Figure 7A

Reverse brackets to give approximately 1" more clearance. Remove hex nuts, flip brackets over, and replace hex nuts. Tighten nuts securely. (Fig. 7)





Figure 7C

Installation in metal ceiling joists.

For in-line installations, remove 7/16" hex nuts. Reposition brackets so that housing opening is at the side instead of the bottom. (Fig. 8)



Figure 8



## WIRING OPTIONS

If you do not have adequate access to wiring compartment from outside housing, wire unit from inside. Remove blower (described in 'Vertical Ducting'' section below.) Wiring compartment cover is fastened with two sheet metal screws.

Unit may be installed with a variable speed switch to control fan speed. Use a Solid State Speed Control and single-gang switch box. Wire unit as shown in Figure 9A.

Wiring may enter unit from top or side. To change wiring adapter plate position, remove sheet metal screws, flip plate over, and replace screws. Make sure that tab on housing slides through slot on plate. (Fig. 9)





## **DUCTING OPTIONS**

To duct ventilator vertically, change blower as follows: a.) Remove and install damper on top of unit with damper bushings as shown. (Fig. 10)



Figure 10



Figure 11

c.) Remove 9/16" hex nut holding blower in place. d.) Pivot blower assembly slightly toward back of housing and lift straight out.

e.) Position blower so that blower outlet lines up with vertical opening. Reinstall blower by inserting integral tab on blower channel into slot in blower mounting bracket in housing. Pivot blower assembly slightly so that stud on blower mounting bracket slides through slot in blower channel. Replace 9/16" hex nut and tighten firmly to assure minimum sound levels. f.) Plug in blower.

......

b.) Unplug electrical connector from blower. Do not pull on plug wires. (Fig. 11)

#### PARTS LIST - VCDB95

KEY	PARTNO	DESCRIPTION	OTY.
1	97006045	Damper Assembly Complete	1
2	99760002	Damper Flap Magnet	2
3	99170245	#8B x 3/8" Screw	12
4	97006020	Housing Assembly	1
5	99420466	Insulation Mounting Clip	4
6	98005512	Wiring Adapter Plate	1
7	99150471	#10-32 x 1/2" Green Ground Screw	2
8	97006142	Wiring Harness	1
9	97006062	Mounting Bracket Assembly	2
10	99400035	Strain Relief Bushing	1
11	98005513	Outlet Box Cover	1
12	99420470	Grille Nut	4
13	99260477	1/4 - 20 Whiz Nut	4
14	99500319	Wrapper Insulation	1
15	99500320	Side Insulation	2
16	97007076	Blower Assembly - Left	1
17	99020146	Blower Wheel - Counter Clockwise	1
18	99150483	1/4 x 3/8" Screw	12
19	98006007	Blower Reinforcing Strap	2
20	98005410	Venturi Ring	2
21	99150417	#8A x 1/4" Screw	6
22	99080148	Motor	1
23	93170250	5/16 - 18 x 3/4" Screw	4
24	93260447	5/16 - 18 Locknut	4
25	97006032	Blower Mounting Bracket Assembly	1
26	93260456	3/8 - 16 Flange Locknut	1
27	99020145	Blower Wheel - Clockwise	1
28	97007075	Blower Assembly - Right	1
29	98005532	Grille	1
30	99150472	#8 - 18 x 1-1/4" Screw	4



CARNES

COMPANY 448 South Main Street Verona, WI. 53593 Phone: 608-845-6411 Telex: 26-5410 Fax: 608-845-6470

40900A

### **TAB PLACEMENT HERE**

### **DESCRIPTION:**

Water Heater



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## WATER HEATER

### installation-

CAUTION: TEXT PRINTED OR OUTLINED IN RED CONTAINS INFORMATION RELATIVE TO YOUR SAFETY. PLEASE READ THOROUGHLY BEFORE USING APPLIANCE.

#### REQUIRED ABILITY

INSTALLATION OR SERVICE OF THIS WATER HEATER REQUIRES ABILITY EQUIVALENT TO THAT OF A LICENSED TRADESMAN IN THE FIELD INVOLVED. PLUMBING AND ELECTRICAL WORK ARE REQUIRED.

#### GENERAL

The installation must conform to these instructions, the local code authority having jurisdiction, and the requirements of the power company. In the absence of code requirements follow NFPA-70-1987, The National Electrical Code which may be ordered from: American Standards Institute, 1430 Broadway, New York, NY 10018.

#### WARNING

AN ELECTRICAL GROUND IS REQUIRED TO REDUCE RISK OF ELECTRIC SHOCK OR POSSIBLE ELEC-TROCUTION. THE GROUND SCREW AT THE JUNC-TION BOX IS FOR BONDING THE HEATER TO A GROUNDED SERVICE ENTRANCE CONDUCTOR, A GROUNDED SERVICE ENTRANCE RACEWAY, OR AN EARTH GROUNDING ELECTRODE CONDUCTOR.

THE HEATER SHOULD BE LOCATED IN AN AREA WHERE LEAKAGE OF THE TANK OR CONNECTIONS WILL NOT RESULT IN DAMAGE TO THE AREA ADJACENT TO THE HEATER OR TO LOWER FLOORS OF THE STRUCTURE. When such locations cannot be avoided, a suitable drain pan piped to an adequate drain should be installed under the heater. Drain pans suitable for these heaters are available from your distributor or Product Service Division, 7250 South Cicero Avenue, Chicago, 1L 60629.

The heater internal wiring conforms with one of the designated diagrams on page 4. The heater data plate identifies this wiring by designation in the space marked CIRCUIT. The voltage and wattage ratings are also shown on the plate.

#### **REMOVING PANELS FROM TABLE TOP MODELS**

The drain valve, electrical components and wiring leads are situated behind the front panel.

### operation

NEVER OPERATE THE HEATER WITH THE COLD WATER INLET VALVE CLOSED OR WITHOUT FILLING WITH WATER PER THE FILLING INSTRUC-TIONS. FAILURE TO DO SO WILL CAUSE DAMAGE AND CAN VOID ELEMENT WARRANTY.

#### FILLING

1. Close the water heater drain valve. (Turn clockwise).

#### To remove:

- 1. Turn off the heater electrical supply.
- 2. Remove screw at bottom of front panel and using the finger catch at the bottom, pull panel outward.
- 3. Lower front panel to clear top panel and remove.
- Fold aside the insulation to uncover the components behind their electrical barriers.
- Remove top panel by removing screw and hook under front edge. Slide panel toward front of heater.

#### TEMPERATURE AND PRESSURE RELIEF VALVE

CAUTION: To reduce the risk of excessive pressures and temperatures in this water heater install temperature and pressure protective equipment required by local codes but not less than a combination temperature and pressure relief valve certified by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials, as meeting the requirements for relief valve and automatic gas shutoff devices for hot water supply systems, ANSI Z21.22-1984.

This valve must be marked with a maximum set pressure not to exceed the marked maximum working pressure of the water heater. Install the valve into an opening provided and marked for this purpose in the water heater and orient it or provide tubing so that any discharge from the valve will exit only within 6 inches above, or at any distance below the structural floor and cannot contact any live electrical part. The discharge opening must not be blocked or reduced in size under any circumstances.

#### HYDROGEN GAS (FLAMMABLE)

**CAUTION:** Hydrogen gas can be produced in a hot water system served by this heater that has not been used for a long period of time (generally two weeks or more). HYDROGEN GAS IS EXTREMELY FLAMMABLE. To reduce the risk of injury under these conditions, it is recommended that the hot water faucet be opened for several minutes at the kitchen sink before using any electrical appliance connected to the hot water system. If hydrogen is present, there will probably be an unusual sound such as air escaping through the pipe as the water begins to flow. There should be no smoking or open flame near the faucet at the time it is open.

- 2. Open a nearby hot water faucet to permit air to escape.
- Fully open the cold water inlet valve, filling the heater and piping.
- 4. Close the hot water faucet when water flows.
- 5. Turn the water heater electrical switch on.

#### TEMPERATURE REGULATION

#### WARNING

HOT WATER AT TEMPERATURES DESIRED FOR AUTOMATIC DISHWASHER AND LAUNDRY USE CAN CAUSE PAINFUL SCALDING WITH POSSIBLE SERIOUS AND PERMANENT INJURY. TEMPERA-TURES AT WHICH INJURY OCCURS VARIES WITH THE PERSON'S AGE AND THE LENGTH OF EXPO-SURE. THE SLOWER RESPONSE TIME OF CHILD-REN, AGED OR HANDICAPPED PERSONS INCREASES THE HAZARD TO THEM.

IT IS RECOMMENDED THAT LOWER WATER TEM-PERATURES BE USED WHERE POSSIBILITY OF EXPOSURE SUCH AS ABOVE EXIST.

CAUTION: THE CONSUMER PRODUCT SAFETY COMMISSION RECOMMENDS TEMPERATURES OF 130°F OR LOWER.

Each heating element has a thermostat which is factory set at  $140^{\circ}F$  (60°C) unless specified differently by state requirements.

The thermostat(s) can be adjusted to provide a warmer or cooler water temperature.

To change the temperature setting:

- 1. Turn off the heater electrical supply.
- 2. Remove front panel(s) and fold aside insulation.
- Move temperature indicator on thermostat to desired temperatures.

## checklist-

Before contacting your dealer, check the water heater to see if the apparent problem is caused by some external faults. Consulting this checklist may eliminate the need for a repair call and restore hot water service.

#### NOT ENOUGH OR NO HOT WATER

- 1. Be certain electrical switch is turned on.
  - In some areas an additional special meter, controlled by a timer, is used to govern the periods electricity is available. If the heater operates on atimed electrical circuit, recovery will be limited to certain hours.
- 2. Check for loose or blown fuses.
- If the water has been excessively hot and is now cold, the high temperature limit control may have operated. Contact your dealer or utility company.
- 4. The storage capacity of the heater may have been exceeded by large demands.
- 5. If the heater was installed when incoming water temperatures were warm, colder incoming temperatures will create the effect of less hot water.
- 6. Look for leaking or open hot water faucets.

#### WATER HEATER MAKES SOUNDS

1. See MAINTENANCE.

 Replace insulation, panel(s) and turn on heater electrical supply.

A non-adjustable high temperature limit control operates before steam temperatures are reached. The high limit is in the same area as the thermostat and must be reset manually when it operates. BECAUSE THE HIGH LIMIT OPERATES ONLY WHEN ABNORMALLY HIGH WATER TEMPERATURES ARE PRESENT, IT IS IMPORTANT THAT YOUR DEALER BE CONTACTED TO DETER-MINE THE REASON FOR OPERATION.

#### DRAINING

Drain the heater if turned off and exposed to freezing temperatures. Freezing water will expand and damage the heater.

- Turn off the electrical switch and cold water inlet valve.
  - Connect a hose to the drain valve to carry the water away.
- 2. Open a nearby hot water faucet and the heater drain valve.
  - Grasp the drain valve handle so as to not be exposed to hot water if a hose is not connected to it.
- 3. Leave the drain valve open during shutdown.
- Follow FILLING instructions to restart.

#### HEATERS WITHOUT DRAIN VALVES:

For convenience of service, it is recommended that a drain valve be installed in the outlet piping, as close to the heater as possible, see page 1.

#### WATER IS TOO HOT

1. Refer to TEMPERATURE REGULATION section.

#### WATER LEAKAGE IS SUSPECTED

See LEAKAGE CHECKPOINTS.

#### HOT WATER ODOR

On occasion, hot water may develop a strong odor. If this occurs, drain the heater completely; flush thoroughly; and refill. If the problem persists, chlorination of the heater and replacement of the factory installed magnesium anodes with aluminum anodes may correct the condition.

Occasionally water softener companies recommend removal of heater anodes for odor reasons.

CAUTION: Unauthorized removal of the anode(s) will void the warranty. For further information, contact your dealer.

### IF YOU CANNOT IDENTIFY OR CORRECT THE PROBLEM

- 1. Turn off the water heater electrical switch.
- 2. Close the water inlet valve.
- 3. Contact your dealer.



3

### maintenance

Electric water heater maintenance consists of cleaning the tank bottom and removing scale from the heating elements. Your dealer should be contacted for tank and element cleaning. In some instances a hissing sound may be heard as the scale builds up. This noise is normal altho the scale should be removed. Periodically the temperature and pressure relief value should be checked to insure that it is in operating dition. Lift the lever at the top of the value several times until the value seats properly and operates freely.

CAUTION: THE WATER PASSING OUT OF THE VALVE DURING THIS CHECKING OPERATION MAY BE EXTREMELY HOT.









A-6

TWO WIRE CIRCUIT FOR NON-

8-7 FOUR WIRE CIRCUIT FOR SIMUL-TANEOUS OPERATION, HAS DOUBLE HIGH LIMIT CONTROL



8.6





\*\*MUST NOT BE CONVERTED TO SIMULTANEOUS OPERATION IF TOTAL WATTS/HR. INPUT EXCEEDS 6240 W @ 208 VOLTS 7200 W @ 240 VOLTS 8300 W @ 277 VOLTS

**†WHITE FOR 120V AND 277V** 

4

## leakage checkpoints



INSTRUCTIONS: USE THIS ILLUSTRATION AS A GUIDE WHEN CHECKING FOR SOURCES OF WATER LEAKAGE. YOU OR YOUR DEALER MAY BE ABLE TO CORRECT WHAT APPEARS TO BE A PROBLEM.

> COVER AND INSULATION SHOWN REMOVED TO REVEAL TANK TOP



Condensation and dripping may appear on pipes when cold water temperature is low. Pipe fitting may be leaking.

Where possible, remove or lift top cover to examine threads of fittings installed into tank for evidence of leakage. Correct fitting leaks as necessary.



- 1. Defective element which leaks at terminals or thru flange. Replace element\*.
- 2. Loose element/gasket leak:
  - (a) Screw-in type: tighten with 1½" socket wrench or Part No. 21163 or 23985 wrench. If leak continues, remove element\*, discard gasket and clean thread areas. Apply nonhardening Permatex No. 2 to thread areas, install new gasket and screw element into fitting until it seats. Tighten ½ to ¾ turn with wrench.
- (b) Flange type: tighten screws with wrench. If leak continues remove element<sup>\*</sup> and discard gasket. Clean gasket seating areas and re-install element with new gasket.

NOTE: Part No. 40000-1 scale cleaning replacement screws available where threads have become rusted or damaged, preventing tightening.

All water which appears at the heater bottom or on the surrounding floor may be caused by condensation, loose connections or relief valve operation and leakage. Do not replace the heater until a full inspection of all potential leak points is made and corrective steps taken to stop the leak. Leakage from other appliances, water lines or ground seepage should also be suspected until proven otherwise.

ANODE ROD (SOME MODELS) INLET OUTLET 411111 TOP OR SIDE RELIEF VALVE OPENINGS 60

Relief valve operation and leakage may be due to water expansion during heating cycle or foreign material on seat of valve. If the valve is not piped to an open drain the released water could be mistaken for a leaking heater. To check where threaded portion enters tank, insert Q-tip or similar absorbent material between jacket opening and valve to swab spud area. Remove valve<sup>5</sup> if leak is indicated and repair with pipe joint compound.

TO OPEN

DRAIN

Water on the side of the tank may be condensation due to the panel or insulation not being in place.

Drain valve leakage could be from the valve itself. Either correct the problem or replace the valve.\* To check for leakage where threaded portion enters tank, insert Q-tip or similar absorbent material between jacket opening and valve to swab spud area. Remove valve\* if leak is indicated and repair with pipe joint compound.

\*Contact your dealer as it is necessary to shut off electricity and drain tank to perform procedure.

### replacement parts

Replacement parts may be ordered through dealers, authorized servicers or distributors. Refer to Yellow Pages for where to call or contact the Product Service Division, 7250 South Cicero Avenue, Chicago, IL 60629, 1-800-433-2545. When ordering parts, specify complete model no., serial no., (see rating plate), quantity and name of part desired. Standard hardware items should be purchased locally.



#### LIMITED WARRANTY

#### KEEP THIS WARRANTY AND MANUAL POSTED ADJACENT TO THE HEATER FOR FUTURE REFERENCE WHENEVER MAINTENANCE, ADJUSTMENT OR SERVICE IS REQUIRED.

A. O. Smith Corporation, the warrantor, extends the following LIMITED WARRANTY to the owner of this water heater:

1A. THE TANK - MODELS ECTT/EDLJ/PEC/PEN

If the glass-lined tank in this water heater shall prove upon examination by the warrantor to have leaked due to natural corrosion from potable w therein, during the first TEN years after initial installation for residential purposes, the warrantor will supply a complete new A. O. Smith v heater of equivalent size and current model. Some government agencies are requiring energy efficient standards for water heaters. In the event relations prohibit sale of a model of equivalent size and construction, A. O. Smith will provide a model which complies with the regulations of your area, in which case the consumer will be charged the difference in price between the like replacement and the energy efficient model required.

- This warranty on its tank is reduced to THREE years when the water heater has been used for commercial, institutional, industrial or other non-residential purposes. Multi-family dwelling installation is a legitimate residential application if unit is properly sized.
- The warranty on the replacement water heater will be limited to the unexpired term of the original warranty. h
- 1B. THE TANK MODELS EES/ELJ/ELJF/ELS/ELSF/ESTT/ETT/ETTN/KEN

If the glass-lined tank in this water heater shall prove upon examination by the warrantor to have leaked due to natural corrosion from potable water therein, during the first FIVE years after initial installation for residential purposes, the warrantor will supply a complete new A. O. Smith water heater of equivalent size and current model. Some government agencies are requiring energy efficient standards for water heaters. In the event regu-lations prohibit sale of a model of equivalent size and construction, A. O. Smith will provide a model which complies with the regulations of your area, in which case the consumer will be charged the difference in price between the like replacement and the energy efficient model required.

- This warranty on its tank is reduced to ONE year when the water heater has been used for commercial, institutional, industrial or other nona. residential purposes. Multi-family dwelling installation is a legitimate residential application if unit is properly sized.
- The warranty on the replacement water heater will be limited to the unexpired term of the original warranty. b.

#### ALL OTHER PARTS 2

If within ONE year after initial installation of this water heater, any part or portion shall prove upon examination by the warrantor to be defective in material or workmanship, the warrantor will repair or replace such part or portion at its option.

#### 3. CONDITIONS AND EXCEPTIONS

This warranty shall apply only when the water heater is installed in accordance with local plumbing and building codes, ordinances and regulations, the printed instructions provided with it and good industry practices. In addition, a temperature and pressure relief valve, certified by the American Gas Association, must have been installed.

- This warranty shall apply only when the heater is used:
- (1) at temperatures not exceeding the maximum setting of its thermostat;
- at water pressure not exceeding the working pressure shown on the water heater; (2)
- when filled with potable water, free to circulate at all times and with the tank free of damaging water sediment or scale deposits; in a non-corrosive and non-contaminated atmosphere: (3)
- (4)
- (5) with factory approved anode(s) installed;
- (6) in the United States, its territories or possessions, and Canada.
- Any accident to the water heater, any misuse, abuse (including freezing) or alteration of it, any operation of it in a modified form, or any b. attempt to repair tank leaks will void this warranty.

#### SERVICE AND REPAIR EXPENSE

Under this limited warranty the warrantor will provide only a replacement water heater or part thereof. The owner is responsible for all other costs. Such costs may include but are not limited to:

- Labor charges for service, removal, repair, or reinstallation of the water heater or any component part; a.
- Shipping and delivery charges for forwarding the new water heater or replacement part from the nearest distributor and returning the claim b. defective heater or part to such distributor except in the state of California where such charges are the manufacturer's responsibility;
  - All cost necessary or incidental for handling and administrative charges, and for any materials and/or permits required for installation of the replacement heater or part.

#### LIMITATION ON IMPLIED WARRANTIES 5

Implied warranties, including any warranty of merchantability imposed on the sale of this heater under state law are limited to one (1) year duration for the heater or any of its parts. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

#### **CLAIM PROCEDURE** 6.

Any claim under this warranty should be initiated with the dealer who sold the heater, or with any other dealer handling the warrantor's products. If this is not practicable, the owner should contact:

California Customers ONLY	U.S. Customers except California	Canadian Customers		
	A. O. Smith Corporation	A. O. Smith Enterprises Ltd.		
11848 Bernardo Plaza Ct., Suite 220A	7250 South Cicero Ave.	P. O. Box 310 - 768 Erie Street		
San Diego, CA 92128	Chicago, IL. 60629	Stratford, Ontario N5A 6T3		
Telephone: (619) 487-9060	Telephone: (312) 496-2506	Telephone: (519) 271-5800		
The supersector will each be an and an	a sub-t-t-t-start and setting such a handle of some the	made which and many factored and it will be		

The warrantor will only honor replacement with identical or similar water heater or parts thereof which are manufactured or distributed by а. the warrantor.

- b.\* Dealer replacements are made subject to in-warranty validation by warrantor.
- 7. DISCLAIMERS

NO OTHER EXPRESS WARRANTY HAS BEEN OR WILL BE MADE IN BEHALF OF THE WARRANTOR WITH RESPECT TO THE HEATER OR THE INSTALLATION, OPERATION, REPAIR OR REPLACEMENT OF THE HEATER. THE WARRANTOR SHALL NOT BE RESPON-SIBLE FOR WATER DAMAGE, LOSS OF USE OF THE UNIT, INCONVENIENCE, LOSS OR DAMAGE TO PERSONAL PROPERTY, OR OTHER CONSEQUENTIAL DAMAGE. THE WARRANTOR SHALL NOT BE LIABLE BY VIRTUE OF THIS WARRANTY OR OTHERWISE FOR DAMAGE TO ANY PERSONS OR PROPERTY, WHETHER DIRECT OR INDIRECT, AND WHETHER ARISING IN CONTRACT OR IN TORT

а. Some states do not allow the exclusion or limitation of the incidental or consequential damage, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. h

Fill in the following for your own reference. Keep it. Registration is not a condition of warranty. The model and serial number are found on the heater's rating plate.

Model No.	Serial No	Date Installed	
Dealer's Name			
Dealer's Address		Phone No	
City and State		Zip	



WILKINS REGULATOR CO.

A Division of Zurn Industries, Inc.



#### MODEL 575 REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER

### MODEL 550 DOUBLE CHECK VALVE ASSEMBLY

#### Sizes 3/4" - 2"

#### **INSTALLATION · TESTING · MAINTENANCE**

#### BASIC INSTALLATION INSTRUCTIONS CAUTION:

Installation of Backflow Preventers must be performed by qualified licensed personnel. Faulty installation could result in an improperly functioning device.

The installer, to be sure he has the up-to-date information, should read all installation instructions before attempting to install the device.

The installer should be sure the proper device has been selected for the particular installation.

WILKINS Model 575 Reduced Pressure Principle Backflow Preventers are for use on potable water lines where a health hazard could exist if a backflow or backsiphonage situation were to occur.

WILKINS Model 550 Double Check valve assemblies are for use on a potable water line where a health hazard does not exist in event of a backflow situation.

Proper performance is dependent upon following these Installation Instructions, and prevailing governmental and industry standards and codes. Failure to do so, according to the WILKINS Certificate of Limited Warranty "releases WILKINS of any liability that it might otherwise have with respect to that device." Such failure could also result in an improperly functioning device.

Damage to the device could result wherever water hammer and/or water thermal expansion could cause excessive line pressure. Where this could occur, shock arrestors and/or pressure relief valves should be installed downstream of the device.

- Before installing either a Model 575 Backflow Preventer or a Model 550 Double Check valve unit, flush the lines thoroughly to remove all debris, chips and other foreign matter.
- The Backflow Preventer must be installed in a horizontal position to provide proper operation of the relief valve.

The cast arrow on the side of the unit must point in the direction of water flow.

- Provide adequate space around the installed unit so that the test cocks will be accessible for testing, servicing and repair.
- 4. If installation of a Model 575 unit is in a building, provide a suitable drain arrangement to drain off spillage from the relief valve. An air gap of at least two times the pipe diameter must be provided between the relief valve and the drain piping to prevent a cross-connection. Do not pipe the relief valve solldly to a floor drain, sewer or sump.
- Always consult local codes for installation methods, approvals and guidance.

#### OUTDOOR INSTALLATION

Model 575 Backflow Preventers and Model 550 Double Check valve units may be installed outdoors only if the device is protected against any freezing constitions. Exposure to freezing conditions will result in improper functioning of the device. The installation location must be kept above 32°F. All the basic installation instructions apply.

If installation is above ground, install the unit at least 12 inches above surrounding flood level.

If installation is in a pit or vault, observe the following additional precautions:

- The installed backflow preventer must never be submerged in water because this could cause a cross-connection. Make sure that the pit or vault always remains dry by providing ample drainage.
- If there is any possibility of freezing, protect the backflow preventer by providing heat or insulation sufficient to prevent unit from freezing.
- Allow enough space in the pit or vault for testing and repair of the backflow preventer.



FIGURE 1 TYPICAL INSTALLATION IN BUILDING

#### INDOOR INSTALLATION

Indoor installation is preferred in areas that are subject to freezing conditions. All the basic installation instructions apply to such installations. (FiG. 1)

#### PARALLEL INSTALLATION

Where uninterrupted service from a single meter connection must be inaintained, two or more Model 575 Reduced Pressure Principle Backflow Preventers or Model 550 Double Check Valve assemblies may be connected in parallel. Parallel installation permits testing of backflow preventors individually without interrupting service. When two backflow preventers are used in parallel, the total capacity of the device must equal or exceed the capacity of the main line. All the basic installation instuctions apply to a parallel installation.

When paralleling devices, edequate room (6" or more) must be provided between units to allow for testing and recair.

#### PLACING THE DEVICE IN SERVICE

After the installation of a Model 575 or Model 550 unit has been completed, place the unit in service as follows:

#### MODEL 575 REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTERS

- Start with both gate valves closed. Slowly open the inlet gate valve until the backflow preventer is completely pressurized.
- A sizable, short discharge from the relief valve may occur while the device is pressurizing. The discharge should cease by the time the gate valve is fully open.

If the discharge should continue, close the gate valve. Loosen the vent screws (2) on the relief valve and reopen the gate valve. Close the vent "screws when water flow is noted."

- 3. If the discharge still does not stop, refer to "Maintenance Instructions" for Repair Procedures.
- Repressurize device as in Step 1. Device should function properly.
- 5. After the device has been pressurized, vent all trapped air from both check valves and the relief valve by opening each of the three vent screws two full turns. When liquid appears at all the vents, close the three vent screws. Do not remove the vent screws to bleed air.
- Slowly open the discharge gate valve. The Model 575 Reduced Pressure Principle Backflow Preventer is now in service.
- 7. If "spitting" or intermittent discharges from the relief valve are noted, "spitting" (drainage) from the relief valve could be a result of pressure fluctuations and/or water hammer condition in the system. If such condition exists, install water pressure reducing valves or water hammer shock arrestors in compliance with industry standards as needed.
- 8 After the backflow preventer has been properly installed, test the device (see "Testing the Model 575 Device"). If the device fails the test, remove the first and second check valves and thoroughly flush the device. If the relief valve fails to operate properly, inspect the sensing line for clogging (also see maintenance instructions). Clean rubber seats of all debris and place the unit back in service

#### MODEL 550 DOUBLE CHECK VALVE ASSEMBLIES

- Start with both gate valves closed. Slowly open the inlet gate valve until the backflow preventer is completely pressurized.
- When the unit has been pressurized, vent any trapped air by loosening the vent screw in the valve cover two full turns (Do not remove screw). Close the screw when water appears at the vent.
- 3. Slowly open the discharge gate. The double check valve assembly is now in service.
- After the device has been placed in service. test the device (see "Testing The Model 550 Device").

### **TEST PROCEDURE**

NOTE The following test procedures conform to the recommendations of the 'Foundation for Cross-Connection Control of the University of Southern California

The test procedure for the Model 575 Reduced Pressure Backflow Preventer is based on use of the Midwest Model 830 Test Kit.

The test procedure for the Model 550 Double Check Valve Assembly is based on use of the Midwest Model 890 Test Kit.

#### TESTING THE MODEL 575 DEVICE WITH RP TEST KIT

1. PRELIMINARY STEPS (Fig. 2)

- a. Connect the HIGH (red) hose of the test kit to the No. 2 test cock of the backflow preventer.
- b. Connect the LOW (green) hose of the test kit to the No. 3 test cock of the backflow preventer.
- c. Open test cock No. 2 and test cock No. 3 on the backflow preventer.
- d. Open the VENT valve of the gauge (black).
- e. Open the HIGH (red) valve and bleed to atmosphere until air has been expelled. Then, close the HIGH valve.
- f. Open the LOW (green) valve and bleed to atmosphere until all air has been expelled. Then, close the LOW valve.
- g. Close the VENT valve.
- Close the No. 2 gate valve on the backflow preventer.
- i. Proceed with the No. 1 check valve test.
- Be sure there are no leaks. This will distort testing results.

#### 2. NUMBER 1 CHECK VALVE TEST

Purpose: To determine the static pressure drop across check valve #1.

Requirement: The static pressure drop across check valve No. 1 shall be at least 3 psi greater than the opening pressure of the differential relief valve.

The PSID (differential pressure) reading on the kit gauge is the normal static pressure with no flow for the No. 1 check valve. This value should be recorded for record purposes. The reading should hold steady and not decrease.

If the reading decreases and continues to do so, the valve is leaking. Clean and inspect the No. 1 seal ring and seat. Refer to "Maintenance Procedure" for correction steps.

#### 3. RELIEF VALVE OPENING PRESSURE TEST

Purpose: To test operation of pressure differential relief valve.

Requirements: The pressure differential relief valve must open before the "line to zone differential pressure" reaches 2 psi.

- a. Open the HIGH (red) valve on the test kit a number of turns.
- b. Open the LOW (green) valve very slightly until the gauge pointer begins to drop. This establishes a bypass, line to zone.
- c. Hold the LOW (green) valve at this position. Observing the PSID gauge, place one hand beneath the relief valve drain to sense the first discharge.

Record the gauge reading of first discharge.

If this value is less than 2 psi, the relief valve is malfunctioning. Repeat preliminary steps (1a thru 1i) and test steps 3 a thru 3c. If results are repeated make sure the No. 2 gate is completely closed. If condition persists, check for a plugged sensing line or the relief valve is stuck closed by corrosion. Refer to "Maintenance Procedure" for valve repair steps.

#### 4. NUMBER 2 CHECK VALVE TEST

Purpose: To test the No. 2 check valve for tightness against reverse flow.

Requirements: The valve must be tight against reverse flow under all pressure differentials

- a. Connect the VENT (black) hose of the test kit to the No. 4 test cock on the backflow preventer Open the No. 4 test cock
- b. Observe the differential pressure with all gauge valves closed.

c. Open the HIGH (red) and VENT (black) valves on the test kit. This places line pressure on the downstream side of the No. 2 check valve

The PSID reading on the gauge should hold steady with valves open.

If the gauge reading continues to decrease the valve is leaking. Clean and inspect the No. 2 seal ring and seat. Refer to "Maintenance Procedure" for correction steps.



FIGURE 2. TYPICAL TEST SET-UP, SCHEMATIC DIAGRAM - RP



FIGURE 3. TYPICAL TEST SET-UP, SCHEMATIC DIAGRAM - DC

#### TESTING THE MODEL 550 DEVICE WITH DC TEST KIT

#### 1. PRELIMINARY STEPS (Fig. 3)

- a. Connect HIGH (red) hose to test cock N the double check valve assembly
- b. Connect LOW (green) hose to test cock No. 3.
- c. Open test cocks No. 2 and No. 3.
- d. Open HIGH (red) and LOW (green) valves on test kit to bleed air from lines and fill hoses.
- e. Close red and green valves.
- f. Close shutoff valve No. 2
- g. Close shutoff valve No. 1

#### 2. TESTING NUMBER 1 CHECK VALVE

Purpose: To test No. 1 check valve for tightness against reverse flow.

Requirements: The valve must be tight against reverse flow under all pressure differentials.

- a. Bleed off upstream pressure by slowly opening HIGH (red) valve until red pointer on test kit reads about 2 psi less than downstream side as indicated by green pointer.
- b. Close red valve
- c. Both pointers should hold steady and maintain 2 psi differential.
- d. If both pointers drop in (a.) check valve indicates leakage.
- e. To confirm if valve leaks:
  - 1. With No. 1 shutoff valve still closed, open green valve and bleed both pointers down about 10 psi.
  - 2. Close green valve.
  - Connect bypass (black) hose to No. 1 test cock on device.
  - 4. Open test cock No. 1
  - Slowly open both red and green together, placing line pressure on stream side of check valve and venting upstream side.
  - Red Pointer should decrease and green pointer increase.
  - 7. Close red valve.
  - 8. Red pointer should hold steady.
  - If red pointer continues to increase, the check valve leaks. See 'Maintenance Instructions'' for correction steps.
- Close all kit valves, test cocks and disconnect hoses from device.

#### 3. TESTING NUMBER 2 CHECK VALVE

Purpose: To test No. 2 check valvé for tightness against reverse flow.

Frequirements: The valve must be tight against reverse flow under all pressure differentials.

Repeat steps of test of No. 1 check valve except with hoses connected red to test cock No. 3 and green to test cock No. 4.

	APPARENT PROBLEMS					
1	PROBLEM	POSSIBLE CAUSE	REMEDY			
and the second second second second	Ratias Valve Continuousiy Descharges	1. Fouled 1st check 2. Fouled relief valve seat 3. Plugged sensing tube 4 Fouled 2nd check with backnow condition	Inspect seal rings and seats for dirt or wear. Inspect sensing tubes for blockage			
	Refer Yolve Intern-Produ Recognes	1 Water hammer 2 Wide line pressure fluctuations on inlet 3 Property working valve 4 Air trapped in valve	Check for water harwner or line Buctuations and correct if needed. Bleed air from valve			
and the second s	Loz or No Fiom	E. Device installed Sackwards Gates not fully opened				

## MAINTENANCE INSTRUCTIONS

#### CAUTION:

Proper performance is dependent upon licensed, qualified bersonnel performing regular, periodic testg according to WILKINS' specifications and prevailg governmental and industry standards and codes. Failure to do so could result in an improperly functioning device.

All Model 575 Backflow Preventers and Model 550 Double Check Valve units must be inspected and maintained by licensed personnel at least once a year or more frequently as specified by local codes. Replacement of worn or damaged parts must only be made with genuine "WILKINS" parts. The WILKINS Certificate of Limited Warranty provides that failure to do so "releases WILKINS of any Liability that it might otherwise have with respect to that device." Such failure could also result in an improperly functioning device.

Model 575 devices should be thoroughly flushed after backflow conditions occur to prevent any type of corrosive deterioration to its components. Failure to do so could result in malfunction of the device.

#### 1. GENERAL

Maintenance of either the Model 575 Backflow Preventer or the Model 550 Double Check Valve Unit can be performed without removing the device from the line. There are NO SPECIAL TOOLS required.

#### 2. CHECK VALVES

To service the Check Valves, proceed as follows:

- a. Shut off the No. 2 gate valve, then shut off the No. 1 gate valve.
- b. Open the No. 2, No. 3 and No. 4 test cocks to release pressure and drain water from the backflow preventer.
- c. On the Model 575, loosen the sensing tube nuts and remove the sensing tube from the top of the check valve and the relief valve.

CAUTION: Take care in removing the cover in the following steps. The cover is spring loaded.

- d. Holding the cover down firmly, loosen and remove the four (4) bolts which mount the cover of the check valve.
- e. Slowly ease the cover outward to relieve the spring tension.
- f. Remove the cover, spring and poppet assembly from the check valve.
- g. Inspect the rubber seat of the poppet assembly for cuts or, embedded debris.
- If damage is noted, loosen and remove the screw holding the retaining washer in place.
- i. Remove seal ring.

- J. If reverse side of seal is unused, invert seal and reassemble, otherwise replace with proper "WILKINS" seal. In reassembly, be sure seal is fully seated and "flat" in poppet.
- Inspect valve cavity and seating area. Remove any debris. Check for possible damage to seat. if seat is damaged body assembly should be replaced.
- I. Inspect cover and cover sealing area Replace O-ring seal with proper "WILKINS" part
- m. Reassemble the check valves. Install the covers with the bleed screws in the highest possible position.
- Reassemble the sensing line removed in (c.). Be sure clamping collars are tight. (See "Relief Valve" before reassembling.)
- Refer to "Placing Device in Service" section above to reuse device.
- p. Inspect device after water is turned on and before testing to eliminate leaks.

#### 3. RELIEF VALVE

The relief valve is more easily serviced if it is dismounted from the valve body.

#### To dismount:

- a. Close No. 1 and No. 2 gate valves and open test cocks No. 2 and No. 3 to relieve pressure.
- b. Loosen and unscrew the sensing tube nuts. (On the  $\frac{3}{4}$ " and 1" there is only one tube. The  $\frac{1}{4}$ ",  $\frac{1}{2}$ " and 2" units have two tubes).
- c. Remove and inspect tubes for possible deposits of debris. Clear out tubes and their connectors on the check valve unit (the sensing opening on the ¾" and 1" units is in the mounting surface).
- d. Hold the valve to keep it from falling. Loosen and remove the two mounting bolts.
- To service the relief valve
- a. Remove four of the six bolts that secure the cover to the relief valve. Loosen the two remaining bolts a few turns, but leave these two bolts loosely in place.
- b. Using a screwdriver, pry the cover loose.
- CAUTION: The cover is spring loaded. Hold down firmly and remove the two loosened bolts. Ease cover away from valve body to relieve spring tension.
- c. Carefully lift the cover, spring and spring retainer from unit.

**CAUTION:** During disassembly and reassembly take care not to twist or apply torque to the diaphragm. Twisting could tear the diaphragm Do not remove the relief valve disc while the cover is in place. Damage to the disc could result from such removal.

- d. Remove the nut at the top of the diaphragm from the stem
- Inspect the diaphragm for pinholes, tears and frayed fabric edges. Replace the diaphragm if any damage is noted
- f Remove the nut at the bottom of the stem and remove the seal retainer
- g. Inspect the seal ring for tears and embedded debris. If damage is noted, remove seal. If reverse side is unused, invert and reassemble. Otherwise, replace with proper "WILKINS" part.
- h. Remove the three screws that secure the seat and remove the stem assembly. Inspect the sealing surface on seat. Slight nicks or dents may cause the relief valve to leak. If the sealing surface is damaged, replace the seat.
- Replace the seat O-ring with proper "WILKINS" part.
- Remove all stem O-rings. Replace the O-rings with proper "WILKINS" parts.

NOTE: Use caution when reinserting the stem assembly to avoid damaging the stem O-rings. When replacing the spring retainer, make sure that the small point is centered over the stem. This centering equalizes the spring force required for proper action of the relief valve.

- k. Reassemble the relief valve following the steps (h) through (a) above, making sure that the bevelled end of the seat is exposed. Tighten all bolts, but not excessively.
- Before remounting the relief valve to the check valve body, replace the sealing gasket or O-ring with proper "WILKINS" part.
  - NOTE: The 1¼", 1½" and 2" devices utilize an outside sensing line for relief valve closure. The ¼" and 1" devices have an inside sensing line drilled into the body and relief valve. Always check to make sure there is no foreign matter in the sensing line, removing it if there is.
- m. Open gate valve No. 1 and bleed any entrapped air through the bleed screws located above and below the diaphragm. Do not remove the vent screws when bleeding air.
- n. Check complete unit for leaks, tighten as reguired.
- After testing, open gate valves and the device is in service.





FOR PART NUMBERS PLEASE SEE THE WILKINS BACKFLOW PREVENTER PARTS CATALO

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