### 50LC\*B

Single Package Rooftop Cooling Only with Multi–Zone VAV (Variable Air Volume) Operation with Puron® (R-410A) Refrigerant Sizes: 08, 09, 12



# **Installation Instructions**

**NOTE**: Read the entire instruction manual before starting the installation

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### 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 packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloths for brazing operations and have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and appropriate national electrical codes (in USA, ANSI/NFPA70, National Electrical Code (NEC); in Canada, CSA C22.1) for special requirements.

It is important to recognize safety information. This is the safety-alert symbol  $\triangle$ . When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. 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 which **could** result in personal injury or death. CAUTION is used to identify unsafe practices, which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

# WARNING

#### ELECTRICAL SHOCK HAZARD

A

Failure to follow this warning could cause personal injury or death.

Before performing service or maintenance operations on unit, always turn off main power switch to unit and install lock(s) and lockout tag(s). Unit may have more than one power switch.

### WARNING

#### UNIT OPERATION AND SAFETY HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

Before performing service or maintenance operations on unit, always turn off main power switch to unit and install lock(s) and lockout tag(s). Unit may have more than one power switch.

### WARNING

PERSONAL INJURY AND ENVIRONMENTAL HAZARD

Failure to follow this warning could cause personal injury or death.

Relieve pressure and recover all refrigerant before system repair or final unit disposal.

Wear safety glasses and gloves when handling refrigerants. Keep torches and other ignition sources away from refrigerants and oils.

# **A** CAUTION

#### CUT HAZARD

Failure to follow this caution may result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing air conditioning equipment.

### **Rated Indoor Airflow (cfm)**

The table to the right lists the rated indoor airflow used for the AHRI efficiency rating for the units covered in this document.

Model Number	Full Load Airflow (cfm)
50LC*B08	2625
50LC*B09	2970
50LC*B12	3500

Position:	1	2	3	4	5	6	7	8	9	,	10	11	1 1	2	13	14	1	5	16	17	1	8
Example:	5	0	L	С	0	В	1	2	A	_	0	A	_	-	-	1	_	N	0	A	-	
Example: Unit Heat Type 50 - Electric Cooling/Heating Packaged Rooftop Model Series - WeatherExp LC - Ultra High Efficiency Heat Options 0 = Standard - No Electric Heat E = Medium Electric Heat E = Medium Electric Heat F = High Electric Heat Refrigerant Systems B = Three stage cooling cap with multi-zone VAV opt Cooling Tons 08 - 7.5 ton 09 - 8.5 ton 12 - 10 ton Sensor Options A = None B = RA Smoke Detector C = SA Smoke Detector D = RA + SA Smoke Detector E = CO <sub>2</sub>	5 ert® leat	/ cor		C	_	-	-	-		_		-	_	-		-	_		0	A           Se           0 =           1 =           3 =           4 =           5 =           ike           state           wit           state           wit           state	EIABCDE F VENUE	Packaging 0 = Standard 1 = LTL ectrical Options = None = HACR Circuit Breaker = Non-Fused Disconnect = Thru-The-Base Connections = HACR Circuit Breaker and Thru-The Base Connections = HACR Circuit Breaker and Thru-The Base Connections = Non-Fused Disconnect and Thru-The-Base Connections = Non-Fused Disconnect and Thru-The-Base Connections = <b>Options</b> one npowered Convenience Outlet bowered Convenience Outlet inged Panels inged Panels and npowered Convenience Outlet inged Panels and powered Convenience Outlet inged Panels and bowered Convenience Outlet inged Panels and powered Convenience Outlet inged Panels and bowered Convenience Outlet thaust Options (required on each unit) ard Leak Temperature Economizer Barometric Relief ard Leak Enthalpy Economizer Barometric Relief
F = RA Smoke Detector and G = SA Smoke Detector and H = RA + SA Smoke Detector	l CO <sub>2</sub> or an	<sup>2</sup> nd C															_	F	२ =	wi UI wi	th E tra I th E	LOW LEAK Temperature Economizer Barometric Relief LOW LEAK Enthalpy Economizer Barometric Relief
<ol> <li>Standard Static Belt Drive</li> <li>Medium Static Belt Drive</li> <li>High Static Belt Drive with</li> <li>Ultra High Static Belt Drive</li> </ol>	e with th VI	h VF FD c	D c	ontr rolle	ollei r	-													VA	V-F	RTU	t <b>rols</b> Open Controller on each model)
Coil Options: Fin/Tube (Con A = Al/Cu - Al/Cu B = Precoat Al/Cu - Al/Cu C = E-coat Al/Cu - Al/Cu D = E-coat Al/Cu - E-coat Al E = Cu/Cu - Al/Cu F = Cu/Cu - Al/Cu M = Al/Cu - Al/Cu - Louvere N = Precoat Al/Cu - Al/Cu - P P = E-coat Al/Cu - Al/Cu - Q Q = E-coat Al/Cu - Louvere S = Cu/Cu - Cu/Cu - Louvere	/Cu d Ha - Lou Louv /Cu - red F	ail G ivere verec — L	uarc ed H d Ha ouve Gua	l lail ( ail G erec rd	Guar	rd 1		Gua	rd)					1 5	= 5 =		= F e 75/3 18-2	ac 3/60	tory ) )/3/0			n Revision

NOTE: Not all possible options can be displayed above. Refer to other support material or your local Carrier Expert

Fig. 1 - 50LC\*B08-12 Model Number Nomenclature (Example)



Fig. 2 - Unit Dimensional Drawing – 08 Size Unit



Fig. 2 - Unit Dimensional Drawing - 08 Size Unit (cont.)



Fig. 3 - Unit Dimensional Drawing - 09 and 12 Size Units



Fig. 3 - Unit Dimensional Drawing - 09 and 12 Size Units (cont.)

50LC\*B



LOCATION	DIMENSION	CONDITION	
A	48-in (1219 mm) 18-in (457 mm) 18-in (457) mm 12-in (305 mm)	Unit disconnect is mounted on panel No disconnect, convenience outlet option Recommended service clearance Minimum clearance	
В	42–in (1067 mm) 36–in (914 mm)	Surface behind servicer is grounded (e.g., metal, masonry wall) Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass)	
С	36–in (914 mm) 18–in (457 mm)	Side condensate drain is used Minimum clearance	
D	42–in (1067 mm) 36–in (914 mm)	Surface behind servicer is grounded (e.g., metal, masonry wall, another unit) Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass)	

**NOTE:** Unit not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.

#### Fig. 4 - Service Clearance Dimensional Drawing

### **INSTALLATION**

#### **Jobsite Survey**

Complete the following checks before installation.

- 1. Consult local building codes and the NEC (National Electrical Code) ANSI/NFPA 70 for special installation requirements.
- 2. Determine unit location (from project plans) or select unit location.
- 3. Check for possible overhead obstructions which may interfere with unit lifting or rigging.

#### Step 1 — Plan for Unit Location

Select a location for the unit and its support system (curb or other) that provides for at least the minimum clearances required for safety. This includes the clearance to combustible surfaces, unit performance and service access below, around and above unit as specified in unit drawings. See Fig. 4. NOTE: Consider also the effect of adjacent units.

Unit may be installed directly on wood flooring or on Class A, B, or C roof-covering material when roof curb is used

Do not install unit in an indoor location. Do not locate air inlets near exhaust vents, relief valves, or other sources of contaminated air.

Although unit is weatherproof, avoid locations that permit water from higher level runoff and overhangs to fall onto the unit.

Select a unit mounting system that provides adequate height to allow installation of condensate trap per requirements. Refer to Step 9 — Install External Condensate Trap and Line – for required trap dimensions.

#### Roof Mount —

Check building codes for weight distribution requirements. Unit operating weight is shown in Table 1.

50LC*B	UNITS LB (KG)								
SULC"B	08	09	12						
Base Unit	1360 (618)	1430 (650)	1500 (682)						
Economizer									
Vertical	103 (47)	103 (47)	103 (47)						
Horizontal	242 (110)	242 (110)	242 (110)						
Powered Outlet	35 (16)	35 (16)	35 (16)						
Curb	Curb	Curb	Curb						
14—in/356 mm	180 (82)	180 (82)	180 (82)						
24-in/610 mm	255 (116)	255 (116)	255 (116)						

**Table 1 – Operating Weights** 

#### Step 2 — Plan for Sequence of Unit Installation

The support method used for this unit will dictate different sequences for the steps of unit installation. For example, on curb-mounted units, some accessories must be installed on the unit before the unit is placed on the curb. Review the following for recommended sequences for installation steps.

#### Curb-mounted installation -

Install curb

Install field-fabricated ductwork inside curb

Install accessory thru-base service connection package (affects curb and unit) (refer to accessory installation instructions for details)

Prepare bottom condensate drain connection to suit planned condensate line routing (refer to Step 9 for details)

Rig and place unit

Install outdoor air hood

Install condensate line trap and piping

Make electrical connections

Install other accessories

#### Pad-mounted installation —

Prepare pad and unit supports

Check and tighten the bottom condensate drain connection plug

Rig and place unit

Convert unit to side duct connection arrangement

Install field-fabricated ductwork at unit duct openings

Install outdoor air hood

Install condensate line trap and piping

Make electrical connections

Install other accessories

#### Frame-mounted installation —

Frame-mounted applications generally follow the sequence for a curb installation. Adapt as required to suit specific installation plan.

#### Step 3 — Inspect Unit

Inspect unit for transportation damage. File any claim with transportation agency.

Confirm before installation of unit that voltage, amperage and circuit protection requirements listed on unit data plate agree with power supply provided. On units with hinged panel option, check to be sure all latches are snug and in closed position.

Locate the carton containing the outside air hood parts; see Figs. 14. Do not remove carton until unit has been rigged and located in final position.

#### Step 4 — Provide Unit Support

#### Roof Curb Mount -

Accessory roof curb details and dimensions are shown in Fig. 6. Assemble and install accessory roof curb in accordance with instructions shipped with the curb.

**NOTE**: The gasketing of the unit to the roof curb is critical for a watertight seal. Install gasket supplied with the roof curb as shown in Fig. 7. Improperly applied gasket can also result in air leaks and poor unit performance.

Curb should be level. This is necessary for unit drain to function properly. Unit leveling tolerances are show in Fig. 5. Refer to Accessory Roof Curb Installation Instructions for additional information as required.





Install insulation, cant strips, roofing felt, and counter flashing as shown. *Ductwork must be attached to curb and not to the unit.* 

#### **IMPORTANT:**

If the unit's electric and control wiring is to be routed through the basepan and the unit is equipped with the factory-installed Thru-the-Base service option see the following section:

### • Factory-Option Thru-Base Connections

on page 23

If using the field-installed Thru-the-Base accessory follow the instructions provided with the accessory kit.

**NOTE**: If electrical connection is not going to occur at this time, tape or otherwise cover the fittings so that moisture does not get into the building or conduit in the interim.

#### Slab Mount (Horizontal Units Only) -

Provide a level concrete slab that extends a minimum of 6 in. (150 mm) beyond unit cabinet. Install a gravel apron in front of condenser coil air inlet to prevent grass and foliage from obstructing airflow.

**NOTE:** Horizontal units may be installed on a roof curb if required.

9

Alternate Unit Support (In Lieu of Curb or Slab Mount) —

A non-combustible sleeper rail can be used in the unit curb support area. If sleeper rails cannot be used, support the long sides of the unit with a minimum of 3 equally spaced 4-in. x 4-in. (102 mm x 102 mm) pads on each side.



Fig. 6 - Roof Curb Details - Size 08-12 Units

#### Step 5 — Field Fabricate Ductwork

Cabinet return-air static pressure (a negative condition) shall not exceed 0.35 in. wg (87 Pa).

For vertical ducted applications, secure all ducts to roof curb and building structure. *Do not connect ductwork to unit*.

Fabricate supply ductwork so that the cross sectional dimensions are equal to or greater than the unit supply duct opening dimensions for the first 18 in. (458 mm) of duct length from the unit basepan.

Insulate and weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

Ducts passing through unconditioned spaces must be insulated and covered with a vapor barrier.

If a plenum return is used on a vertical unit, the return should be ducted through the roof deck to comply with applicable fire codes.

# **A** CAUTION

#### PROPERTY DAMAGE HAZARD

Failure to follow this caution may result in damage to roofing materials.

Membrane roofs can be cut by sharp sheet metal edges. Be careful when placing any sheet metal parts on such roof.

### For Units with Accessory or Optional Electric Heaters -

All installations require a minimum clearance to combustible surfaces of 1-in (25 mm) from duct for first 12-in (305 mm) away from unit.

Outlet grilles must not lie directly below unit discharge.

**NOTE:** A 90-degree elbow must be provided in the ductwork to comply with UL (Underwriters Laboratories) code for use with electric heat.

# WARNING

### PERSONAL INJURY HAZARD

Failure to follow this warning could cause personal injury.

For vertical supply and return units, tools or parts could drop into ductwork and cause an injury. Install a 90-degree turn in the return ductwork between the unit and the conditioned space. If a 90-degree elbow cannot be installed, then a grille of sufficient strength and density should be installed to prevent objects from falling into the conditioned space. Due to electric heater, supply duct will require 90-degree elbow.

#### Step 6 — Rig and Place Unit

When the unit is ready to be rigged and no longer will be lifted by a fork truck, the wood protector under the basepan must be removed. Remove 4 screws from each base rail. Wood protector will drop to the ground. See instructions on the unit base rails.

Keep unit upright and do not drop. Spreader bars are not required. Rollers may be used to move unit across a roof. Level by using unit frame as a reference. See Table 1 and Fig. 7 for additional information.

Lifting holes are provided in base rails as shown in Fig. 7. Refer to rigging instructions on unit.



			DIMENSIONS								
UNIT		/EIGHT		Α		В	С				
	LB	KG	IN	MM	IN	MM	IN	MM			
50LC*B08	2280	1034	116	2945	63	1600	59.5	1510			
50LC*B09	2285	1037	116	2945	58	1473	59.5	1510			
50LC*B12	2285	1037	116	2945	58	1473	59.5	1510			

NOTES:

1. SPREADER BARS REQUIRED — Top damage will occur if spreader bars are not used.

2. Dimensions in ( ) are in millimeters.

3. Hook rigging shackles through holes in base rail, as shown in detail "A." Holes in base rails are centered around the unit center of gravity.

4. Use wooden top to prevent rigging straps from damaging unit.

#### Fig. 7 - Rigging Details

When using the standard side drain connection, ensure the red plug in the alternate bottom connection is tight. Do this before setting the unit in place. The red drain pan can be tightened with a 1/2-in. square socket drive extension. For further details see "Step 11 – Install External Condensate Trap & Line on page 15.

Before setting the unit onto the curb, recheck gasketing on curb.

### **CAUTION**

#### UNIT DAMAGE HAZARD

A

Failure to follow this caution may result in equipment damage.

All panels must be in place when rigging. Unit is not designed for handling by fork truck when panels or packaging are removed.

#### Positioning on Curb —

For full perimeter curbs CRRFCURB074A00 and 075A00, the clearance between the roof curb and the front and rear base rails should be  $^{1}/_{4}$  in (6.4 mm). The clearance between the curb and the end base rails should be  $^{1}/_{2}$  in (13 mm). For retrofit applications with curbs CRRFCURB003A01 and 4A01, the unit should be position as shown in Fig. 8. Maintain the 15.5 in (394 mm) and 8  $^{5}/_{8}$  in (220 mm) clearances and allow the 22  $^{5}/_{16}$  in (567 mm) dimension to float if necessary.



**Fig. 8 - Retrofit Installation Dimensions** 

If the alternative condensate drain location through the bottom of the unit is used in conjunction with a retrofit curb, the hole in the curb must be moved 12.5 in (320 mm) towards the end of the unit. See Fig. 9.



**Fig. 9 - Alternative Condensate Drain Hole Positions** 

Although unit is weatherproof, guard against water from higher level runoff and overhangs.

#### **IMPORTANT:**

If the unit has the factory-installed Thru-the-Base option, make sure to complete installation of the option before placing the unit on the roof curb.

See the following section:

• Factory-Option Thru-Base Connections

on page 23

**NOTE:** If electrical connections is not going to occur at this time, tape or otherwise cover the fittings so that moisture does not get into the building or conduit in the interim.

Remove all shipping materials and top skid. Remove extra center post from the condenser end of the unit so that the condenser end of the unit matches Fig. 20 - 22. Recycle or dispose of all shipping materials.

#### Step 7 — Convert to Horizontal & Connect Ductwork (when required)

Unit is shipped in the vertical duct configuration. Unit *without* factory-installed return air smoke detector option may be field-converted to horizontal ducted configuration using accessory CRDUCTCV002A00. To convert to horizontal configuration, remove screws from side duct opening covers and remove covers. See Fig. 10.

Discard the supply duct cover. Install accessory CRDUCTCV002A00 to cover the vertical supply duct opening. Use the return duct cover removed from the end panel to cover the vertical return duct opening.

Field-supplied flanges should be attached to horizontal duct openings and all ductwork should be secured to the flanges. Insulate and weatherproof all external ductwork, joints, and roof or building openings with counter flashing and mastic in accordance with applicable codes.

Do not cover or obscure visibility to the unit's informative data plate when insulating horizontal ductwork.





#### Step 8 — SAT Sensor Installation

The supply air temperature (SAT) sensor is secured in the supply section of the unit for shipping purposes (see Fig, 11). This sensor must be relocated and mounted in the supply duct during installation.

# Step 9 — VAV Duct Pressure Transducer and Field Tubing Installation

Before VAV rooftop unit can operate correctly, installation of the factory supplied duct pressure transducer (DPT) and plastic pneumatic tubing (field supplied) is required. The DPT is mounted in the unit control box for shipping purposes and is shown in Fig. 12. Remove the screw holding the DPT and disconnect quick connects from the transducer terminals. For correct pressure sensing, mount the DPT externally to the main trunk duct approximately  $2/_3$  of the way from the unit. Install factory supplied duct pressure tap (located in the installer's packet) at the DPT location by inserting tap perpendicular to duct airflow with the arrow on pressure tap flange matching airflow direction. Connect <sup>1</sup>/<sub>4</sub>-in plastic pneumatic tubing (field supplied) to barbed fitting on pressure tap and connect the other end to "High" fitting of pressure transducer. Leave "Low" pressure connection open to the atmosphere. Connect 20 or 22 AWG insulated wire [ $35^{\circ}$ C ( $95^{\circ}$ F) minimum] to DPT "+" and "-" terminals. Route wiring back to rooftop unit along with the low voltage VAV terminal field control wiring. Connect wire from DPT "+" terminal to quick connect on red wire from VAV-RTU Open Board J4 – Terminal 4 and wire from DPT "-" terminal to quick connect on black wire from VAV RTU-Open Board J4– Terminal 5 with  $^{3}/_{16}$ -in quick connects. Wire nuts may also be used.

Proper installation of these components is required for accurate input to Analog Input 1 (static\_press) on the VAV-RTU Open Control Board. For more information on this please refer to the 48/50LC\*B07-26 Controls, Start-Up, Operation, and Troubleshooting document.



Fig. 11 - SAT Sensor - Shipping Location



C150384

50LC\*B

Fig. 12 - Duct Pressure Transducer

#### Step 10 — Install Outside Air Hood

#### Economizer Hood Removal and Setup -

- 1. The hood is shipped in knock-down form and located in the return air compartment. It is attached to the economizer using two plastic tie-wraps.
- 2. To gain access to the hood, remove the filter access panel. (See Fig. 13.)



Fig. 13 - Typical Access Panel Locations

3. Locate and cut the (2) plastic tie-wraps, being careful to not damage any wiring. (See Fig. 14.)



Fig. 14 - Economizer Hood Package Location

4. Carefully lift the hood assembly through the filter access opening and assemble per the steps outlined in the following procedure *Economizer Hood Assembly*.

#### Economizer Hood Assembly -

**NOTE:** If the power exhaust accessory is to be installed on the unit, the hood shipped with the unit will not be used and must be discarded. Save the aluminum filter for use in the power exhaust hood assembly. 1. The indoor coil access panel will be used as the top of the hood. If the panel is still attached to the unit, remove the screws along the sides and bottom of the panel. See Fig. 15.



Fig. 15 - Indoor Coil Access Panel Relocation

2. Swing out indoor coil access panel and insert the hood sides under the panel (hood top). Be careful not to lift the panel too far as it might fall out. Use the screws provided to attach the hood sides to the hood top. Use screws provided to attach the hood sides to the hood sides to the unit. See Fig. 16.



Fig. 16 - Economizer Hood Construction

- 3. Remove the shipping tape holding the economizer barometric relief damper in place.
- 4. Insert the hood divider between the hood sides. See Fig. 16 and 17. Secure hood divider with 3 screws on each hood side. The hood divider is also used as the bottom filter rack for the aluminum filter.
- 5. Attach the post that separates the filters with the screws provided.



Fig. 17 - Economizer Filter Installation

- 6. Open the filter clips which are located underneath the hood top. Insert the aluminum filters into the bottom filter rack (hood divider). Push the filter into position past the open filter clips. Close the filter clips to lock the filters into place. See Fig. 17.
- 7. Install the two rain deflectors on the edge of the hood top as shown in Fig. 15.
- 8. Caulk the ends of the joint between the unit top panel and the hood top as shown in Fig. 15.
- 9. Replace the filter access panel.

#### Step 11 — Install External Condensate Trap & Line

The unit has one 3/4-in. condensate drain connection on the end of the condensate pan and an alternate connection on the bottom. See Fig. 18. Unit airflow configuration does not determine which drain connection to use. Either drain connection can be used with vertical or horizontal applications.



Fig. 18 - Condensate Drain Pan (Side View)

To use the alternate bottom drain connection, remove the red drain plug from the bottom connection (use a 1/2-in. square socket drive extension) and install it in the side drain connection.

The piping for the condensate drain and external trap can be completed after the unit is in place. See Fig. 19.

All units must have an external trap for condensate drainage. Install a trap at least 4-in. (102 mm) deep and protect against freeze-up. If drain line is installed downstream from the external trap, pitch the line away from the unit at 1-in. per 10 ft (25 mm in 3 m) of run. Do not use a pipe size smaller than the unit connection  $({}^{3}/_{4}$ -in.).



NOTE: Trap should be deep enough to offset maximum unit static difference. A 4" (102) trap is recommended

C08022

#### Fig. 19 - Condensate Drain Piping Details

#### Step 12 — Make Electrical Connections

### WARNING

#### ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to unit ground lug in control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code); ANSI/NFPA 70, latest edition (in Canada, Canadian Electrical Code CSA [Canadian Standards Association] C22.1), and local electrical codes.

**NOTE:** Field-supplied wiring shall conform with the limitations of minimum  $63^{\circ}F(33^{\circ}C)$  rise.

#### Field Power Supply -

For those units without through-the-curb power, conduit must be used to route the main power from the condenser end, via the power entry in the corner post of the unit (see Figs. 20, 21 and 22) to either the factory option disconnect or the bottom of the control box. 1" conduit is provided wrapped around compressor. A second conduit is provided with factory installed powered convenience outlet. For those units that require conduit larger than 1", it must be field supplied. Figs. 20, 21 and 22 show the various wire routings.

If the field disconnect is larger than 100A, it must be attached to the unit using accessory CRDISBKT001A00 — disconnect switch bracket — (see Fig. 23). Follow the instructions provided with this accessory. For smaller field disconnects, be sure to use 1/2" screws to mount the disconnect directly to the end panel, following the instructions on the Field Disconnect Warning label (see

Fig. 24). In either case, set the disconnect vertical location on the unit so that a  $90^{\circ}$  fitting can be used to connect the conduit to the disconnect.



Fig. 20 - Conduit into Factory Option Non-Fused Disconnect or HACR





Fig. 22 - Conduit into Single Point Box



Fig. 23 - Mounting Position for Field Disconnects (over 100A)



Fig. 24 - Mounting Position for Field Disconnects (up to 100A)

Field power wires are connected to the unit at line-side pressure lugs at the main terminal block (TB1), at factory-installed option non-fused disconnect switch or HACR, or field or factory-installed Single Point box for electric heat. Refer to Table 2 for maximum wire size at connection lugs. Use copper wire only. See Fig. 25. Units Without Single Point Box, Disconnect or HACR Option







Units With Electric Heat Option with Single Point Box and Without Disconnect or HACR Option





Table 2 – Connection Lug Min/Max Wire Sizes

	Minimum	Maximum
TB1 in unit control box	#14	#1
Terminal/Fuse block in Single Point Box for Electric Heat	#8	3/0
80A Disconnect Option	#14	#4
100A Disconnect Option	#8	1/0
200A Disconnect Option	#4	300 kcmil
25A HACR Option	#14	1/0
30A HACR Option	#14	1/0
35A HACR Option	#14	1/0
40A HACR Option	#14	1/0
50A HACR Option	#14	1/0
60A HACR Option	#14	1/0
70A HACR Option	#14	1/0
80A HACR Option	#14	1/0
90A HACR Option	#14	1/0
100A HACR Option	#14	1/0
110A HACR Option	#4	300 kcmil
125A HACR Option	#4	300 kcmil
150A HACR Option	#4	300 kcmil
175A HACR Option	#4	300 kcmil
200A HACR Option	#4	300 kcmil

**NOTE:** TEST LEADS - Unit may be equipped with short leads (pigtails) on the field line connection points off the optional non-fused disconnect switch or HACR. These leads are for factory run-test purposes only; remove and discard before connecting field power wires to unit connection points. Make field power connections directly to line connection pressure lugs only.

### WARNING

#### FIRE HAZARD

Failure to follow this warning could result in intermittent operation or performance satisfaction.

Do not connect aluminum wire between disconnect switch and air conditioning unit. Use only copper wire. (See Fig. 26.)



Fig. 26 - Disconnect Switch and Unit

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Fig. 27 - 50LC\*B08-12 VAV-RTU Open Control Wiring Diagram

50LC\*B



50LC\*B

Fig. 28 - Typical 50LC\*B08-12 Power Wiring Diagram

#### All Units —

All field wiring must comply with the NEC and local requirements.

Size wire based on MCA (Minimum Circuit Amps) on the unit informative plate. See Fig. 25 and the unit label diagram for power wiring connections to the unit power terminal blocks and equipment ground. Refer to Table 2 for maximum wire size at connection lugs.

Provide a ground-fault and short-circuit over-current protection device (fuse or breaker) per NEC Article 440 (or local codes). Refer to unit informative data plate for MOCP (Maximum Over-current Protection) device size.

**NOTE:** Units ordered with factory installed HACR do not need an additional ground-fault and short-circuit over-current protection device unless local codes require.

Voltage to compressor terminals during operation must be within voltage range indicated on unit nameplate. See Tables 8 and 9. On 3-phase units, voltages between phases must be balanced within 2% and the current within 10%. Use the formula shown in the legend for Tables 8 and 9 (see Note 2 on page 46) to determine the percent of voltage imbalance.

All units except 208/230-v units are factory wired for the voltage shown on the nameplate. If the 208/230-v unit is to be connected to a 208-v power supply, the control transformer must be rewired by moving the black wire with the 1/4-in. female spade connector from the 230-v connection and moving it to the 200-v 1/4-in. male terminal on the primary side of the transformer. Refer to unit label diagram for additional information.

#### CAUTION A

#### UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation would invalidate any applicable Carrier warranty.

NOTE: Check all factory and field electrical connections for tightness.

#### **Units Without Factory-Installed** Non-Fused Disconnect or HACR -

When installing units, provide a disconnect switch of adequate size per NEC (National Electrical Code). Disconnect sizing data is provided on the unit informative plate. Locate on unit cabinet or within sight of the unit per national or local codes. Do not cover unit informative plate if mounting the disconnect on the unit cabinet.

#### **Units With Factory-Installed** Non-Fused Disconnect or HACR—

The factory-installed option disconnect switch is located in a weatherproof enclosure located under the main control box. The manual switch handle is shipped in the disconnect or HACR enclosure. Assemble the shaft and handle to the switch or HACR at this point. Discard the factory test leads (see Fig. 25). The factory disconnect is a 200A disconnect on 230-3-60 units and a 100A disconnect on 460-3-60 and 575-3-60 units. On units with factory installed non-fused disconnect, without factory installed electric heat, the factory supplied load side wires may be of insufficient size for accessory electric heat applications. If so, remove the load side factory wiring. Re-size wires per unit nameplate data provided with accessory electric heat.



4. Make sure the NFD shipped from the factory is at OFF position (the arrow on the black handle knob is at OFF).

2. Remove (3) hex screws on the NFD enclosure - (2) on

To field install the NFD shaft and handle:

1. Remove the unit front panel (see Fig. 2).

the face of the cover and (1) on the bottom.

3. Remove the front cover of the NFD enclosure.

- 5. Insert the shaft with the cross pin on the top of the shaft in the horizontal position.
- 6. Measure the tip of the shaft to the top surface of the pointer to be 3.75 - 3.88 in. (95 - 99 mm) for 80A & 100A NFD and 3.43 - 3.56 in. (87 - 90 mm) for 200A NFD.
- 7. Tighten the locking screw to secure the shaft to the NFD.
- 8. Turn the handle to the OFF position with red arrow pointing at OFF.
- 9. Install the handle on to the painted cover horizontally with the red arrow pointing to the left.
- 10. Secure the handle to the painted cover with (2) screws and lock washers supplied.
- 11. Engaging the shaft into the handle socket, re-install (3) hex screws on the NFD enclosure.
- 12. Re-install the unit front panel.



Fig. 30 - Handle and Shaft Assembly for NFD

Fig. 29 - Location of Non-Fused Disconnect Enclosure



Fig. 31 - Location of HACR Enclosure

#### To field install the HACR shaft and handle:

- 1. Remove the unit front panel (see Fig. 2).
- 2. Remove (3) hex screws on the HACR enclosure (2) on the face of the cover and (1) on the bottom.
- 3. Remove the front cover of the HACR enclosure.
- 4. Make sure the HACR shipped from the factory is at OFF position (the white arrow pointing at OFF).
- 5. Insert the shaft all the way with the cross pin on the top of the shaft in the horizontal position.
- 6. Tighten the locking screw to secure the shaft to the HACR.
- 7. Turn the handle to the OFF position with red arrow pointing at OFF.
- 8. Install the handle on to the painted cover horizontally with the red arrow pointing to the left.
- 9. Secure the handle to the painted cover with (2) screws and lock washers supplied.
- 10. Engaging the shaft into the handle socket, re-install (3) hex screws on the HACR enclosure.
- 11. Re-install the unit front panel.



Fig. 32 - Handle and Shaft Assembly for HACR

Convenience Outlets —

# WARNING

#### ELECTRICAL OPERATION HAZARD

Failure to follow this warning could result in personal injury or death.

Units with convenience outlet circuits may use multiple disconnects. Check convenience outlet for power status before opening unit for service. Locate its disconnect switch, if appropriate, and open it. Lock-out and tag-out this switch, if necessary.

Two types of convenience outlets are offered on the 50LC\*B 08-12 units : non-powered and unit-powered. Both types provide a 125-volt GFCI (ground-fault circuit-interrupter) duplex receptacle rated at 15-A behind a hinged waterproof access cover, located on the panel beneath the control box. See Fig. 33.



Fig. 33 - Convenience Outlet Location

**Non-powered type:** This type requires the field installation of a general-purpose 125-volt 15-A circuit powered from a source elsewhere in the building. Observe national and local codes when selecting wire size and conduit requirements, fuse or breaker requirements and disconnect switch size and location. Route 125-v power supply conductors into the bottom of the utility box containing the duplex receptacle.

**Unit-powered type:** A unit-mounted transformer is factory-installed to stepdown the main power supply voltage to the unit to 115-v at the duplex receptacle. This option also includes a manual switch with fuse, located in a utility box and mounted on a bracket behind the convenience outlet; access is through the panel beneath the control box. See Fig. 33.

The primary leads to the convenience outlet transformer are not factory-connected. Selection of primary power source is a customer-option. If local codes permit, the transformer primary leads can be connected at the line-side terminals on the unit-mounted non-fused disconnect switch; this will provide service power to the unit when the unit disconnect switch is open. Other connection methods will result in the convenience outlet circuit being de-energized when the unit disconnect switch is open. See Fig. 34. On a unit without a unit-mounted disconnect, connect the source leads to the main terminal block (TB1).

If the convenience outlet transformer is connected to the line side of a field disconnect, the conduit provided with the unit must be used to protect the wire as they are routed from the transformer to the field disconnect. The end of the conduit with the straight connector attaches to the field disconnect. The other end does not need to connect to the transformer; however, the conduit must be routed so that all wiring is either in the conduit or behind the access panel.



UNIT VOLTAGE	CONNECT AS	PRIMARY CONNECTIONS	TRANSFORMER TERMINALS
208, 230	240	H1 + H3 H2 + H4	
460	480	L1: RED Splice BLU + YEL L2: GRA	H1 H2 + H3 H4
575	600	L1: RED L2: GRA	H1 H2

Fig. 34 - Unit Powered Convenience Outlet Wiring

If the convenience outlet transformer is connected to the line side of the factory disconnect option, route the wires through the web bushing located on the bottom of the disconnect box. For the load side wiring to the factory option disconnect, route the wires through the hole on the right side of the disconnect. Be sure to create a drip loop at least 6" long.

Test the GFCI receptacle by pressing the TEST button on the face of the receptacle to trip and open the receptacle. Check for proper grounding wires and power line phasing if the GFCI receptacle does not trip as required. Press the RESET button to clear the tripped condition. **Fuse on power type:** The factory fuse is a Bussman "Fusetron" T-15, non-renewable screw-in (Edison base) type plug fuse.



Fig. 35 - Convenience Outlet Utilization Notice

# WARNING

#### ELECTRICAL OPERATION HAZARD

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Failure to follow this warning could result in personal injury or death.

Using unit-mounted convenience outlets: Units with unit-mounted convenience outlet circuits will often require that two disconnects be opened to de-energize all power to the unit. Treat all units as electrically energized until the convenience outlet power is also checked and de-energization is confirmed. Observe National Electrical Code Article 210, Branch Circuits, for use of convenience outlets.

**Installing Weatherproof Cover:** A weatherproof while-in-use cover for the factory-installed convenience outlets is now required by UL standards. This cover cannot be factory-mounted due its depth; it must be installed at unit installation. For shipment, the convenience outlet is covered with a blank cover plate.

The weatherproof cover kit is shipped in the unit's control box. The kit includes the hinged cover, a backing plate and gasket.

DISCONNECT ALL POWER TO UNIT AND CONVENIENCE OUTLET. LOCK-OUT AND TAG-OUT ALL POWER.

Remove the blank cover plate at the convenience outlet; discard the blank cover.

Loosen the two screws at the GFCI duplex outlet, until approximately 1/2-in (13 mm) under screw heads are exposed. Press the gasket over the screw heads. Slip the backing plate over the screw heads at the keyhole slots and align with the gasket; tighten the two screws until snug (do not over-tighten).

Mount the weatherproof cover to the backing plate as shown in Fig. 36. Remove two slot fillers in the bottom of the cover to permit service tool cords to exit the cover. Check for full closing and latching.



Fig. 36 - Weatherproof Cover Installation

#### HACR —

The amp rating of the HACR factory installed option is based on the size, voltage, indoor motor and other electrical options of the unit as shipped from the factory. If field installed accessories are added or changed in the field (i.e., electric heat, power exhaust), the HACR may no longer be of the proper amp rating and therefore will need to be removed from the unit. See unit nameplate and label on factory installed HACR for the amp rating of the HACR that was shipped with the unit from the factory. See unit nameplates for the proper fuse, HACR or maximum over-current protection device required on the unit with field installed accessories.



Fig. 37 - HACR Caution Label

#### Factory-Option Thru-Base Connections —

This service connection kit consists of a 1/2-in electrical bulkhead connector and a  $1^{1}/2$ -in electrical bulkhead connector, connected to an "L" bracket covering the embossed (raised) section of the unit basepan in the condenser section. See Fig. 38. The 1/2-in bulkhead connector enables the low-voltage control wires to pass through the basepan. The  $1^{1}/2$ -in electrical bulkhead connector allows the high-voltage power wires to pass through the basepan.



#### Fig. 38 - Thru-the-Base Option, Shipping Position

- 1. Remove the "L" bracket assembly from the unit.
- 2. Remove connector plate assembly from the "L" bracket and discard the "L" bracket, but retain the washer head screws and the gasket (located between the "L" bracket and the connector plate assembly).

**NOTE:** Take care not to damage the gasket, as it is reused in the following step.

- 3. Place the gasket over the embossed area in the basepan, aligning the holes in the gasket to the holes in the basepan. See Fig. 39.
- 4. Install the connector plate assembly to the basepan using 8 of the washer head screws.

**NOTE:** If electrical connections are not going to occur at this time, tape or otherwise cover the fittings so that moisture does not get into the building or conduit in the interim.



Fig. 39 - Installing Thru-the-Base Option

Check tightness of connector lock nuts before connecting electrical conduits.

Field-supplied and field-installed liquidtight conduit connectors and conduit may be attached to the connectors on the basepan. Pull correctly rated high voltage and low voltage wires through appropriate conduits. Connect the power conduit to the internal disconnect (if unit is so equipped) or to the external disconnect (through unit side panel). Remove one of the two knockouts located on the bottom left side of the unit control box. Use this hole for the control conduit.

#### Units Without Thru-Base Connections -

- 1. Install power wiring conduit through side panel openings. Install conduit between disconnect and control box.
- 2. Install power lines to terminal connections as shown in Fig. 25.

#### Unit Without Thru-Base Connection Kit -

Pass the thermostat control wires through the bushing on the unit end panel. Route the wire through the snap-in wire tie and up to the web bushing near the control box. Route the wire through the bushing and into the bottom left side of the control box after removing one of the two knockouts in the corner of the box. Using a connector at the control box to protect the wire as it passes into the control box pull the wires over to the terminal strip at the lower left corner of the Integrated Staging Control (ISC) Board. Use the connector at the control box and the wire tie to ensure that the thermostat wire is tight and will not be damaged by contact with the condenser coil. See Fig. 40.

**NOTE:** If thru-the-bottom connections accessory is used, refer to the accessory installation instructions for information on routing power and control wiring.



Fig. 40 - Thermostat Wire Routing

#### Heat Anticipator Settings -

Set heat anticipator settings at 0.14 amp for the first stage and 0.14 amp for second-stage heating, when available.

#### **Electric Heaters**

50LC\*B08-12 units may be equipped with factory or field-installed electric heaters. The heaters are modular in design, with heater frames holding open coil resistance wires strung through ceramic insulators, line-break limit switches and a control contactor. One or two heater modules may be used in a unit.

Heater modules are installed in the compartment below the indoor (supply) fan outlet. Access is through the indoor access panel. Heater modules slide into the compartment on tracks along the bottom of the heater opening. See Fig. 41.

### **A** CAUTION

#### UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

Not all available heater modules and single point boxes may be used in every unit. Use only those heater modules that are UL listed for use in a specific size unit. Refer to the label on the unit cabinet for the list of approved heaters and single point boxes.



Fig. 41 - Typical Component Location

#### Single Point Boxes

When heaters are installed, power wiring to both heaters and the rest of the unit is connected via the single point box accessory, which will be installed directly under the unit control box, just to the left of the partition separating the indoor section (with electric heaters) from the outdoor section. The single point box has a hinged access cover. See Fig. 42. The single point box also includes pigtails to complete the wiring between the single point box and the unit's main control box terminals. The pigtails will already be connected into the unit's main control box on units with factory installed electric heat. Refer to the accessory heater and Single Point Box installation instructions for details on tap connections for field installed electric heat accessory.



Fig. 42 - Typical Single Point Installation

#### Heater and Supplementary Fuses —

When the unit MOCP device value exceeds 60-A, unit-mounted supplementary fuses are required for each heater circuit. These fuses are included in accessory Single Point Boxes, with power distribution and fuse blocks.

All fuses on 50LC\*B08-12 units are 60-A. (Note that all heaters are qualified for use with a 60-A fuse, regardless of actual heater ampacity, so only 60-A fuses are necessary.)

#### Heater Low-Voltage Control Connections —

One or two heaters can be installed in the unit. Use the wiring procedure below for each heater.

The two-stage electric heaters have orange, violet, red and brown wires. The orange and the violet are the control wires and the red and brown wires feed the safety circuit. Connect the orange and the violet wires to the orange and violet wire locations of TB4. Connect the red and brown wires to red and brown wires on TB4. If more than one heater is installed, repeat the wiring procedure for the second heater. The 3 locations across the top of TB4 do allow a switch to be installed in series with some of the heaters in order to add additional heater control. See Fig. 43.

NOTE: The low voltage wiring will already be completed on units with factory installed electric heat.



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#### Fig. 43 - Optional or Accessory Electric Heater **Control Connections**

#### **VAV-RTU Open Controller**

For details on VAV-RTU Open option refer to the 48/50LC\*B 7-26 VAV-RTU Open Controller Controls, Start-up, Operation and Troubleshooting manual.

#### **Integrated Staging Control (ISC) Board**



Fig. 44 - Integrated Staging Control (ISC) Board

#### **Sequence of Operation**

#### General —

The Carrier Integrated Staging Control (ISC) is intended for use with the VAV-RTU Open controller. After initial power to the board, a Green LED will blink with a 1 second duty cycle indicating the unit is running properly. In the event of the ISC board failing, the Green LED will be OFF or continuously ON. When the unit is not running properly, the Green LED will blink along with Red LED lights. The Red LED light configuration will indicate the type of error the board has identified. See Fig. 44 for LED locations and Table 3 for a list of status codes.

The ISC board can be remotely shutdown by removing Jumper 4 and wiring to the Remote Shutdown terminal. The Smoke Control Module can shutdown the unit by removing Jumper 3 and wiring to the Smoke Shutdown terminal. The Smoke Alarm terminal on the ISC Board provides a pass thru connection should a smoke alarm signal be connected. The VAV-RTU Open controller provides the signal which is passed thru the ISC board to the Smoke Alarm terminal.

The crankcase heater will run at all times except when the compressors are running. An auxiliary power supply (24Vac) available at TB-4 Terminal is provided to power auxiliary equipment. An optional Phase Monitor Relay can be wired to the PMR terminal by removing Jumper 5. An optional Condensate Flow Switch can be wired to the COFS Terminal by removing Jumper 7.

#### Static Pressure Control -

The supply fan VFD will be controlled using a PID and an analog input from a duct static pressure transducer. The supply fan will modulate its speed to maintain the desired duct static pressure setpoint.

Table 3 -	- Status	Code	Description	ns for	ISC Board LEDs	
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			LEC	<b>INDICAT</b>	ION	
ERROR#	ERROR NAME	LED01	LED02	LED03	LED04	LED05
1	Check Smoke Detector/PMR/AUX		RED			
2	Check HPS/LPS/COFS	RED	RED			
3	Call for Y3 with no call for Y1. Check Y1 wiring.				RED	
4	Call for Y3 with no call for Y1/Y2. Check Y1 wiring.				RED	RED
5	Call for Y2 with no call for Y1. Check Y1 wiring.		RED		RED	
6	Call for W2 with no call for W1. Check W1 wiring.	RED				RED
7	Call for heat (W1/W2) and cooling (Y1/Y2/Y3). Check VAV-RTU Open wiring.	RED	RED		RED	RED
8	Call for heat (W1/W2) with no IFM. Check G wiring.		RED	Blinking Green	RED	RED
9	Call for cooling (Y1/Y2/Y3) with no G. Check G wiring	RED	RED	LED	RED	
10	Call for heat (W1/W2) and cooling (Y1/Y2/Y3) with no G. Check VAV-RTU Open and G wiring.	RED	RED	(Note 1)		RED
11	Check ISC Board and the VAV-RTU Open wiring	RED			RED	RED
12	Call for Economizer Y1 Feedback (ECON) from economizer with no call for Y1. Check VAV-RTU Open and economizer wiring.	RED				
13	Check ISC Board and the VAV-RTU Open wiring	RED			RED	
14	Check ISC Board and the VAV-RTU Open wiring					RED
15	Check ISC Board and the VAV-RTU Open wiring		RED			RED

NOTES: 1. Green LED Blinking at 1HZ indicates normal operation.

2. Solid red LED indicates an error exists, see above LED configuration.

#### Field Test/Commissioning -

The control will provide BACnet test points to activate specific test modes that can be used to commission the rooftop and the system. Test modes will be available in the Service Test screen on the Property pages and shall also be available on the local Equipment Touch device for standalone commissioning. Tests include: Fan Test, Low Heat Test, High Heat Test, Cooling Test, Power Exhaust Test, and an Economizer Test. When any test is active, the appropriate Linkage mode will be sent to the system's terminals. This will ensure appropriate system operation and airflow during any test mode.

#### Ventilation —

In the Ventilation/Fan Mode the indoor-fan will run at low speed and the damper will operate at minimum position.

#### Supply Air Temperature Control -

The control will maintain the desired supply air temperature setpoint whenever cooling is required. A user configurable setpoint will be provided (default 53°F). The control will use the appropriate method (economizer cooling, mechanical cooling, or a combination of both) to achieve this setpoint whenever the zone temperature is greater than the current cooling setpoint (occupied or unoccupied). If Supply Air Reset is enabled, the reset algorithm will calculate a proportional reset value between the Occupied Cooling setpoint and 1°F above the Occupied Heating setpoint. The amount of reset (reset ratio and maximum reset limit value) is user configurable.

#### Minimum Ventilation -

The economizer minimum position will be adjusted as required based on the supply fan speed. Two user configurable minimum economizer positions will be provided. The economizer will be positioned at the "Low Fan Econ Min Pos" when the fan is operating at its slowest speed. When the fan is operating at its maximum speed, the economizer will be positioned at the "Vent Dmpr Pos / DCV Min Pos". For any supply fan speed between these two points, the economizer minimum position will be calculated proportionally.

#### Demand Controlled Ventilation [DCV] -

Whenever the unit is in an occupied mode and "DCV Control" is set to enable, a unique economizer minimum position will be calculated based on the output of the DCV calculation. Two user configurable values are provided; the "DCV Max Ctrl Setpoint" is the differential CO<sub>2</sub> setpoint that is used as the control point and a "DCV Max Vent Damper Pos" provides the ability to limit the maximum amount of outdoor air being introduced into the unit through the economizer by the DCV control. The economizer will be positioned at the greater of any minimum economizer position. Demand Controlled Ventilation can be used in either a differential mode where both the indoor air and outdoor air CO2 levels are provided to the control or it may be used in a single indoor air mode with only the indoor air CO<sub>2</sub> level. In the latter case, the outdoor air CO<sub>2</sub> level is assumed at 400 ppm.

#### Mechanical Cooling Cycle -

The control will operate three stages of mechanical cooling in order to maintain the desired supply air temperature whenever economizer cooling operation is unavailable but cooling is required. This condition will be determined if the OA has high enthalpy or at a temperature above the Economizer Lockout temperature. The two compressors will be staged in a binary fashion so that three stages of cooling are provided. Mechanical cooling stages will be added as required to meet the desired SA setpoint. The number of stages will depend on the return air conditions and the system load (airflow through the coil). Stages will be added

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or dropped as required to maintain the setpoint while also maintaining the minimum on time and minimum off time for compressor operation. Anytime the SA falls below the desired SA setpoint, stages will be dropped until only stage 1 is operating. At that point, should the SA fall below  $45^{\circ}$ F (7°C), the economizer will modulate to increase the amount of outdoor air in order to maintain this minimum SA temperature. Should the SA is still below the minimum SA temperature, the 1st cooling stage will be disabled and the economizer will return to the minimum position.

#### **Integrated Cooling Cycle -**

If economizer cooling operation is insufficient to maintain the desired SA setpoint, mechanical cooling will be activated to supplement the free economizer cooling. This condition will be determined if the OA has low enthalpy but is at a temperature at least 5 deg F above the desired SA setpoint and below the Economizer Lockout temperature. Mechanical cooling stages will be added as required to meet the desired SA setpoint. The number of stages will depend on the return air conditions and the system load (airflow through the coil). Stages will be added or dropped as required to maintain the setpoint while also maintaining the minimum on time and minimum off time for compressor operation. Anytime the SA falls below the desired SA setpoint, stages will be dropped until only stage 1 is operating. At that point, should the SA fall below the minimum SA temperature, the economizer will modulate to increase the amount of return air in order to maintain this minimum SA temperature. Should the economizer reach the minimum OA position and if the SA is still below the minimum SA temperature, the 1st cooling stage will be disabled.

#### Economizer Cooling Cycle -

The control will provide the ability to utilize outdoor air for maintaining the supply air setpoint should the outdoor air be suitable. The economizer control will utilize an OAT temperature check, a RAT temperature check if RAT is available or a SPT temperature check comparison and optionally, an OA enthalpy check to determine if OA conditions are suitable for economizing. Economizer operation, if available, will begin whenever cooling is required. The economizer will modulate the position of the OA damper to maintain the desired calculated economizer setpoint. The economizer will be controlled to meet CEC Title 24 requirements so that it will remain open 100% during integrated cooling and only partially close if required.

#### Low Ambient Cooling Operation down to 45°F (7°C) -

In Low Ambient RTU conditions when the temperature is between 55°F (13°C) and 45°F (7°C), the Low Ambient Switch (LAS) will be active and the outdoor-fans will run to the pre-set factory outdoor-fan speed. When the temperature is greater than 65°F (18°C), the Low Ambient Switch will deactivate and the outdoor-fans will run in the standard cooling mode. If the Outdoor Fan Select Switch (see Fig. 45) is in the up position, the outdoor fans will run in the Fan Cycle Speed Mode (FCS) set to 250 rpm. If the Outdoor Fan Select Switch is in the down position, the outdoor fans will run in the Minimum Fan Speed Mode (MIN) set to 160 rpm regardless of the cooling demand. At temperatures below  $45^{\circ}$ F (7°C), unit will utilize economizer for SA temperature control.

LC\*B08 through 12 Units have a SPDT Low Ambient Switch wired to the OF terminal and the Outdoor Fan Relay (See Fig. 46). The jumper across the PS terminal will be removed. When the LAS is active, the switch will close making contact to the OF terminal and will drop connection to the ODF Relay. When electrical connection is removed from the ODF Relay, the PS connection will be opened. This will place the third outdoor-fan electrically isolated from receiving any speed command, which will then turn the motor off. This is done for units that only require two outdoor fans to run at the same pre-set factory Low Ambient Speed.



C13327

Fig. 45 - Outdoor Fan Speed Select Switch



Fig. 46 - Schematic of SPDT Low Ambient Switch

The Low Ambient Temperature Outdoor Fan Control Table (below) shows the operation of the outdoor fan for size 08, 09 and 12 units.

 Table 4 – Low Ambient Temperature Outdoor Fan Control

LC Size	No. of Fans On	No. of Fans Off	Switch	Outdoor Fan Select Switch	RPM
08	2	1	(1) SPDT	Down	160
09	2	1	(1) SPDT	Down	160
12	2	1	(1) SPDT	Down	160

#### Heating —

In the Heating Mode power is applied to the G and W1 terminal at the ISC board and energizes the first state of electric heat. Upon more call for heat power is applied to the G and W2 terminal at the ISC board and energizes the second state of electric heat. The VFD controlled indoor fan will operate at high speed regardless of the heating demand.

#### Morning Warm-up-

The control will provide a Morning Warm-up cycle the first time if transition from unoccupied to occupied and if the heating is required and the unit goes into heating immediately. Whenever the unit enters the heating mode, before any heat stage is enabled, the control will provide a Linkage mode to the system that will cause the terminals to maintain sufficient airflow. The Linkage mode of Warm-up (2) will be sent to the terminal system to insure sufficient airflow while in the heating mode but also providing a controlled warm-up cycle to prevent overheating of some zones. As a safety measure, should the heating cycle continue and the SAT approach the "Maximum Heating SAT" limit, the Linkage mode sent will change to Pressurization (6) to insure all terminals open to their maximum airflow. The Linkage mode will remain Pressurization until that heating cycle ends. Once the heating demand is met and the heat cycle is completed or if cooling is required, heating will be locked out until the beginning of the next occupied period.

#### **Occupied Heating -**

Optionally, the user may enable occupied heating which will allow heating whenever heating is needed during the occupied period. The cycle will operate exactly the same as Morning Warm-up above, except it will not be limited by the transition into an occupied period.

# Variable Air Volume (VAV) with Variable Frequency Drive

The Variable Air Volume (VAV) system utilizes a Variable Frequency Drive (VFD) to modulate supply fan speed using a PID and an analog input from a duct static pressure sensor. The supply fan will adjust to meet the configured static set point regardless of cooling stage. In heating mode the latest VAV Open air terminals offer a minimum airflow setting. This shall be configured to maintain the required airflow (CFM) whenever the RTU is in a heating mode per the unit's specification. The Open VAV terminals will recognize the Heating or Warm-up modes as a heat mode and utilize the higher airflow minimum setpoint as configured. The system will further monitor the SAT of the RTU to determine if the SAT is approaching the configured maximum limit. As the limit is approached, the Linkage mode is changed to Linkage Pressurization to ensure all terminals open to their maximum supply airflow.



Fig. 47 - Variable Frequency Drive (VFD)



### Multi-Speed VFD Display Kit (Field-Installed Option)

**NOTE:** The Remote VFD Keypad is part of the Multi-Speed VFD display kit (PN: CRDISKIT002A00) which is a field-installed option. It is not included with the 50LC\*B08-12 base units.

The VFD keypad as shown in Fig. 49 consists of the following sections:





Alpha Numeric Display: The LCD display is back lit with 2 alpha-numeric lines. All data is displayed on the LCD.



	C13113
1	Parameter number and name.
2	Parameter value.
3	Setup number shows the active setup and the edit setup. If the same set-up acts as both the active and edit set-up, only that setup number is shown (factory setting). When the active and edit setup differ, both numbers are shown in the display (SETUP 12). The flashing number indicates the edit setup.
4	The symbol in the number 4 position in the figure above indicates motor direction. The arrow point either clockwise or counter-clockwise to show the motor's current direction.
5	The position of the triangle indicates the currently selected menu: Status, Quick Menu or Main Menu.

**Menu Key:** Use the Menu key to select between Status, Quick Menu or Main Menu. The triangle icon at the bottom of the LCD display indicates the currently selected mode. (See number 5 in the table above.)

**Navigation Keys and Status LEDs:** The Navigation keys and Status LEDs are detailed in the following table.



**Operation Keys and LEDs:** The following table details the functions of the Operating keys. An illuminated yellow LED above the key indicates the active key.



	C13115
1	Hand On key: Starts the motor and enables control of the variable frequency drive (VFD) via the VFD Keypad option.
	<b>NOTE:</b> Please note that terminal 27 Digital Input ( <i>5-12 Terminal 27 Digital Input</i> ) has coast inverse as default setting. This means that the Hand On key will not start the motor if there is no 24V to terminal 27, so be sure to connect terminal 12 to terminal 27.
2	<b>Off/Reset</b> key: Stops the motor (off). If in alarm mode the alarm will be reset.
3	<b>Auto On</b> key: The variable frequency drive is controlled either via control terminals or serial communication.

#### Connecting the Keypad to the VFD

The VFD keypad can be mounted directly to the variable frequency drive, provided you can easily access the front panel of the VFD. If you don't have easy access to the VFD front panel, use the cable included with the kit to connect the keypad to the VFD.

#### Connecting the Keypad Directly to the VFD ----

1. Place the bottom of the VFD keypad into the variable frequency drive as shown in Fig. 50.



Fig. 50 - Align Bottom of VFD Keypad with Opening in VFD Front Panel

2. Push the top of the VFD keypad into the variable frequency drive as shown in Fig. 51.



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C13118

50LC\*B

#### Using the Cable to Connect the Keypad to the VFD -

Fig. 51 - Secure Keypad in Place

The VFD keypad can be connected to the variable frequency drive via the cable included with the Multi-Speed VFD display kit (PN: CRDISKIT002A00).



Fig. 52 - VFD Remote Keypad Cable

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- 1. Connect the male end of the cable to the front panel of the variable frequency drive. Use 2 of the screws included with the kit to secure the cable to the VFD.
- 2. Connect the female end of the cable to the back panel of the VFD Remote keypad. Secure the cable to the remote keypad using the 2 remaining screws from the kit.

#### **Program the VFD for Indoor Fan Control**

**IMPORTANT:** 50LC\*B08-12 units are programmed at the Factory for variable indoor fan speeds. The following procedure is only to be used to recover this function after an event such as a system crash.

**NOTE:** This procedure requires use of the VFD Keypad which is included as part of the field-installed Multi-Speed VFD display kit (PN: CRDISKIT002A00). If the VFD keypad is not already installed, install it. See "Connecting the Keypad to the VFD" for details.

# To program the VFD for variable indoor fan motor speeds:

1. At Power-Up:

At the first power up the LCD displays the Select Language screen. The default setting is English. To change the language, press the **OK** key and use the  $\blacktriangle$  and  $\blacktriangledown$  keys to scroll to the desired language and then press **OK**.



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#### Fig. 53 - Keypad with Power Up Screen Displayed

- 2. Selecting Regional Settings:
  - a. Press the **Off Reset** key.
  - b. Press the **Menu** key to move the **▼**(triangle icon) so it is positioned over Main Menu. The display show the following -

0-** Operation / Display	
1-** Load and Motor	

c. Press the OK key, the display changes to -

	-	<u> </u>	-	
0-0* Basic	Settings			
0-1* Set-u	up Operatio	ons		

d. With the top row highlighted, press **OK**. The display changes to -

0-01 Language	
[0] English	

**NOTE:** If English is not the desired language press **OK**, select the desired language and press **OK** again.

e. Press **▼(Down Arrow** key) once; the display changes to -

0-03 Regional Settings	
[0] International	

- f. Press **OK**; the [0] is now highlighted.
- g. Press **▼(Down Arrow)** key once; the display changes to -

0-03 Regional Settings	
[1] North America	

#### h. Press OK

**NOTE:** If the Alarm 060 appears, follow Step 3 to clear the alarm. Make sure to press **Off Reset** when done. If there is no alarm, continue at Step 4.

- 3. Clearing Alarm 060: External Interlock:
  - a. Press the **Menu** key twice to position the ▼(triangle icon) over Main Menu; the display changes to -

0-**	Operation / Display
1-**	Load and Motor

b. Press the ▼(Down Arrow) key until the following display appears -

4-** Limits / Warnings			
5-**	Digital In/Out	igital Ir	

c. Press OK. The display changes to -

5-0*	Digital I/O mode	
5–1*	Digital Inputs	

d. Press **▼**(**Down Arrow**) once to highlight the bottom row and press **OK**. The display changes to -

> 5-10 Terminal 18 Digital In... [8] Start

e. Press **▼**(**Down Arrow**) twice; the following display appears-

5–12 Terminal 27 Digital In… [7] External Interlock

- f. Press **OK** to highlight the number in the bracket.
- g. Press **▼**(**Down Arrow**) until the following display appears -

5-12 Terminal 27 Digital In	
[0] No operation	

- h. Press OK.
- i. Press Off Reset. The Alarm indicator disappears.

- 4. Entering Grid Type:
  - a. Press the **Menu** key to move the ▼(triangle icon) so it is positioned over Main Menu. The display show the following -

0-0* Basic Settings	
0-1* Set-up Operations	

b. Press OK twice: the display changes to -

0–01 Language [0] English

c. Press **▼**(**Down Arrow**) three times, to reach the following display -

0–06 Grid Type	
[102] 200-240V/60Hz	

- d. Press OK to highlight the number in the bracket and then use the ▲ and ▼ (Up and Down Arrow) keys to select the desired voltage and Hertz for the unit.
- e. Press **OK** to accept the selection and continue.
- 5. Entering Motor Data:
  - a. Press the **Menu** key to move the ▼(triangle icon) so it is positioned over Main Menu. The display show the following -

0-**	Operation / Display
1-**	Load and Motor

- b. Press **▼**(**Down Arrow**) once to highlight the bottom row.
- c. Press OK, the display changes to -

1-0*	General	Settings	
1-1*	Motor S	election	

d. Press **▼**(**Down Arrow**) twice to reach the following display -

1-1*	Motor	Selection
1-2*	Motor	Data

e. Press OK, the following display appears -

1-20 Motor Power		
[9] 1.5kW – 2 hp		

**NOTE**: The number in the bracket may be different from what is shown above.

- f. Press OK and then use the ▲ and ▼ (Up and Down Arrow) keys to scroll to the proper motor horsepower. Press OK again to set the selected hp.
- g. Press **▼**(**Down Arrow**) once, the following display appears -

1-22 Motor Voltage	
230V	

 h. Press OK to highlight the voltage value. Use the ▲ and ▼ (Up and Down Arrow) keys to select the nameplate voltage. Press OK again to set the selected voltage.
 i. Press **▼**(**Down Arrow**) once to display the following -



- j. Press **OK** to highlight the Frequency value and then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select the nameplate Hz. Press **OK** again to set the selected Hz.
- k. Press ▼(Down Arrow) once to display the following -

1-24 Motor Current	
6.61A	

 Press OK to highlight the Current value and then use the ▲ and ▼ (Up and Down Arrow) keys to select the Max Amps value provided. Press OK again to set the selected Max Amps.

**NOTE:** Max Amps is greater than the nameplate value. Check the VFD Unit Parameters (see Tables 5 - 7 on pages 37 - 39) and use the value listed for the given unit in the column labeled "Motor Current Must-Hold Amps".

m. Press ▼(Down Arrow) once to display the following -

1-25 Motor Nominal Speed	
1740rpm	

- n. Press OK to highlight the rpm value and then use the ▲ and ▼ (Up and Down Arrow) keys to select the nameplate rpm. Press OK again to set the selected rpm.
- 6. Entering Parameters for 1-71, 1-73, 1-82, and 1-90:
  - a. Press the **Menu** key to move the ▼(triangle icon) so it is positioned over Main Menu. The display show the following -



- b. Press **▼**(**Down Arrow**) once to highlight the bottom row.
- c. Press OK, the display changes to -

1-0*	General Sett	ings
1-1*	Motor Select	ion

d. Press **▼**(**Down Arrow**) until the following display appears -

1-6* Load De	epen. Setting
1-7* Start Ad	justments

e. Press OK, the following display appears -

1-71 Start Delay 2.0s

f. Press OK to highlight the number and then use the ▲ and ▼ (Up and Down Arrow) keys to select the number provided in Tables 5 - 7. Press OK again to set the selected value.

g. Press **▼(Down Arrow)** twice, the following display appears -

1-73 Flying Start	
[1] Enabled	

- h. Press OK to highlight the number in the bracket and then use the ▲ and ▼ (Up and Down Arrow) keys to select the number provided in Tables 5 7. Press OK again to set the selected value.
- i. Press the **Back** key once, the following display appears -



j. Press **▼**(**Down Arrow**) once, the following display appears -

1-7* Start Adjust	tments
1–8* Stop Adjust	

k. Press OK, the following display appears -



1. Press **▼**(**Down Arrow**) once, the following display appears -

1-82 Min Speed for Functio	
1.0 Hz	

- m. Press OK to highlight the number and then use the ▲ and ▼ (Up and Down Arrow) keys to select the number provided in Tables 5 7. Press OK again to set the selected value.
- n. Press the **Back** key once, the following display appears -

1-7* Start Adjustments	
1–8* Stop Adjustments	

o. Press ▼(Down Arrow) once, the following display appears -

1-8*	Stop Adjustments
1-9*	Motor Temperature

p. Press OK, the following display appears -

1-90 Motor Thermal Prote	
[4] ETR trip 1	

- q. Press OK to highlight the number in the bracket then use the ▲ and ♥ (Up and Down Arrow) keys to select the number provided in Tables 5 7. Press OK again to set the selected value.
- 7. Setting References:
  - a. Press the **Menu** key to move the ▼(triangle icon) so it is positioned over Main Menu. The display show the following -



b. Press **▼(Down Arrow)** three times, the following display appears -

2-**	Brakes	
3-**	Reference /	Ramps

c. Press OK, the following display appears -

3-1*	References
3-0*	Reference Limits

3-02 Minimum Reference	
0.000	

**NOTE:** If the bottom row displays a number other than 0.000, press **OK** and use the  $\blacktriangle$  and  $\blacktriangledown$  (**Up** and **Down Arrow**) key to select 0.000.

e. Press **▼**(**Down Arrow**) once, the following display appears -

ſ	3-03 Maximum Reference
	60.000

**NOTE:** If the bottom row displays a number other than 60.000, press **OK** and use the  $\blacktriangle$  and  $\blacktriangledown$  (**Up** and **Down Arrow**) key to select 60.000.

f. Press the **Back** key until the following display appears -

3-0*	Reference	Limits
3–1*	Reference	S

g. Press **▼**(**Down Arrow**) once to move the highlight to the bottom row and then press **OK**. The following display appears -

3-10 Preset Reference [0]0.00%

h. Press **OK** once to highlight the number in the bracket. Press **OK** again; the highlight moves to the current percent value.

Use the  $\blacktriangle$  and  $\bigtriangledown$  (Up and Down Arrow) keys and the following table to enter the required Preset Reference values.

[0]0.00%	Stop
[1]LL.LL%	Low Speed (see Tables 5 – 7, column labeled "Preset References 3–10[1]" for the proper % for each unit)
[2]MM.MM%	Medium Speed (see Tables 5 $-7$ , column labeled "Preset References 3 $-10[2]$ for the proper % for each unit)
[3]100%	Override (High Speed)
[4]100%	High Speed (100% or close to 100% to achieve the required CFM at high speed)
[5]0.00%	Stop
[6]0.00%	Stop
[7]0.00%	Stop

d. Press OK again, the following display appears -

#### 8. Setting the Ramp Time:

a. Press the **Back** key until the following display appears -

3-0*	Reference Limits
3-1*	References

b. Press **▼(Down Arrow)** twice, the following display appears -

3-1*	References
3-4*	Ramp 1

c. Press OK, the following display appears -

3-41 Ramp 1 Ramp up Time	
3.00s	

- d. Press OK again to highlight the bottom row and use the ▲ and ♥ (Up and Down Arrow) keys to select 10.00s. Press OK again to set the selected Ramp up Time.
- e. Press **▼**(**Down Arrow**) once, the following display appears -



- f. Press OK again to highlight the bottom row and use the ▲ and ♥ (Up and Down Arrow) keys to select 10.00s. Press OK again to set the selected Ramp Down Time.
- 9. Setting Limits:
  - a. Press the **Back** key until the following display appears -



b. Press ▼(Down Arrow) once, the following display appears -

3-** Reference / Ramps				
4-** Limits / Warnings				

c. Press OK, the following display appears -

4-1* Motor Limits	
4-4* Adj. Warning 2	

d. Press OK again, the following display appears -

4-10 Motor Speed Direction
[2] Both Directions

e. Press **▼**(**Down Arrow**) once, the following display appears -

4-12 Motor Speed Low Limi… 0.0Hz

f. Press **▼**(**Down Arrow**) again, the following display appears -

4-14 Motor Speed High Limi... 65.0Hz **NOTE:** Press **OK** to highlight the Hz value and then use the  $\blacktriangle$  and  $\blacktriangledown$  (**Up** and **Down Arrow**) keys to enter the required values.

g. Press **▼(Down Arrow**) once, the following display appears -



**NOTE:** Press **OK** to highlight the % value and then use the **\blacktriangle** and **\bigvee** (**Up** and **Down Arrow**) keys to enter the required value. See Table 5 for proper selection of the value for this parameter then press **OK** to set the selected value.

h. Press **▼**(**Down Arrow**) once, the following display appears -



**NOTE:** Press **OK** to highlight the Hz value and then use the  $\blacktriangle$  and  $\blacktriangledown$  (**Up** and **Down Arrow**) keys to enter the required values.

10. Setting Digital Inputs:

a. Press the **Back** key until the following display appears -

3-**	Reference / Ramps
4-**	Limits / Warnings

b. Press **▼**(**Down Arrow**) once, the following display appears -

4-**	Limits / Warnings
	Digital In/Out

c. Press OK, the following display appears -

5-0*	Digital	I/O	mode		
5-1* Digital Inputs					

d. Press **▼**(**Down Arrow**) once to move the highlight to the bottom row and then press **OK**. The following display appears -

5-10 Terminal 18 Digital In… [8] Start

e. Press **▼**(**Down Arrow**) again. The following display appears -

5-11 Terminal 19 Digital In... [16] Preset ref bit 0

f. Press **▼**(**Down Arrow**) again. The following display appears -

5-12 Terminal 27 Digital In... [17] Preset ref bit 1

g. Press **▼(Down Arrow**) again. The following display appears -

5-13 Terminal 29 Digital In... [18] Preset ref bit 2

**NOTE:** By pressing **OK** the number in the bracket can be changed until the desired number appears. Press **OK** again to set the selected value.

- 11. Setting Analog Inputs:
  - a. Press the **Back** key until the following display appears -

4-**	Limits / Warnings
5-**	Digital In/Out

b. Press **▼**(**Down Arrow**) until the following display appears -

5-**	Digital In/Out
6-**	Analog In/Out

c. Press OK, the following display appears -



d. Press **▼**(**Down Arrow**) once to move the highlight to the bottom row and then press **OK**. The following display appears -

-	-			
6-10 T	ermir	nal 53	3 Low Voltage	
2V				

e. Press **▼**(**Down Arrow**) once to move the highlight to the bottom row and then press **OK**. The following display appears -

6-11 Terminal 53 High Voltage	
[10V]	

f. Press **▼**(**Down Arrow**) once to move the highlight to the bottom row and then press **OK**. The following display appears -

6-14 Set Min Reference
0-14 Set Mill Reference
[0 Hz]

g. Press **▼**(**Down Arrow**) once to move the highlight to the bottom row and then press **OK**. The following display appears -

6-15 Set Max Reference
[60 Hz]

- 12. Setting Reset Mode and RFI Filter:
  - a. Press the **Back** key until the following display appears -

0-** Operation / Display	
1-** Load and Motor	

b. Press **▼**(**Down Arrow**) until the following display appears -

13-**	Smart Logic
14-**	Special Functions

c. Press OK, the following display appears -

14-0*	Inverter Switching	
14–1*	Mains On/Off	

d. Press **▼**(**Down Arrow**) twice. The following display appears -

14-1*	Mains On/Off
14-2*	Reset Functions

e. Press OK, the following display appears -

[0] Manual reset

- f. Press **OK** to highlight the number in the bracket.
- g. Use the ▲ and ▼ (Up and Down Arrow) keys to change the number to 3 for 3 automatic resets and then press OK. The display changes to -

14-20 Reset Mode [3] Automatic reset x 3

h. Press **▼**(**Down Arrow**) once, the following display appears -



- i. Press OK to highlight the number of seconds and use the ▲ and ▼ (Up and Down Arrow) keys to select 600 seconds. Press OK again to set the selected value.
- j. Press the **Back** key once, the following display appears -



k. Press ▼(Down Arrow) twice, the following display appears -



1. Press OK, the following display appears -

14-50 RFI Filter [1] On

- m. Press OK to highlight the number in the bracket and use the ▲ and ▼ (Up and Down Arrow) keys to select [0]. Press OK again to set the selected value.
- 13. To Complete Reprogramming:
  - a. Press the **Auto On** key before disconnecting the VFD Remote Keypad from the variable frequency drive.
| 50LC*B08 Units |
|----------------|
| 1              |
| Parameters -   |
| Unit           |
| . VFD          |
| Table 5 –      |

Unit         Macor Macor Math         VFD         VFD         C-06         1-20         1-24         1-25         1-71         1-73         1-92         1-90         3-10[0]           V (2)         V (2)         Macor Math         Mark Math </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>Regional Settings</th> <th>Grid Type</th> <th>Motor Power</th> <th>Motor Voltage</th> <th>Motor Frequency (Hz)</th> <th>Motor Current (Must-Hold Amps)</th> <th>Motor Nominal Speed (rpm)</th> <th>Star Delay (Sec)</th> <th>Flying Start</th> <th>Min Speed for Function (Hz)</th> <th>Motor Thermal Protection</th> <th>Pre</th> <th>Preset Reference</th> <th>e</th>							Regional Settings	Grid Type	Motor Power	Motor Voltage	Motor Frequency (Hz)	Motor Current (Must-Hold Amps)	Motor Nominal Speed (rpm)	Star Delay (Sec)	Flying Start	Min Speed for Function (Hz)	Motor Thermal Protection	Pre	Preset Reference	e
(1)         (1) <th>Voltage</th> <th>Unit Size</th> <th>Motor Option</th> <th>Motor P/N</th> <th>VFD Carrier P/N</th> <th>VFD Mfr P/N</th> <th>0-03</th> <th>90-06</th> <th>1-20</th> <th>1-22</th> <th>1-23</th> <th>1-24</th> <th>1-25</th> <th>1-71</th> <th>1-73</th> <th>1-82</th> <th>1-90</th> <th>3-10 [0]</th> <th>3-10 [1]</th> <th>3-10 [2]</th>	Voltage	Unit Size	Motor Option	Motor P/N	VFD Carrier P/N	VFD Mfr P/N	0-03	90-06	1-20	1-22	1-23	1-24	1-25	1-71	1-73	1-82	1-90	3-10 [0]	3-10 [1]	3-10 [2]
08         STD         HD56FR483         HK30W376         13119683         [1]         [122]         [9]         460         29         1690         2.0         [1]         1.0         [4]         [4]           08         STD         HD56FR39         HK30W332         1310225         [1]         [122]         [9]         575         60         3.1         1690         2.0         [1]         1.0         [4]         [4]           08         MD         HD56FR33         HK30W337         1319763         [1]         [122]         [9]         230         60         2.0         [1]         1.0         [4]         [4]         [4]           08         MD         HD56FR37         HK30W337         1314963         [1]         [122]         [9]         575         60         3.1         1690         2.0         [1]         1.0         [4]	3/230V	80	STD	HD56FR233	HK30WA370	131L9795	[1]	[102]	[6]	230	60	5.8	1695	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
08         STD         HD66FR578         HX30WA322         1310225         [1]         [132]         [9]         575         60         3.1         1690         2.0         [1]         1.0         [4]         [4]           0         8         MID         HD66FR233         HX30WA370         13110795         [1]         [102]         [9]         230         60         5.8         1690         2.0         [1]         1.0         [4]         [4]           0         MID         HD66FR33         HX30WA370         13110765         [1]         [122]         [9]         575         60         3.1         1690         2.0         [1]         1.0         [4] </td <td>460V</td> <td>80</td> <td>STD</td> <td>HD56FR463</td> <td>HK30WA376</td> <td>131L9863</td> <td>[1]</td> <td>[122]</td> <td>[6]</td> <td>460</td> <td>60</td> <td>2.9</td> <td>1690</td> <td>2.0</td> <td>[1]</td> <td>1.0</td> <td>[4]</td> <td>%0</td> <td>66.50%</td> <td>66.50%</td>	460V	80	STD	HD56FR463	HK30WA376	131L9863	[1]	[122]	[6]	460	60	2.9	1690	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
(*)(1	575V	80	STD	HD56FR579	HK30WA382	131N0225	[F]	[132]	[6]	575	60	3.1	1690	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
08         MID         HEGRFHAG         HKG0MA376         131.B663         [1]         [122]         [9]         460         60         29         1690         2.0         [1]         1.0         [4]         [4]           08         MID         HEGRFA3         HK30MA37         [311.025         [1]         [132]         [9]         555         60         3.1         1690         2.0         [1]         1.0         [4]         [4]           0         HIGH         HD58FE64         HK30MA371         131.1076         [1]         [102]         [10]         230         60         3.1         1690         2.0         [1]         1.0         [4]<	3/230V	80	DIM	HD56FR233	HK30WA370	131L9795	[1]	[102]	[6]	230	60	5.8	1695	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
08         MID         HD56FF57         HK30W332         1310225         [1]         [12]         [10]         [575         60         3.1         1690         2.0         [1]         1.0         [4]         [4]           0         HIGH         HD58FE654         HK30W371         [3110766         [1]         [102]         [10]         230         60         9.2         1735         2.0         [1]         1.0         [4]	460V	80	DIM	HD56FR463	HK30WA376	131L9863	[1]	[122]	[6]	460	60	2.9	1690	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
High         HD58FE654         HX30WA371         131L976         [10         [102]         [10]         230         60         9.2         1735         2.0         [11]         1.0         [4]         [4]           High         HD58FE654         HX30WA371         131L9664         [11]         [122]         [10]         460         60         4.2         1735         2.0         [11]         1.0         [4]         [4]           High         HD58FE577         HX30WA373         131L964         [11]         [122]         [11]         575         60         4.9         1770         2.0         [11]         1.0         [4]	575V	80	DIM	HD56FR579	HK30WA382	131N0225	[1]	[132]	[6]	575	60	3.1	1690	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
08         HiGH         HD58FE654         HK30WA377         131L9864         [1]         [12]         [10]         460         60         4.2         1735         2.0         [1]         1.0         [4]         [4]           08         HIGH         HD58FE577         HK30WA383         131N0227         [1]         [132]         [11]         575         60         4.9         1710         2.0         [1]         1.0         [4]         [4]           0         08         ULTRA         HD60FE666         HK30WA372         [1]         [102]         [11]         230         60         1.7         1750         2.0         [1]         1.0         [4]	8/230V	88	HIGH	HD58FE654	HK30WA371	131L9796	E	[102]	[10]	230	60	9.2	1735	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
08         HIGH         HD58FE577         HK30WA383         131N0227         [1]         [132]         [11]         575         60         4.9         1710         2.0         [1]         1.0         [4]         [4]           v         08         ULTRA         HD60FE656         HK30WA372         [3110727]         [11]         230         60         11.7         1750         2.0         [1]         1.0         [4]	460V	80	HIGH	HD58FE654	HK30WA377	131L9864	[1]	[122]	[10]	460	60	4.2	1735	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
(*)         08         ULTRA         HD60FE656         HK30WA372         131L9797         [1]         [102]         [111]         230         60         11.7         1750         2.0         [1]         1.0         [4] </td <td>575V</td> <td>80</td> <td>HIGH</td> <td>HD58FE577</td> <td>HK30WA383</td> <td>131N0227</td> <td>[1]</td> <td>[132]</td> <td>[11]</td> <td>575</td> <td>60</td> <td>4.9</td> <td>1710</td> <td>2.0</td> <td>[1]</td> <td>1.0</td> <td>[4]</td> <td>%0</td> <td>66.50%</td> <td>66.50%</td>	575V	80	HIGH	HD58FE577	HK30WA383	131N0227	[1]	[132]	[11]	575	60	4.9	1710	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
08         ULTRA         HD60FE656         HK30W378         131L9865         [1]         [122]         [11]         460         60         5.4         1750         2.0         [1]         1.0         [4]           08         ULTRA         HD58FE577         HK30W3833         131N0227         [1]         [132]         [11]         575         60         4.9         1710         2.0         [1]         1.0         [4]	8/230V	80	ULTRA	HD60FE656	HK30WA372	131L9797	[1]	[102]	[11]	230	60	11.7	1750	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
08 ULTRA HD58FE577 HK30WA383 131N0227 [1] [132] [11] 575 60 4.9 1710 2.0 [1] 1.0 [4]	460V	80	ULTRA	HD60FE656	HK30WA378	131L9865	[1]	[122]	[11]	460	60	5.4	1750	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
	575V	80	ULTRA	HD58FE577	HK30WA383	131N0227	[1]	[132]	[11]	575	60	4.9	1710	2.0	[1]	1.0	[4]	%0	66.50%	66.50%

RFI Filter	14-50	[o]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[o]	[0]	[0]	[0]
		2	2	0]	2	2	2	2	0]	2	0]	2	0]
Auto. Restart Time (S)	14-21	600	600	600	600	600	600	600	600	600	600	600	600
Reset Mode	14-20	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]
Terminal 53 High Reference	6–15	[09]	[09]	[09]	[09]	[09]	[09]	[09]	[09]	[09]	[09]	[09]	[09]
Terminal 53 Low Reference	6-14	0	0	0	0	0	0	0	0	0	0	0	0
Terminal 53 High Voltage	6-11	[10]	[10]	[10]	[10]	[10]	[10]	[10]	[10]	[10]	[10]	[10]	[10]
Terminal 53 Low Vottage	6-10	N	2	2	0	2	0	2	2	2	2	2	2
Terminal 29 Digital Input	5-13	[18]	[18]	[18]	[18]	[18]	[18]	[18]	[18]	[18]	[18]	[18]	[18]
Terminal 27 Digital Input	5-12	[17]	[17]	[17]	[17]	[17]	[17]	[17]	[17]	[17]	[17]	[17]	[17]
Terminal 19 Digital Input	5-11	[16]	[16]	[16]	[16]	[16]	[16]	[16]	[16]	[16]	[16]	[16]	[16]
Terminal 18 Digital Input	5-10	[8]	[8]	[8]	[8]	[8]	[8]	[8]	[8]	[8]	[8]	[8]	[8]
Current Limit	4-18	100%	100%	1 00%	100%	100%	100%	100%	1 00%	100%	1 00%	100%	100%
Ramp Down Time (Sec)	3-42	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Ramp Up (Sec)	3-41	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
	3-10 [7]	%0	%0	%0	%0	%0	%0	%0	%0	%0	%0	%0	%0
cont.)	3-10 [6]	%0	%0	%0	%0	%0	%0	%0	%0	%0	%0	%0	%0
Preset Reference (cont.)	3–10 [5]	%0	%0	%0	%0	%0	%0	%0	%0	%0	%0	%0	%0
Preset	3-10 [4]	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	3-10 [3]	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Motor Option	STD	STD	STD	DIM	MID	DIM	HIGH	HIGH	HIGH	ULTRA	ULTRA	ULTRA
	Unit Size	80	80	80	80	80	80	80	80	80	80	80	80
	Voltage	208/230V	460V	575V									

# Table 6 – VFD Unit Parameters - 50LC\*B09 Units

						Regional Settings	Grid Type	Motor Power	Motor Voltage	Motor Frequency (Hz)	Motor Current (Must-Hold Amps)	Motor Nominal Speed (rpm)	Star Delay (Sec)	Flying Start	Min Speed for Function (Hz)	Motor Thermal Protection	Pre	Preset Reference	ø
Voltage	Unit Size	Motor Option	Motor P/N	VFD Carrier P/N	VFD Mfr P/N	0-03	90-06	1-20	1-22	1-23	1-24	1-25	1-71	1-73	1-82	1-90	3-10 [0]	3-10 [1]	3-10 [2]
208/230V	60	STD	HD56FR233	HK30WA370	131L9795	[1]	[102]	[6]	230	60	5.8	1695	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
460V	60	STD	HD56FR463	HK30WA376	131L9863	Ξ	[122]	[6]	460	60	2.9	1690	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
575V	60	STD	HD56FR579	HK30WA382	131N0225	[1]	[132]	[6]	575	60	3.1	1690	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
208/230V	60	DIM	HD56FR233	HK30WA370	131L9795	Ξ	[102]	[6]	230	60	5.8	1695	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
460V	60	DIM	HD56FR463	HK30WA376	131L9863	[1]	[122]	[6]	460	60	2.9	1690	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
575V	60	DIM	HD56FR579	HK30WA382	131N0225	[1]	[132]	[6]	575	60	3.1	1690	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
208/230V	60	HDIH	HD60FE656	HK30WA372	131L9797	[1]	[102]	[11]	230	60	11.7	1750	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
460V	60	HDIH	HD60FE656	HK30WA378	131L9865	[1]	[122]	[11]	460	60	5.4	1750	2.0	[1]	1.0	[4]	%0	.66.50%	66.50%
575V	60	HIGH	HD58FE577	HK30WA383	131N0227	Ξ	[132]	[11]	575	60	4.9	1710	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
208/230V	60	NLTRA	HD60FK658	HK30WA372	131L9797	[1]	[102]	[13]	230	60	13.6	1745	2.0	[1]	1.0	[7]	%0	66.50%	66.50%
460V	60	ULTRA	HD60FK658	HK30WA379	131L9866	[1]	[122]	[13]	460	60	6.8	1745	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
575V	60	ULTRA	HD60FE576	HK30WA387	134F0217	[1]	[132]	[13]	575	60	6.0	1745	2.0	[1]	1.0	[4]	%0	66.50%	66.50%

8							ŀ	Ī	Ī	Ī	Ī									1	
				Preset	Preset Reference (cont.)	(cont.)		Ramp Up Time (Sec)	Ramp Down Time (Sec)	Current Limit	Terminal 18 Digital Input	Terminal 19 Digital Input	Terminal 27 Digital Input	Terminal 29 Digital Input	Terminal 53 Low Voltage	Terminal 53 High Voltage	Terminal 53 Low Reference	Terminal 53 High Reference	Reset Mode	Auto. Restart Time (S)	RFI Filter
Voltage	Unit Size	Motor Option	3-10 [3]	3-10 [4]	3-10 [5]	3–10 [6]	3-10 [7]	3-41	3-42	4-18	5-10	5-11	5-12	5-13	6-10	6-11	6-14	6-15	14-20	14-21	14-50
208/230V	60	STD	100%	100%	%0	%0	%0	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[09]	[3]	600	[o]
460V	60	STD	100%	100%	%0	%0	%0	10.00	10.00	100%	[8]	[16]	[11]	[18]	2	[10]	0	[60]	[3]	600	[o]
575V	60	STD	100%	100%	%0	%0	%0	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[o]
208/230V	60	DIM	100%	100%	%0	%0	%0	10.00	10.00	100%	[8]	[16]	[11]	[18]	2	[10]	0	[60]	[3]	600	[o]
460V	60	DIM	100%	100%	%0	%0	%0	10.00	10.00	100%	[8]	[16]	[11]	[18]	2	[10]	0	[09]	[8]	600	[o]
575V	60	DIM	100%	100%	%0	%0	%0	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[o]
208/230V	60	HIGH	100%	100%	%0	%0	%0	10.00	10.00	100%	[8]	[16]	[11]	[18]	2	[10]	0	[09]	[8]	600	[o]
460V	60	HIGH	100%	100%	%0	%0	%0	10.00	10.00	100%	[8]	[91]	[17]	[18]	2	[10]	0	[09]	[8]	600	[o]
575V	60	HIGH	100%	100%	%0	%0	%0	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[o]
208/230V	60	ULTRA	100%	100%	%0	%0	%0	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[o]
460V	60	ULTRA	100%	100%	%0	%0	%0	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[o]
575V	60	ULTRA	100%	100%	%0	%0	%0	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[o]

2 Units
0LC*B1
- 50]
Parameters
Unit
VFD
Table

20         1-22         1-23         1-24         1-25         1-71         1-73         1-82         1-90         3-10[0]         3-	Regional Grid I Settings Type F	Grid Type		Motor Power	Motor Voltage	Motor Frequency (Hz)	Motor Current (Must-Hold Amps)	Motor Nominal Speed (rpm)	Star Delay (Sec)	Flying Start	Min Speed for Function (Hz)	Motor Thermal Protection	Pre	Preset Reference	e
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	VFD Mfr P/N	0-03	0-06	1-20	1-22	1-23	1-24	1-25	1-71	1-73	1-82	1-90	3-10 [0]	3-10 [1]	3-10 [2]
	131L9796 [1]	_	[102]	[10]	230	60	7.9	1680	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
[11]         575         60         3.8         1680         2.0         [1]         1.0         [4]         0%         66.50%           [10]         230         60         9.2         1735         2.0         [1]         1.0         [4]         0%         66.50%           [10]         230         60         9.2         1735         2.0         [1]         1.0         [4]         0%         66.50%           [10]         160         60         4.2         1735         2.0         [1]         1.0         [4]         0%         66.50%           [11]         575         60         4.9         1710         2.0         [1]         1.0         [4]         0%         66.50%           [13]         230         60         13.6         1745         2.0         [1]         1.0         [4]         0%         66.50%           [13]         240         60         6.8         1745         2.0         [1]         1.0         [4]         0%         66.50%           [13]         460         60         6.8         1745         2.0         [1]         1.0         [4]         0%         66.50% <t< td=""><td>131L9864 [1]</td><td></td><td>[122]</td><td>[10]</td><td>460</td><td>60</td><td>3.6</td><td>1680</td><td>2.0</td><td>[1]</td><td>1.0</td><td>[4]</td><td>%0</td><td>66.50%</td><td>66.50%</td></t<>	131L9864 [1]		[122]	[10]	460	60	3.6	1680	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
[10]         230         60         9.2         1735         2.0         [1]         1.0         [4]         0%         66.50%           [10]         140         60         4.2         1735         2.0         [1]         1.0         [4]         0%         66.50%           [11]         575         60         4.9         1710         2.0         [1]         1.0         [4]         0%         66.50%           [13]         230         60         4.9         1710         2.0         [1]         1.0         [4]         0%         66.50%           [13]         230         60         13.6         1745         2.0         [1]         1.0         [4]         0%         66.50%           [13]         460         60         6.8         1745         2.0         [1]         1.0         [4]         0%         66.50%           [13]         575         60         6.8         1745         2.0         [1]         1.0         [4]         0%         66.50%	131N0225 [1]	, 1	[132]	[11]	575	60	3.8	1680	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
[10]         460         60         4.2         1735         2.0         [1]         1.0         [4]         0%         66.50%           [11]         575         60         4.9         1710         2.0         [1]         1.0         [4]         0%         66.50%           [13]         230         60         4.9         1710         2.0         [1]         1.0         [4]         0%         66.50%           [13]         230         60         13.6         1745         2.0         [1]         1.0         [4]         0%         66.50%           [13]         460         60         6.8         1745         2.0         [1]         1.0         [4]         0%         66.50%           [13]         575         60         6.0         1745         2.0         [1]         1.0         [4]         0%         66.50%	131L9796 [1]		[102]	[10]	230	60	9.2	1735	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
[11]         575         60         4.9         1710         2.0         [1]         1.0         [4]         0%         66.5%           [13]         [13]         230         60         136         1745         2.0         [1]         1.0         [4]         0%         66.5%           [13]         [13]         460         60         6.8         1745         2.0         [1]         1.0         [4]         0%         66.5%           [13]         140         60         6.8         1745         2.0         [1]         1.0         [4]         0%         66.5%           [13]         575         60         6.0         1745         2.0         [1]         1.0         [4]         0%         66.5%	131L9864 [1]	1	[122]	[10]	460	60	4.2	1735	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
[13]         230         60         13.6         1745         2.0         [1]         1.0         [4]         0%         66.50%           [13]         460         60         6.8         1745         2.0         [1]         1.0         [4]         0%         66.50%           [13]         575         60         6.0         1745         2.0         [1]         1.0         [4]         0%         66.50%	131N0227 [1]		[132]	[11]	575	60	4.9	1710	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
[13]         460         60         6.8         1745         2.0         [1]         1.0         [4]         0%         66.50%           [13]         575         60         6.0         1745         2.0         [1]         1.0         [4]         0%         66.50%	131L9797 [1]	1	[102]		230	60	13.6	1745	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
[13]         575         60         6.0         1745         2.0         [1]         1.0         [4]         0%         66.50%	131L9866 [1]		[122]	[13]	460	60	6.8	1745	2.0	[1]	1.0	[4]	%0	66.50%	66.50%
	134F0217 [1]		[132]	[13]	575	60	6.0	1745	2.0	[1]	1.0	[4]	%0	66.50%	66.50%

RFI Filter	14-50	[o]	[o]	[o]	[o]	[o]	[o]	[o]	[o]	[0]
Auto. Restart Time (S)	14-21 1	600	600	600	600	600	600	600	600	600
A Mode	14-20	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]
Terminal 53 High Reference	6-15	[60]	[69]	[09]	[09]	[69]	[09]	[09]	[60]	[09]
Terminal 53 Low Reference	6-14	0	0	0	0	0	0	0	0	0
Terminal 53 High Voltage	6-11	[10]	[10]	[10]	[10]	[10]	[10]	[10]	[10]	[10]
Terminal 53 Low Voltage	6-10	N	2	2	2	2	2	2	2	2
Terminal 29 Digital Input	5-13	[18]	[18]	[18]	[18]	[18]	[18]	[18]	[18]	[18]
Terminal 27 Digital Input	5-12	[11]	[11]	[11]	[11]	[11]	[11]	[11]	[11]	[17]
Terminal 19 Digital Input	5-11	[16]	[16]	[16]	[16]	[16]	[16]	[16]	[16]	[16]
Terminal 18 Digital Input	5-10	[8]	[8]	[8]	[8]	[8]	[8]	[8]	[8]	[8]
Current Limit	4-18	100%	100%	100%	100%	100%	100%	100%	100%	100%
Ramp Down Time (Sec)	3-42	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Ramp Up Time (Sec)	3-41	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
	3–10 [7]	%0	%0	%0	%0	%0	%0	%0	0%	%0
(cont.)	3–10 [6]	%0	%0	%0	%0	%0	%0	%0	%0	%0
Preset Reference (cont.)	3-10 [5]	%0	%0	%0	%0	%0	%0	%0	%0	%0
Preset	3–10 [4]	100%	1 00%	100%	1 00%	1 00%	100%	1 00%	100%	1 00%
	3-10 [3]	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Motor Option	STD	STD	STD	DIM	ШD	DIM	HIGH	HIGH	HIGH
	Unit Size	12	12	12	12	12	12	12	12	12
	Voltage	208/230V	460V	575V	208/230V	460V	575V	208/230V	460V	575V

## 209 209/209 209/209 209/209 209 209/209 209/209 209/209 239 239/239 239/239 239/239 263 263/263 263/263 263/263 LRA 106 106 106 106 106 122 122 122 134 134 134 84 84 84 84 **2**8 28 28 97 97 97 97 97 97 DISC. SIZE w/ P.E. (pwrd fr/unit) 100/112 62/67 103/114 97/109 59/58 59/58 56/62 97/109 56/62 54/53 54/53 54/53 54/53 57/56 57/56 59/65 FL 28 28 31 54 28 28 31 54 29 29 32 55 30 33 33 57 26 28 47 26 28 47 28 30 49 28 30 49 MAX FUSE or HACR BRKR 110/125 110/125 110/125 70/80 125/125 70/70 60/60 60/60 70/70 70/80 60/60 60/60 60/60 60/60 60/60 60/60 30 35 60 30 35 35 60 30 35 35 70 30 30 35 35 35 30 35 60 30 35 60 35 35 60 06/119 06/119 09/122 56/55 56/55 68/73 112/124 51/50 51/50 61/68 51/50 51/50 61/68 53/53 53/53 65/71 NCA 27 27 34 59 34 34 34 59 27 27 35 61 29 236 24 51 51 26 33 53 26 33 53 24 31 51 w/ PWRD C.O. 205/205 205/205 205/205 205/205 205/205 235/235 235/235 235/235 259 259/259 259/259 259/259 205/205 205 235 104 104 104 104 104 LRA 205 120 120 132 132 132 80 80 80 80 80 80 80 93 93 83 83 83 SIZE DISC. 93/105 58/62 98/109 52/58 93/105 49/49 52/58 55/60 96/107 49/49 49/49 49/49 53/52 53/52 55/54 55/54 Ā 23 23 23 8 8 5 3 8 8 8 8 2224 284 25 <del>2</del>4 NO P.E. MAX FUSE or HACR BRKR 110/125 110/125 70/70 60/50 60/70 110/125 60/50 60/50 60/70 60/60 60/60 60/50 60/70 60/60 60/60 30 35 35 35 30 80 35 35 30 35 35 60 30 35 60 25 30 50 25 30 50 25 30 50 25 30 50 101/114 05/117 07/119 101/114 47/47 47/47 57/63 57/63 50/49 50/49 60/66 52/51 52/51 63/68 47/47 47/47 MCA 25 25 32 32 57 25 25 25 32 32 37 26 26 33 58 27 27 34 60 60 21 26 26 26 21 26 46 22 28 48 22 84 84 204/204 204/204 204/204 234/234 258 258/258 258/258 258/258 204/204 204/204 204/204 234/234 234/234 LRA 234 204 204 2 2 2 2 120 120 120 82 82 82 82 95 95 95 95 95 95 . SIZE DISC. (pwrd fr/unit) 91/104 51/50 54/59 95/106 51/56 48/48 48/48 51/56 91/104 51/50 54/53 54/53 56/61 97/108 48/48 48/48 F 28 23 24 25 26 25 26 25 24 26 45 26 28 47 26 28 47 MAX FUSE or HACR BRKR 60/70 100/125 60/60 60/60 70/70 110/125 110/125 50/50 60/70 00/125 50/50 50/50 60/60 60/70 ц. 50/50 60/60 8 8 8 8 8 8 8 8 8 8 8 8 8 35 30 35 25 30 50 25 30 50 35 35 80 8 8 8 3 NO C.O. or UNPWR C.O 103/116 100/113 106/118 00/113 51/50 51/50 46/46 46/46 49/48 55/62 49/48 59/65 46/46 46/46 55/62 62/67 MCA 25 25 32 38 23 29 49 24 24 57 57 24 24 31 31 57 24 51 51 51 51 200/200 200/200 200 200/200 200/200 200/200 230/230 230/230 230/230 254/254 254/254 254/254 200/200 LRA 200 230 254 102 102 102 102 102 102 102 102 118 118 118 118 130 130 130 78 78 78 78 78 78 91 91 91 91 SIZE DISC. 90/102 50/48 50/48 52/57 93/104 44/44 46/52 87/99 44/44 46/52 87/99 47/46 49/55 44/44 47/46 Ā 44/44 24 25 50 50 50 25 50 25 51 51 51 51 51 51 22 20 40 26 22 22 22 22 22 22 22 22 22 22 NO P.E. MAX FUSE or HACR BRKR 60/60 100/110 50/50 50/50 100/125 60/50 60/50 60/70 110/125 60/60 00/110 50/50 60/60 50/50 50/50 50/50 80 30 52 52 80 30 52 52 42 S 25 25 45 20 22 20 S2 80 33 30 86 33 101/113 42/42 42/42 51/57 95/108 42/42 42/42 95/108 99/111 47/46 47/46 51/57 45/44 45/44 54/60 57/62 MCA 8 8 8 3 2 2 2 2 2 23 23 30 25 25 31 31 6 2 <del>1</del> 19 24 44 23 26 46 5 8 9 20.9/24.1 34.4/39.7 69.9/80.6 34.4/39.7 69.9/80.6 34.4/39.7 69.9/80.6 34.4/39.7 69.9/80.6 20.9/24.1 20.9/24.1 20.9/24.1 12.0 19.9 40.3 -12.0 19.9 40.3 12.0 19.9 40.3 12.0 19.9 40.3 15.9 32.2 -15.9 32.2 FL 15.9 32.2 -15.9 32.2 I I ۱ ۱ ١ 7.5/10.0 12.4/16.5 25.2/33.5 7.5/10.0 12.4/16.5 25.2/33.5 12.4/16.5 7.5/10.0 12.4/16.5 25.2/33.5 25.2/33.5 7.5/10.0 10.0 16.5 33.5 -10.0 16.5 33.5 -10.0 16.5 33.5 10.0 16.5 33.5 -16.5 33.5 -16.5 33.5 -16.5 33.5 НĦ Nom (K -16.5 33.5 ELEC. CRHEATER\*\*\*A00 NONE 288A 291A 294A NONE 288A 291A 294A NONE 293A 296A NONE 293A 296A 293A 296A NONE 288A 291A 294A ΓPE ULTRA HIGH ULTRA HIGH ULTRA HIGH HIGH HIGH HGH đ MED ЗIJ MED Ę MED ZH-44-V.M ON 208/230-3-60 09-2-097 09-8-978 тіνυ 50LC\*B08

Table 8 – Unit Wire/Fuse or HACR Breaker Sizing Data

See "Legend and Notes for Tables 8 and 9" on page 46

Table 8 - Unit Wire/Fuse or HACR Breaker Sizing Data (cont.)

							Ī								ĺ				
Σ					ON	NO P.E.			w/ P.E. (pwrd fr/unit)	/rd fr/unit)			ON	NO P.E.			w/ P.E. (pwrd fr/unit)	rd fr/unit)	
∎ <u>H</u>	CRHEATER***A00	Nom (KW)	FLA	¢UM	MAX FUSE or	DISC. 8	SIZE	¢ UN	MAX FUSE or	DISC.	SIZE	¢ UM	MAX FUSE or	DISC.	SIZE	¢ UM	MAX FUSE or	DISC.	SIZE
					HACR BRKR	FLA	LRA		HACR BRKR	FLA	LRA	MCA	HACR BRKR	FLA	LRA		HACR BRKR	FLA	LRA
	NONE		I	45/45	60/50	46/46	227	49/48	60/60	51/50	231	50/49	60/60	52/52	232	53/53	60/60	56/56	236
STD	288A	7.5/10.0	20.9/24.1	45/45	60/50	46/46	227/227	49/48	60/60	51/50	231/231	50/49	60/60	52/52	232/232		60/60	56/56	236/236
	291A 294A	12.4/16.5 25.2/33.5	34.4/39.7 69.9/80.6	51/57 95/108	60/60 100/110	46/52 87/99	227/227 227/227	55/62 100/113	60/70 100/125	51/56 91/104	231/231 231/231	57/63 101/114	60/70 110/125	52/58 93/105	232/232 232/232	61/68 106/119	70/70 110/125	56/62 97/109	236/236 236/236
	NONE		I	45/45	60/50	46/46	227	49/48	60/60	51/50	231	50/49	60/60	52/52	232	-	60/60	56/56	236
MED	288A	7.5/10.0	20.9/24.1	45/45	60/50	46/46	227/227	49/48	60/60	51/50	231/231	50/49	60/60	52/52	232/232	53/53	60/60	56/56	236/236
Ì	291A	12.4/16.5	34.4/39.7	51/57	60/60	46/52	227/227	55/62	60/70	51/56	231/231	57/63	60/70	52/58	232/232	61/68	70/70	56/62	236/236
	294A	25.2/33.5	69.9/80.6	95/108	100/110	87/99	227/227	100/113	100/125	91/104 -2	231/231	101/114	110/125	93/105 	232/232	106/119	110/125	97/109	236/236
		- 7 5/10 0		50/49 50/40	60/60	52/51 52/51	281 281/281	54/53 54/53	60/60	56/55 56/55	285 285/285	55/54 55/54	60/60	58/56 F8/56	286 286/286	58/57 58/57	70/70	62/61 62/61	290
ндн		12.4/16.5	34.4/39.7	57/62	60/70	52/57	281/281	62/67	02/02	56/61	285/285	63/68	02/02	58/62	286/286	68/73	70/80	62/67	290/290
	294A	25.2/33.5	69.9/80.6	101/113	110/125	93/104	281/281	106/118	110/125	97/108	285/285	107/119	110/125	98/109	286/286	112/124	125/125	103/114	290/290
	NONE		ı	53/52	60/60	55/54	292	56/55	60/60	60/59	296	57/56	70/60	61/60	297	61/60	70/70	65/64	301
ULTRA		7.5/10.0	20.9/24.1	53/52	60/60	55/54	292/292	56/55	60/60	60/59	296/296	57/56	70/60	61/60	297/297	61/60	70/70	65/64	301/301
HGH		12.4/16.5	34.4/39.7	60/66	60/70	55/60	292/292	65/71	70/80	60/65	296/296	66/72	70/80	61/66	297/297	71/77	80/80	65/70	301/301
	294A	25.2/33.5	69.9/80.6	105/117	110/125	96/107	292/292	110/122	110/125	100/112	296/296	111/123	125/125	102/113	297/297	116/128	125/150	106/117	301/301
	NONE	I	I	24	30	25	113	26	30	27	115	27	30	28	115	28	30	30	117
STD	289A	10.0	12.0	24	8	25	113	26	30	27	115	27	30	28	115	5 28	30	30	117
1	292A	16.5	19.9	83 i	8	26	113	31	35	58	115	32	35	29	115	8	35	31	117
	295A	33.5	40.3	54	60	50	113	57	60	52	115	57	60	52	115	59	60	54	117
	NONE	I	I	24	80	25	113	26	30	27	115	27	30	28	115	28	30	30	117
MED	289A	10.0	12.0	24	8	52	113	26	8	27	115	27	8	5 28	115	82 3	80	30	117
	292A 206A	16.5 33.5	19.9	52	08	26	113	31 57	35 60	82 22	115 115	32	35	29	115 115	8 8	35 60	31 54	711
	NONE	2		- ec	8	8	7 11	5	00	5 6	140	5	20	20	1 10	8 6	20	5 6	1 4 5
			1 0 0	8 8	8 6	07 80	141	0 80	n S	6	54 5	87 00	с У 45	0, 6	54 5	6	с с 9 г	20	145 745
HIGH		16.5	19.9	3 6	35	50	141	34	35	3 8	143	34	35	3 6	143	e e	40	33	145
	295A	33.5	40.3	57	09	52	141	59	60	54	143	60	60	55	143	62	70	57	145
	NONE	1	1	28	30	29	146	30	35	31	148	30	35	32	148	32	35	34	150
ULTRA		10.0	12.0	28	8	29	146	30	35	31	148	30	35	32	148	32	35	34	150
НGН	292A 295A	16.5 33.5	19.9 40.3	8 8	35	30	146 146	36 61	40	32 79	148 148	36 62	40	33 79	148 148	88 72	40	35 58	150
1	NONE	1		8 8	25	2	84	24	25	35	88	5 66	25	23	86	25	30	22	06
STD	293A	16.5	15.9	24	3 23	52	5 28	29	3 00	28	88	26	3 00	53 5	86	3 5	35	58	8 6
	296A	33.5	32.2	4	45	40	84	49	50	45	88	46	50	42	86	51	60	47	06
	NONE	-	I	20	25	21	84	24	25	25	88	22	25	23	86	25	30	27	06
MED	293A	16.5	15.9	24	25	22	84	29	30	26	88	26	30	23	86	31	35	28	06
	296A	33.5	32.2	44	45	40	84	49	50	45	88	46	50	42	86	51	60	47	90
		I	I	23	25	23	97	25	30	27	101	23	25	25	66	27	30	29	103
HIGH		16.5	15.9	26	R	23	97	31	35	28	101	28	30	25	66	ŝ	35	30	103
	296A	33.5	32.2	46	50	42	97	51	60	47	101	48	50	44	66	53	60	49	103
LTRA	NONE	1 0	1 1	24	55	25 25	<u> </u>	27	30 2E	50	115 116	25	30	27	113	59 58	35 26	31	117
HIGH		10.01	0.00	Q I	8 1	C2	-	2	2	3	2	2	20	2	2	3	2	20	

See "Legend and Notes for Tables 8 and 9" on page 46.

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Not         Not <th></th> <th>-</th> <th></th> <th></th> <th></th> <th>-</th> <th></th> <th></th> <th></th> <th></th>											-				-				
Image: black					9 V	ĿE.			w/ P.E. (pw	rd fr/unit)		Ì	N S	Р.Е.			w/ P.E. (pwi	d fr/unit)	
10         11<	CRHEATER***A00	Nom (kW)	FLA		MAX FUSE or	DISC. §	SIZE		MAX FUSE or	DISC.	SIZE	4011	MAX FUSE or	DISC.	SIZE		MAX FUSE or	DISC. S	lZE
Protect         Description         Description <thdescripication< th=""> <thdescription< th=""></thdescription<></thdescripication<>					HACR BRKR	FLA	LRA		HACR BRKR	FLA	LRA	MCA	HACR BRKR	FLA	LRA		HACR BRKR	FLA	LRA
FTC         3640         575(0)         36404/2         5160         6000	NONE	1	1	51/50		52/52	252	54/54	60/60	56/56	256	55/55	60/60	58/57	257	59/59	70/70	62/62	261
FUN         PANA         CAUCID         CAUCID <thcaucid< th=""></thcaucid<>	288A	7.5/10.0	20.9/24.1	51/50		52/52	252/252	54/54	60/60	56/56	256/256	55/55	60/60	58/57	257/257	59/59	70/70		261/261
Mode         Process         Result         Result </th <th>291A</th> <th>12.4/16.5</th> <th>34.4/39.7</th> <th>52/59</th> <th></th> <th>52/53</th> <th>252/252</th> <th>57/63</th> <th>60/70</th> <th>56/58</th> <th>256/256</th> <th>58/65</th> <th>60/70</th> <th>58/59</th> <th>257/257</th> <th>63/69</th> <th>70/70</th> <th></th> <th>261/261</th>	291A	12.4/16.5	34.4/39.7	52/59		52/53	252/252	57/63	60/70	56/58	256/256	58/65	60/70	58/59	257/257	63/69	70/70		261/261
	294A 2014 ± 2014	25.2/33.5 37 6/50 0	69.9/80.6 104 3/1 20 3	97/110 140/120		89/101 128/146	252/252 252/252	101/114 144/134	110/125	93/105 132/151	256/256 256/256	103/116 146/135	110/125	94/106 134/152	257/257 257/257	107/120	110/125 175/150		261/261 261/261
Math         Disk         Control         Disk         Disk <thdisk< th="">         Disk         <thdisk< th=""> <t< th=""><th></th><th>0.00/0.10</th><th>0.021 (0.101</th><th>50/61</th><th>_</th><th>54/50</th><th>010</th><th>E8/55</th><th>20/80</th><th>E0/67</th><th></th><th>E7/E8</th><th>001/001</th><th>20/100</th><th>700</th><th>61 /BO</th><th>001/02</th><th>_</th><th>007</th></t<></thdisk<></thdisk<>		0.00/0.10	0.021 (0.101	50/61	_	54/50	010	E8/55	20/80	E0/67		E7/E8	001/001	20/100	700	61 /BO	001/02	_	007
MB         yand         y	288A	7 5/10 0	20.9/24.1	52/51	00/00 60/60	54/53	278/278	56/55	70/60	58/57	282/282	57/56	01/01	09/58	283/283	61/60	07/07		287/287
To the probability of the pr	291A	12.4/16.5	34.4/39.7	54/60	60/60	54/55	278/278	59/65	20/20	58/59	282/282	60/66	70/70	59/60	283/283	65/71	70/80		287/287
Not         Same         Not         Same         Not         Same         Sa	294A	25.2/33.5	69.9/80.6	99/111		90/102	278/278	103/116	110/125	95/106	282/282	105/117	110/125	96/107	283/283	109/122	110/125		287/287
Huth         200.         - </th <th>291A+294A</th> <th>37.6/50.0</th> <th>104.3/120.3</th> <th>142/131</th> <th>_</th> <th>130/147</th> <th>278/278</th> <th>146/135</th> <th>150/150</th> <th>134/152</th> <th>282/282</th> <th>148/137</th> <th>150/150</th> <th>135/153</th> <th>283/283</th> <th>152/141</th> <th>175/150</th> <th></th> <th>287/287</th>	291A+294A	37.6/50.0	104.3/120.3	142/131	_	130/147	278/278	146/135	150/150	134/152	282/282	148/137	150/150	135/153	283/283	152/141	175/150		287/287
Hut         294A         7/5         7/10         9/60         9/60         9/60         6/60         9/60         6/60         9/60         6/60         9/60         6/60         9/60         6/60         9/60         6/60         9	NONE	I	ı	57/56	70/70	59/58	313	61/60	80/70	64/63	317	62/61	80/80	65/64	318	66/65	80/80		322
Hoth         291A         7.1.1(15         8.4403         0.00         7.000         8.000         7.3131         6.011         9.000         7.000         6.000         7.000         6.000         7.000         6.000         7.000         6.000         7.000         6.000         7.000         6.000         7.000         6.000         7.000         6.000         7.000         6.000         7.000         6.000         7.000         <	288A	7.5/10.0	20.9/24.1	57/56	70/70	59/58	313/313	61/60	80/70	64/63	317/317	62/61	80/80	65/64	318/318	66/65	80/80		322/322
1         2004.         32/3203         000/17         110/12         110/11         111/13         111/11         111/11         111/11         111/11         111/11         111/11         111/11         111/11         111/11         111/11	291A	12.4/16.5	34.4/39.7	60/66		59/60	313/313		80/80	64/65	317/317	66/72	80/80	65/66	318/318		80/80		322/322
Image: list of the	294A	25.2/33.5	69.9/80.6	105/117		96/107	313/313		110/125	100/112	317/317	111/123	125/125	102/113	318/318				322/322
Interproduct (Includence) (I	291A+294A	37.6/50.0	104.3/120.3	148/137	-	136/153	313/313	153/141	175/175	140/157	317/317	154/143	175/175	141/158	318/318	-			322/322
ND         2004         10.0         120         20 <t< th=""><th>NONE</th><th>1</th><th>I</th><th>26</th><th></th><th>27</th><th>126</th><th>28</th><th>30</th><th>29</th><th>128</th><th>28</th><th>30</th><th>30</th><th>128</th><th>8</th><th>35</th><th>32</th><th>130</th></t<>	NONE	1	I	26		27	126	28	30	29	128	28	30	30	128	8	35	32	130
STD         288A         165         199         29         27         126         29	289A	10.0	12.0	26		27	126	28	30	29	128	28	30	30	128	80	35	32	130
	292A	16.5	19.9	80		27	126	32	35	29	128	33	35	30	128	35	35	32	130
290A+266A         500         602         67         74         126         66         90         76         128         66         90         76         129         70         80         70	295A	33.5	40.3	56		51	126	58	60	53	128	58	60	53	128	61	70	55	130
Mole         -	292A+295A	50.0	60.2	65		74	126	68	80	76	128	68	80	76	128	70	80	78	130
100         100 <th>NONE</th> <th>I</th> <th>I</th> <th>26</th> <th>30</th> <th>27</th> <th>140</th> <th>28</th> <th>30</th> <th>29</th> <th>142</th> <th>28</th> <th>30</th> <th>30</th> <th>142</th> <th>30</th> <th>35</th> <th>32</th> <th>144</th>	NONE	I	I	26	30	27	140	28	30	29	142	28	30	30	142	30	35	32	144
None         220A         165         199         30         27         140         32         35         412         35         36         37         35         36         37         35         36         37         35         36         37         35         36         35         36         37         35         36         37         35         36         37         35         36         35         36         36         37         35         36         37         35         36         37         35         36         37         35         36         37         35         36         37         35         36         37         35         36         37         36	289A	10.0	12.0	26	90	27	140	28	30	59	142	28	30	30	142	8	35	32	144
225A         335         403         56         00         51         140         56         142         56         142         61         70         55           141         225A         50.0         60.0         53         142         61         70         55           161         70         71         140         56         32         315         315         316         316         317         316         317         316         316         317         316         317         316         316         317         316         316         317         316         31	292A	16.5	19.9	30	90	27	140	32	35	29	142	33	35	30	142	35	35	32	144
292A+58A         500         602         65         70         74         140         68         80         76         142         76         142         70         80         76         142         70         80         73         153           HGH         292A         165         190         28         30         157         36         40         35         159         38         40         35           HGH         292A         165         190         28         30         157         36         40         35         36         40         35         36         40         35         36         40         35         36         40         36         30         157         36         40         35         35         40         35         36         40         35         36         40         35         36         40         36         40         36         40         35         36         40         36         40         35         36         40         36         40         36         40         36         40         36         40         36         40         36         40         36 <t< th=""><th>295A</th><th>33.5</th><th>40.3</th><th>56</th><th>09</th><th>51</th><th>140</th><th>58</th><th>60</th><th>53</th><th>142</th><th>58</th><th>60</th><th>53</th><th>142</th><th>61</th><th>70</th><th>55</th><th>144</th></t<>	295A	33.5	40.3	56	09	51	140	58	60	53	142	58	60	53	142	61	70	55	144
NONE         -         -         29         35         30         157         30         35         30         157         30         35         40         35           HIGH         2884         100         120         120         120         35         30         157         30         35         40         35         40         35           PIGH         296A         315         403         35         403         50         61         70         56         159         33         40         35           VONE         -         -         2         2         30         177         167         71         80         77         80         33         40         35         40         35           VONE         -         -         2         2         2         107         29         30         171         171         24         25         25         109         26         40         25           VONE         -         -         2         2         2         111         27         20         109         25         109         26         40         25           VONE	292A+295A	50.0	60.2	65	20	74	140	68	80	76	142	68	80	76	142	70	80	78	144
Include         288A         100         120         28         30         157         30         35         32         159         33         40         35           HICH         292A         165         193         53         30         157         36         40         35         159         38         40         35           Pace         165         193         53         300         602         56         157         1         10         22         159         38         40         35           Pace         165         165         165         165         165         167         30         27         111         27         30         73         40         35         22         23         107         29         30         27         111         27         30         26         100         27         29         20	NONE	I	I	29	35	30	157	30	35	32	159	31	35	33	159	33	40	35	161
HIGH         282A         165         199         33         5         30         157         36         40         33         159         38         40         33         40         33         40         33         40         33         40         33         40         35         40         35         40         33         40         33         40         33         40         33         40         33         40         33         40         33         40         35         35         130         40         35         159         38         40         35         35         30         40         35         30         40         35         159         38         40         35         30         20         30         20         20         111         21         20	289A	10.0	12.0	29	35	30	157	30	35	32	159	31	35	33	159	S	40	35	161
295A         33.5         40.3         59         60         54         157         61         70         56         159         64         70         56           292A+295A         50.0         602         79         157         71         80         79         159         74         80         81           292A+295A         50.0         602         69         77         157         71         80         79         159         74         80         81           87D         293A         165         159         25         23         107         56         50         57         111         27         30         28         30         29         74         80         74         80         74         80         74         80         74         80         74         80         74         80         74         80	292A	16.5	19.9	ŝ	35	30	157	36	40	32	159	36	40	33	159	38	40	35	161
ZMA+Z6M         5000         600         77         150         77         600         79         179         70         70	295A	33.5	40.3	20	00 00	54	157	61	02	20	159	62	20	56	159	64	02	58	161
NUME         -	AC814282	0.00	2002	8 8	8 8	11	/61		00 5	2	ACI T		00	21	ACI 1	4	00 00	0	101
STD         Zeade         10.3         Zeade         10.3         Zeade         10.3         Zeade         10.3         Zeade         10.3         Zeade         20.4				N 8	8 8	ŝ	101	0 0	000	7 5	= ;	4 C	0, 0	20	601	8 8	00	R C	2 7
2934+2964         0.00         0.01	2064	33.5	8.0 E	45	34	41	107	67	200	42 C	Ē	47	202	643	801	9 6	ŝ	47	2 6
NONE         -         -         23         25         24         116         27         30         28         120         25         30         26         30         30         30           MED         293A         165         159         26         30         24         116         31         35         28         120         25         30         26         118         33         35         30         30           VED         296A         33.5         32.2         46         50         42         116         51         60         47         120         28         30         26         118         33         35         30           293A+296A         50.0         481         54         60         66         65         120         56         60         67         49           293A+296A         50.0         481         59         60         65         120         56         60         67         49           293A         16.5         159         28         30         28         130         28         32         32         32         32         32         32         32	293A+296A	50.0	48.1	2 S	2 09	59	107	58	8 09	3 2	Ē	55	09	61	109	8 09	800	66	113
MeD         2934         165         159         26         30         24         116         31         35         28         120         28         30         26         33         35         30         31	NONE	,	1	23	25	24	116	27	30	28	120	25	30	26	118	29	30	30	122
WED         296A         33.5         32.2         46         50         42         116         51         60         47         120         48         50         44         118         53         60         49           293A+296A         50.0         481         54         60         65         120         48         50         44         118         53         60         49           293A+296A         50.0         481         54         60         65         120         56         60         67         49           293A+296A         50.0         481         54         60         65         134         26         60         67         70         67         49           MIGH         -         -         -         25         30         28         134         26         70         67         49           MIGH         296A         33.5         226         40         53         30         28         32         32         32         32         32         32         32         32         32         32         32         32         32         32         32         32         32         <	293A	16.5	15.9	26	8	24	116	31	35	28	120	28	30	26	118	g	35	30	122
293A+296A         50.0         48.1         54         60         60         65         120         56         60         62         18         61         70         67           NONE         -         -         25         30         29         30         314         26         30         58         60         67         70         67         70         67           HIGH         -         -         -         25         30         29         30         134         26         30         35         32           MIGH         293A         16.5         159         28         130         29         30         134         26         30         35         32         32           203A+296A         50.0         48.1         56         60         67         134         51         60         50         55	296A	33.5	32.2	46	50	42	116	51	60	47	120	48	50	44	118	53	60	49	122
NONE         -         -         25         30         26         130         29         30         134         26         30         28         35         32         33         35         32         30         35         32         32         33         35         32         30         28         32         35         30         134         26         30         28         32         35         32         30         35         32         33         35         30         134         30         28         35         32         32         32         32         32         32         32         32         32         32         33         33         30         36         35         32 <th< th=""><th>293A+296A</th><th>50.0</th><th>48.1</th><th>54</th><th>60</th><th>60</th><th>116</th><th>59</th><th>60</th><th>65</th><th>120</th><th>56</th><th>60</th><th>62</th><th>118</th><th>61</th><th>70</th><th>67</th><th>122</th></th<>	293A+296A	50.0	48.1	54	60	60	116	59	60	65	120	56	60	62	118	61	70	67	122
293A     16.5     15.9     28     30     26     130     33     35     30     134     30     28     132     35     35     32       296A     33.5     32.5     32.3     53     60     49     134     51     60     46     132     55     60     50       296A     33.5     32.5     32.2     48     50     44     130     53     60     49     134     51     60     46     132     55     60     50       293A+296A     50.0     48.1     56     60     67     134     58     60     64     132     63     70     69	NONE	I	I	25	30	26	130	29	30	30	134	26	30	28	132	30	35	32	136
296A         33.5         32.2         48         50         44         130         53         60         49         134         51         60         46         132         55         60         50           293A+296A         50.0         48.1         56         60         62         130         61         70         67         134         58         60         64         132         55         60         59	293A	16.5	15.9	28	30	26	130	33	35	30	134	30	30	28	132	35	35	32	136
50.0         48.1         56         60         62         130         61         70         67         134         58         60         64         132         63         70         69	296A	33.5	32.2	48	50	44	130	53	60	49	134	51	60	46	132	55	60	50	136
	293A+296A	50.0	48.1	56	09	62	130	61	70	67	134	58	60	64	132	8	20	69	136
See "Legend and Note		2944 291A+294A NONE 291A+294A 291A 291A 291A 291A 291A 291A 291A 291	o		689,80.6 104.3/120.3 20.9/24.1 34.4/39.7 69.9/80.6 104.3/120.3 20.9/24.1 34.4/39.7 69.9/80.6 104.3/120.3 20.9/24.1 34.4/39.7 69.241 34.4/39.7 69.28 40.3 60.2 112.0 119.9 40.3 60.2 112.0 119.9 40.3 60.2 112.0 112.0 112.0 112.0 112.0 113.9 40.3 60.2 115.9 40.3 60.2 115.9 40.3 40.3 60.2 115.9 40.3 40.2 40.3 40.1 40.1 40.3	69.390.6         97/11/0         100/11/0           69.37/20.3         140/129         150/150           2.32/51         60/60         34.493           3.4,493         54/60         60/60           3.4,493         54/60         60/60           3.4,493         54/60         60/60           3.4,493         54/60         60/60           3.4,493         54/60         60/60           53,413         142/131         150/150           -         57/56         70/70           3.4,493         60/66         70/70           3.4,493         60/66         70/70           3.4,493         142/131         150/155           104.3/120.3         148/137         150/155           104.3/120.3         148/137         150/155           -         26         30           112.0         26         30           112.0         26         30           112.0         26         30           112.0         27         56           60.2         65         70           60.2         26         30           112.0         27         26	669,960.6         97/110         100/110         89/101           -         -         52/51         60/60         54/53           2.09,327         54/60         60/60         54/53           2.09,327         54/60         60/60         54/53           3.4,3927         54/60         60/60         54/53           3.4,3927         54/60         60/60         54/53           9.4,111         100/125         90/102         130/147           -         57/56         70/70         59/58           3.4,439.7         56/150         130/147         100/125           -         57/56         70/70         59/58           3.4,439.7         60/66         70/70         59/58           3.4,439.7         60/66         70/70         59/56           3.4,439.1         110/127         130/147         110/127           -         26         30         27           19.9         30         111         110/125         56/107           60.2         66         30         27         27           19.9         30         27         110.33/153         27           19.3         105/171	669,960.6         97/110         100/110         89/101           -         -         52/51         60/60         54/53           20.9380.6         99/111         120/120         128/146           -         52/51         60/60         54/53           34,937         54/60         60/60         54/53           34,937         54/60         60/60         54/53           99/111         100/125         90/102         130/147           -         57/56         70/70         59/60           59/90.5         99/111         100/125         90/102           104.3/120.3         142/137         150/150         130/147           -         57/56         70/70         59/60           69.980.6         105/117         110/125         96/107           104.3/120.3         142/137         150/150         130/147           -         26         30         27         10           112.0         26         30         27         10           19.9         30         27         10         27           19.9         30         27         10         27           19.9         30	69.900.6         97/11/0         100/11/0         89/101         222/252         101/13/1           -         52/51         60/66         54/53         278/278         56/55         54/53         57/56         56/55         54/53         57/56         56/55         56/57	69.900.6         97/11.0         100/11.0         89/101         252/252         101/114           -         52/51         60/60         54/53         278/278         56/55           20.924.1         52/51         60/60         54/53         278/278         56/55           30.924.1         57/56         70/70         59/58         313         61/60           104.3/120.3         442/131         150/150         130/147         278/278         103/116           104.3/120.3         442/131         100/175         90/102         278/278         116/0           20.996.06         99/111         100/175         90/102         278/278         101/122           104.3/120.3         442/131         150/150         130/147         278/278         116/0           20.996.0         05/6         70/70         59/68         313/313         110/122           104.3/120.3         142/131         110/125         313/313         110/122           104.3/120.3         149/135         59/6         70/70         59/68         313/313         110/122           104.3/120.3         105/117         110/125         313/313         110/122         116/60         59/66         59/66	66.960.6         97/110         100/110         86.1/13         11/14         11/11.25           10.33/120.3         40/129         150/150         128/146         252/252         144/134         150/150           2.09.41         52/51         60/60         54/55         278/278         56/55         70/60           3.44/367         54/60         54/55         278/278         56/55         70/60           3.44/367         54/60         54/55         278/278         56/55         70/60           3.44/367         56/150         130/147         278/278         56/56         70/70           3.44/367         57/16         59/66         313/313         61/60         80/70           3.44/367         50/167         130/147         110/725         96/71         80/70           3.44/367         50/167         59/66         313/313         61/60         80/70           3.44/367         50/167         130/147         110/725         96/71         80/70           3.44/367         50/167         130/147         130/133         150/141         175/175           3.44/367         50/167         130/147         110/725         96/717         80/80	6698063         97/110         1007110         88/101         252/252         101/1/14         110/125         58/105         127/151           -         55/15         60660         54/53         27/18         56/55         70/100         58/51         50/165         58/51         50/160         58/55         70/100         58/51         50/16         58/51         70/100         58/51         70/100         58/51         70/100         58/51         70/100         58/51         70/100         58/51         70/100         58/51         70/100         58/51         70/100         58/51         70/100         58/51         70/100         58/51         70/100         58/51         70/100         58/51         70/100         58/51         70/101         58/101         58/105         13/111         110/125         13/112 <th>0639006         97/110         100/110         89/110         100/125         25/256         100/125         25/15         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/157         282/282           603867         32/151         60005         54/53         278/128         103/116         110/125         210/157         282/282           6038601         100/131         50/147         278/128         103/116         110/125         100/112         227/128           2002411         150/150         54/157         70/107         59/158         313/313         65/11         100/125         28/107         282/282           2002411         150/150         150/150         151/17         101/122         110/122         110/125         100/112         217/317           200221         56/107         59/107         59/107         59/107         59/107         59/107         59/107         59/107         59/107         50/150         51/17           2002211         10/127         10/128</th> <th>68:36:05         97/10         69/101         28:75:25         10/110         28:75:25         10/110         28:75:25         10/110         28:75:25         10/110         28:75:25         10/110         28:75:25         10/110         28:75:25         21/115         22:75:25         21/117         22:75         22:75:25         21/117         22:75         22:75:25         21/117         22:75         21:75:15         21:75:17         22:75:17         22:75:25         21:117         22:75         21:117         22:75         21:117         22:75         21:117         22:75         21:117         22:75         22:75         22:75</th> <th>60.9000         977/10         107/110         807/100         80/117         1007/125         707/100         80/117         1007/125         707/100         80/110         807/110         807/110         807/110         807/110         807/110         807/110         807/117         1007/125         707/107         808/111         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125</th> <th>0000000         000110         000110         2002222         1101114         1101125         0101155         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         1001105<!--</th--><th>Residention         Sylive         Synivelies         Sylive         Synivelies         Sylive         Synivelies         Synivelies</th><th>mean         mean         <th< th=""><th>Constract         Tititity         Constract         <th< th=""></th<></th></th<></th></th>	0639006         97/110         100/110         89/110         100/125         25/256         100/125         25/15         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/155         26/157         282/282           603867         32/151         60005         54/53         278/128         103/116         110/125         210/157         282/282           6038601         100/131         50/147         278/128         103/116         110/125         100/112         227/128           2002411         150/150         54/157         70/107         59/158         313/313         65/11         100/125         28/107         282/282           2002411         150/150         150/150         151/17         101/122         110/122         110/125         100/112         217/317           200221         56/107         59/107         59/107         59/107         59/107         59/107         59/107         59/107         59/107         50/150         51/17           2002211         10/127         10/128	68:36:05         97/10         69/101         28:75:25         10/110         28:75:25         10/110         28:75:25         10/110         28:75:25         10/110         28:75:25         10/110         28:75:25         10/110         28:75:25         21/115         22:75:25         21/117         22:75         22:75:25         21/117         22:75         22:75:25         21/117         22:75         21:75:15         21:75:17         22:75:17         22:75:25         21:117         22:75         21:117         22:75         21:117         22:75         21:117         22:75         21:117         22:75         22:75         22:75	60.9000         977/10         107/110         807/100         80/117         1007/125         707/100         80/117         1007/125         707/100         80/110         807/110         807/110         807/110         807/110         807/110         807/110         807/117         1007/125         707/107         808/111         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125         707/117         1007/125	0000000         000110         000110         2002222         1101114         1101125         0101155         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         10011055         1001105 </th <th>Residention         Sylive         Synivelies         Sylive         Synivelies         Sylive         Synivelies         Synivelies</th> <th>mean         mean         <th< th=""><th>Constract         Tititity         Constract         <th< th=""></th<></th></th<></th>	Residention         Sylive         Synivelies         Sylive         Synivelies         Sylive         Synivelies         Synivelies	mean         mean <th< th=""><th>Constract         Tititity         Constract         <th< th=""></th<></th></th<>	Constract         Tititity         Constract         Constract <th< th=""></th<>

Table 8 - Unit Wire/Fuse or HACR Breaker Sizing Data (cont.)

<b>HACR Breaker</b>
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1         1	Hat         Annual         Annual <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>4</th> <th></th> <th>5</th> <th></th> <th>, LC /</th> <th>(a) (a)</th> <th></th> <th></th> <th>C a</th> <th>L</th> <th></th> <th>5</th> <th>, LC /</th> <th></th> <th></th>							4		5		, LC /	(a) (a)			C a	L		5	, LC /		
1         1			IFM					2 2			-	w/ н:е. (pwi	ra 11/ unu)		-	2				w/ ו	(1)UN/JI D	
QLL <thl< th="">LLLLLL</thl<>	·····         ·····         ·····         ·····         ·····         ·····         ·····         ·····         ·····         ·····         ·····         ······         ······         ······         ······         ······         ······         ······         ······         ······         ······         ······         ······         ·······         ·······         ·······         ·······         ·······         ·······         ········         ········         ········         ·········         ··········         ···········         ··············         ················		TYPE	CRHEATER***A00	Nom (KW)	FLA	MCA	HACR	DISC.	SIZE	MCA	HACR	DISC.	SIZE	MCA	HACR	DISC.	SIZE	MCA	HACR	DISC. 8	SIZE
Mote <th> <th>ION</th><th></th><th></th><th></th><th></th><th>40M</th><th>BRKR</th><th>FLA</th><th>LRA</th><th></th><th>BRKR</th><th>FLA</th><th>LRA</th><th></th><th>BRKR</th><th>FLA</th><th>LRA</th><th></th><th>BRKR</th><th>FLA</th><th>LRA</th></th>	<th>ION</th> <th></th> <th></th> <th></th> <th></th> <th>40M</th> <th>BRKR</th> <th>FLA</th> <th>LRA</th> <th></th> <th>BRKR</th> <th>FLA</th> <th>LRA</th> <th></th> <th>BRKR</th> <th>FLA</th> <th>LRA</th> <th></th> <th>BRKR</th> <th>FLA</th> <th>LRA</th>	ION					40M	BRKR	FLA	LRA		BRKR	FLA	LRA		BRKR	FLA	LRA		BRKR	FLA	LRA
Prime         Sign         Sign <t< th=""><th>JANDA1         JANDA1         JAND11         JAND11&lt;</th><th></th><th></th><th>NONE</th><th></th><th>1</th><th>42/42</th><th>50/50</th><th>44/44</th><th>200</th><th>46/46</th><th>50/50</th><th>48/48</th><th>204</th><th>47/47</th><th>60/60</th><th>49/49</th><th>205</th><th>51/51</th><th>60/60</th><th>54/53</th><th>209</th></t<>	JANDA1         JAND11         JAND11<			NONE		1	42/42	50/50	44/44	200	46/46	50/50	48/48	204	47/47	60/60	49/49	205	51/51	60/60	54/53	209
PM         Final         F	No.         No. <th></th> <th>STD</th> <th>288A</th> <th>7.5/10.0</th> <th>20.9/24.1</th> <th>42/42</th> <th>50/50</th> <th>44/44</th> <th>200/200</th> <th>46/46</th> <th>50/50</th> <th>48/48</th> <th>204/204</th> <th>47/47</th> <th>60/60</th> <th>49/49</th> <th>205/205</th> <th>51/51</th> <th>60/60</th> <th>54/53</th> <th>209/209</th>		STD	288A	7.5/10.0	20.9/24.1	42/42	50/50	44/44	200/200	46/46	50/50	48/48	204/204	47/47	60/60	49/49	205/205	51/51	60/60	54/53	209/209
MORE         J         I	-         -			294A 294A	12.4/16.5 25.2/33.5	34.4/39.7 69.9/80.6	57/57 108/108	60/60 110/110	46/52 87/99	200/200 200/200	62/62 113/113	70/70 125/125	51/56 91/104	204/204 204/204	63/63 114/114	70/70 125/125	52/58 93/105	205/205 205/205	68/68 119/119	70/70 125/125	56/62 97/109	209/209 209/209
4         3         3         3         4         3         4         3         4         3         4         3         4         3         4         3         4         3         4         3         4         3         4         3         4         3         4         3         4         3         4         3         4         3         4         3         4         4         3         4         4         3         4         4         3         4         4         3         4         4         3         4         4         3         4         4         3         4         4         3         4         4         3	3.0.04.1         5.0.4.4         0.000         4444         0.000         4444         0.000         4444         0.000         4444         0.000         14141         151715         87105         81101         121011			NONE	1	1	42/42	50/50	44/44	200	46/46	50/50	48/48	204	47/47	60/60	49/49	205	51/51	60/60	54/53	209
1         1	34,463         107,10         6,060         6,062         7,070         5,060         7,070         5,060         7,070         5,060         5,060         5,070         <	(		288A	7.5/10.0	20.9/24.1	42/42	50/50	44/44	200/200	46/46	50/50	48/48	204/204	47/47	60/60	49/49	205/205	51/51	60/60	54/53	209/209
1         2         3	Modelie         High         H	09-	MED	291A	12.4/16.5	34.4/39.7	57/57	60/60	46/52	200/200	62/62	70/70	51/56	204/204	63/63	70/70	52/58	205/205	68/68	70/70	56/62	209/209
Field in the control of the contr	-         64/6         0.00         47/4         Could         49/4         0.000         51/5	£-(		294A	25.2/33.5	69.9/80.6	108/108	110/110	87/99	200/200	113/113	125/125	91/104	204/204	114/114	125/125	93/105	205/205	119/119	125/125	97/109	209/209
Moti         28.4         7.100         9.004         5.100         5	Zukzki, 4,646         50,00         61/16         2002         61/16         2002         61/16         2002         61/16         2002         61/17         2002         61/17         60/10         2002         61/17         2002         61/17         2002         61/17         2002         61/17         2002         61/17         2002         2001         2002         2001 <th< th=""><th>\530</th><th></th><th>NONE</th><th>I</th><th>I</th><th>45/45</th><th>50/50</th><th>47/46</th><th>230</th><th>49/49</th><th>60/60</th><th>51/50</th><th>234</th><th>50/50</th><th>60/60</th><th>53/52</th><th>235</th><th>53/53</th><th>60/60</th><th>57/56</th><th>239</th></th<>	\530		NONE	I	I	45/45	50/50	47/46	230	49/49	60/60	51/50	234	50/50	60/60	53/52	235	53/53	60/60	57/56	239
Altern         Takes         Takes <t< th=""><th>Max Max         Multing         <t< th=""><th>802</th><th>HIGH</th><th>288A</th><th>7.5/10.0</th><th>20.9/24.1</th><th>45/45</th><th>50/50</th><th>47/46</th><th>230/230</th><th>49/49</th><th>60/60</th><th>51/50</th><th>234/234</th><th>50/50</th><th>60/60</th><th>53/52</th><th>235/235</th><th>53/53</th><th>60/60</th><th>57/56</th><th>239/239</th></t<></th></t<>	Max Max         Multing         Multing <t< th=""><th>802</th><th>HIGH</th><th>288A</th><th>7.5/10.0</th><th>20.9/24.1</th><th>45/45</th><th>50/50</th><th>47/46</th><th>230/230</th><th>49/49</th><th>60/60</th><th>51/50</th><th>234/234</th><th>50/50</th><th>60/60</th><th>53/52</th><th>235/235</th><th>53/53</th><th>60/60</th><th>57/56</th><th>239/239</th></t<>	802	HIGH	288A	7.5/10.0	20.9/24.1	45/45	50/50	47/46	230/230	49/49	60/60	51/50	234/234	50/50	60/60	53/52	235/235	53/53	60/60	57/56	239/239
Huth         200         - <th></th> <th></th> <th></th> <th>294A</th> <th>12.4/16.5 25.2/33.5</th> <th>34.4/39.7 69.9/80.6</th> <th>60/60 111/111</th> <th>60/60 125/125</th> <th>43/92 90/102</th> <th>230/230 230/230</th> <th>65/65 116/116</th> <th>/U//U 125/125</th> <th>95/106</th> <th>234/234 234/234</th> <th>66/66 117/117</th> <th>/0//0 125/125</th> <th>96/107</th> <th>235/235 235/235</th> <th>122/122</th> <th>80/80 125/125</th> <th>59/65 100/112</th> <th>239/239 239/239</th>				294A	12.4/16.5 25.2/33.5	34.4/39.7 69.9/80.6	60/60 111/111	60/60 125/125	43/92 90/102	230/230 230/230	65/65 116/116	/U//U 125/125	95/106	234/234 234/234	66/66 117/117	/0//0 125/125	96/107	235/235 235/235	122/122	80/80 125/125	59/65 100/112	239/239 239/239
HUT         28.04         7.010         20.940         20.940 <th>300         100         000         500<th></th><th></th><th>NONE</th><th></th><th>1</th><th>47/47</th><th>60/60</th><th>50/48</th><th>254</th><th>51/51</th><th>60/60</th><th>54/53</th><th>258</th><th>52/52</th><th>60/60</th><th>55/54</th><th>259</th><th>56/56</th><th>60/60</th><th>59/58</th><th>263</th></th>	300         100         000         500 <th></th> <th></th> <th>NONE</th> <th></th> <th>1</th> <th>47/47</th> <th>60/60</th> <th>50/48</th> <th>254</th> <th>51/51</th> <th>60/60</th> <th>54/53</th> <th>258</th> <th>52/52</th> <th>60/60</th> <th>55/54</th> <th>259</th> <th>56/56</th> <th>60/60</th> <th>59/58</th> <th>263</th>			NONE		1	47/47	60/60	50/48	254	51/51	60/60	54/53	258	52/52	60/60	55/54	259	56/56	60/60	59/58	263
HOI         2014         12,41/16         34,43/7         69/17         59/16         58/16/2         67/17         70/70         56/16         71/70         56/17         71/70         56/17         71/70	34,4437         6002         70/70         55/47         60/10         55/47         60/10         55/47         60/10         55/47         60/10         56/47         60/10         56/47         60/10         56/47         60/10         56/47         60/10         56/47         60/10         56/47         60/10         56/47         60/10         56/47         60/10         56/47         60/10         56/47         60/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10         56/47         70/10 <t< th=""><th></th><th>ULTRA</th><th>288A</th><th>7.5/10.0</th><th>20.9/24.1</th><th>47/47</th><th>60/60</th><th>50/48</th><th>254/254</th><th>51/51</th><th>60/60</th><th>54/53</th><th>258/258</th><th>52/52</th><th>60/60</th><th>55/54</th><th>259/259</th><th>56/56</th><th>60/60</th><th>59/58</th><th>263/263</th></t<>		ULTRA	288A	7.5/10.0	20.9/24.1	47/47	60/60	50/48	254/254	51/51	60/60	54/53	258/258	52/52	60/60	55/54	259/259	56/56	60/60	59/58	263/263
Image: bold in the second in the se	06.00000         11/11/13         125/125         93/104         11/11/14         125/125         93/104         126/124         <		HIGH	291A	12.4/16.5	34.4/39.7	62/62	70/70	52/57	254/254	67/67	70/70	56/61	258/258	68/68	70/70	58/62	259/259	73/73	80/80	62/67	263/263
MONE         -         -         -         2         3         3         1         0         2         0         2         0         2         0         2         0         2         0         2         0         2         0         2         0         2         0         2         0         2         0         2         0         2         0         2         0         2         0         2         0         2         0         2         0         0         2	-         23         24         102         24         30         26         104         25         30         26         104         27         30         28           143         5         5         5         102         54         102         54         50         56         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30         28         104         57         30<			294A	25.2/33.5	69.9/80.6	113/113	125/125	93/104	254/254	118/118	125/125	97/108	258/258	119/119	125/125	98/109	259/259	124/124	125/125	103/114	263/263
STD         209A         100         120         22         24         100         25         24         100         25         24         101         25         104				NONE	I	I	23	25	24	102	24	30	26	104	25	30	26	104	27	30	28	106
323         165         193         59         0         0         102         103         59         104         57         0         29         104         57         0         29         0			STD	289A	10.0	12.0	53	25	24	102	24	30	26	104	25	30	26	104	27	30	28	106
Meth         333         443         5         7         9         1         7         9         7         9         7         9         7         9         9         7         9<	44.3         5         7		5	292A	16.5 20 r	19.9	23	88	26	102	31	35	58	104	32	35	29	104	34	35	31	106
Mole          - <th><math display="block"> \begin{array}{cccccccccccccccccccccccccccccccccccc</math></th> <th></th> <th></th> <th>AC82</th> <th>0.00</th> <th>40.3</th> <th>5</th> <th>00</th> <th>nc</th> <th>201</th> <th>/6</th> <th>00</th> <th>70</th> <th>104</th> <th>10</th> <th>00</th> <th>70</th> <th>104</th> <th>AC</th> <th>00</th> <th>54</th> <th>901</th>	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			AC82	0.00	40.3	5	00	nc	201	/6	00	70	104	10	00	70	104	AC	00	54	901
MED         S20.M         100         120         25         29         104         25         104         25         104         25         104         25         104         25         104         25         104         25         200         25         104         25         200         25         104         25         200         25         104		80		NONE	1 0	1 0	នួន	25 21	24	102	24	30	26	104	25	30	26	104	27	30	28	106
			MED	289A	10.0	12.0	88	£ 3	24	102	24	30	50	104	25	90 10	26	104	27	30 30	28	106
HIGH         288A         100         120         27         120         27         120         27         200         27         120         27         200         27         120         27         200         27	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			292A 295A	16.5 33.5	19.9 40.3	29	08 09	26	102	31 57	35 60	82 62	104	32	35 60	29	104	34 59	35 60	31	106
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HIH         22A         165         193         30         27         118         32         33         30         120         35         30         120         35         30         120         35         30         30         30         30         30         30         30         30         30         30         30         120         35         30         120         35         30         120         30		097		289A	10.0	12.0	ន	52	32	118	25	30	27	120	26	8 00	27	120	27	8 08	50	122
2564         335         403         56         00         51         118         56         100         53         100         10	403         66         51         118         58         60         53         120         58         60         53         120         61         70         55           -         25         30         28         130         28         130         28         130         53         50 <t< th=""><th></th><th>нон</th><th>292A</th><td>16.5</td><td>19.9</td><td>30</td><td>30</td><td>27</td><td>118</td><td>32</td><td>35</td><td>59</td><td>120</td><td>33</td><td>35</td><td>30</td><td>120</td><td>35</td><td>35</td><td>32</td><td>122</td></t<>		нон	292A	16.5	19.9	30	30	27	118	32	35	59	120	33	35	30	120	35	35	32	122
NONE          2         3         2         1         2         3         2         3         2         3 <th><math display="block"> \begin{array}{cccccccccccccccccccccccccccccccccccc</math></th> <th></th> <th></th> <th>295A</th> <th>33.5</th> <th>40.3</th> <th>56</th> <th>60</th> <th>51</th> <th>118</th> <th>58</th> <th>60</th> <th>53</th> <th>120</th> <th>58</th> <th>60</th> <th>53</th> <th>120</th> <th>61</th> <th>70</th> <th>55</th> <th>122</th>	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			295A	33.5	40.3	56	60	51	118	58	60	53	120	58	60	53	120	61	70	55	122
ULTRA         2894         100         120         25         30         28         130         28         130         28         30         28         30         28         30         28         30         28         30				NONE	I	1	25	30	26	130	26	30	28	132	27	30	28	132	29	30	30	134
HIGH         282A         165         199         31         35         31         132         33         31         132         36         40         33           RTD         285A         33.5         40.3         57         60         55         131         132         35         41         35         40         57         60         55         132         60         55         132         62         70         57           STD         285A         165         153         27         60         55         132         60         55         132         62         70         57           STD         286A         33.5         32.2         44         45         40         78         25         24         82         24         82         27         80         31         35         32.2         44         45         40         78         26         27         28         28         27         28         28         28         28         28         28         28         28         28         28         28         28         28         28         28         28         28         28         28	199         31         35         31         132         34         35         31         132         35         31         132         36         40         35 $$ 19         27         00         52         130         54         132         36         40         35 $$ 19         20         52         130         55         24         82         25         54         37         31         33         36         40         35 $15.9$ 20         22         28         26         27         25         28         37         36         40         37 $15.9$ 24         25         22         76         30         23         80         31         35         28 $15.9$ 24         40         78         23         25         24         80         31         35         28         30         26         40         37         26         28         26         27         25         28         28         26         28         26         28         28         28         26         28         28 </th <th></th> <th>ULTRA</th> <th>289A</th> <th>10.0</th> <th>12.0</th> <th>25</th> <th>30</th> <th>26</th> <th>130</th> <th>26</th> <th>30</th> <th>28</th> <th>132</th> <th>27</th> <th>30</th> <th>28</th> <th>132</th> <th>29</th> <th>30</th> <th>30</th> <th>134</th>		ULTRA	289A	10.0	12.0	25	30	26	130	26	30	28	132	27	30	28	132	29	30	30	134
NUNE          - <th></th> <th></th> <th>нон</th> <th>292A 295A</th> <th>16.5 33.5</th> <th>19.9 40.3</th> <th>31</th> <th>35</th> <th>50</th> <th>130</th> <th>34 59</th> <th>35 60</th> <th>31</th> <th>132</th> <th>34 60</th> <th>35 60</th> <th>31 55</th> <th>132</th> <th>36 62</th> <th>40</th> <th>33</th> <th>134</th>			нон	292A 295A	16.5 33.5	19.9 40.3	31	35	50	130	34 59	35 60	31	132	34 60	35 60	31 55	132	36 62	40	33	134
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	322       44       45       40       78       49       50       45       80       51       60       47         -       19       20       28       46       50       42       80       51       60       47         15.9       24       25       24       85       24       82       28       29       26       47         15.9       24       25       22       78       26       30       27       80       31       35       28		STD	293A	16.5	15.9	24	25	23	78	29	30	26	82	26	30	23	80	31	35	28	84
NONE         -         1         10         20         20         78         25         24         82         21         25         24         30         26         27         30         26         27         30         26         24         30         26         24         30         26         28         27         28         27         28         27         28         27         28         27         28         27         28<	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			296A	33.5	32.2	44	45	40	78	49	50	45	82	46	50	42	80	51	60	47	84
WED         233A         16.5         15.9         24         25         22         78         29         30         26         30         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         31         35         28         30         28         28         30         28         28         30         28         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30				NONE	I	I	19	20	20	78	23	25	24	82	21	25	22	80	24	30	26	84
296A         335         32.2         44         45         40         78         49         50         45         80         51         60         47           NONE         -         -         -         -         21         25         22         91         24         90         51         60         47           NONE         -         -         21         25         22         21         93         26         30         28           NONE         -         -         21         25         22         25         24         93         26         30         28           Sold         15.5         22         28         95         28         95         28         30         28         30         28           NONE         -         21         25         22         28         95         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30	322       44       45       40       78       49       50       45       80       51       60       47         -       21       25       22       91       24       30       26       95       22       25       24       90       47         15.9       26       30       26       95       22       25       24       30       28         31       35       28       95       28       95       28       95       26       30       28         32.2       46       50       47       95       28       95       28       30       26       30       28         32.2       24       30       28       95       28       95       28       95       28       96       44       98       53       30       28       30       28       30       28       30       28       30       28       30       28       30       28       30       28       30       28       30       28       30       28       30       28       30       28       30       28       30       28       30       28       30       28 <th>09</th> <th>MED</th> <th>293A</th> <th>16.5</th> <th>15.9</th> <th>24</th> <th>25</th> <th>53</th> <th>78</th> <th>29</th> <th>30</th> <th>26</th> <th>82</th> <th>26</th> <th>30</th> <th>23</th> <th>80</th> <th>31</th> <th>35</th> <th>28</th> <th>84</th>	09	MED	293A	16.5	15.9	24	25	53	78	29	30	26	82	26	30	23	80	31	35	28	84
NONE         -         -         21         25         22         91         24         30         28         32         24         30         28<	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	-6		296A	33.5	32.2	44	45	40	78	49	50	45	82	46	50	42	80	51	60	47	84
HIGH         233         16.5         15.9         26         30         23         91         31         35         28         96         28         30         25         30         23         35         30         31         35         28         96         28         30         25         93         33         35         30         40         43         41         93         35         30         43         35         30         43         35         30         43         35         30         43         35         30         43         35         30         43         35         30         43         35         30         43         35         30         43         35         30         43         35         30         43         35         30         43         35         30         43         35         30         33         35         30         31         35         30         33         35         30         30         33         35         30         30         33         33         33         33         33         33         33         33         33         33         30         33	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	-92		NONE	I	I	21	25	8	91	24	30	26	95	22	25	24	93	26	30	28	97
ZBOA         3.5.5         3.2.2         40         94         51         60         47         95         48         50         44         93         53         93	32.2     40     30     42     91     51     60     47     95     48     30     44     95     33     93     49       -     21     25     22     91     24     30     26     95     22     25     24     93     28       15.9     26     30     23     91     31     35     28     95     25     24     93     28     30       32.2     46     50     42     91     51     60     47     95     48     50     44     83     35     30     28       32.2     46     50     42     91     51     60     47     95     48     50     44     83     35     30     49	9.	нон	293A	16.5 20 r	15.9	20 70	8	8 S	6 9	31	35	82 [	8 S	28	30	25	88	8 5	35	30	97
NONE         -         21         25         22         91         24         30         26         95         22         24         93         26         30         28           293A         16.5         15.9         26         30         28         95         22         25         24         93         26         30         28           293A         16.5         15.9         26         30         23         91         31         35         28         95         28         95         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         28         30         33         35         30         28         30         28         30         28         30         28         30         28         30         28         30         49         35         30         49         49         35         60         49         49         53         50	- 21 25 22 91 24 30 26 95 22 24 93 26 30 28 15.9 25 24 93 26 30 28 31 15.9 26 30 28 33 35 30 28 33 35 30 28 33 32.2 46 50 42 91 51 60 47 95 48 50 44 93 53 60 49			YOR?	C.55	32.2	<del>6</del>	ß	42	R.	5	ng	4/	ß	48	nc	44	56	50	na	49	A/
236A 10.3 10.3 10.4 10.3 10.4 10.4 10.4 10 10 10 10 10 10 10 10 10 10 10 10 10			ULTRA	NONE		1 1	21	55	88	6 6	24	30 2E	50 20	95 OF	22	25	24	88	26	30	58	97
			нвн	296A	33.5	32.2	8 8	8 6	3 4	9 6	0 1	60 09	47	62 62	48 20	20	6 44	8 8	23	ç 09	30 49	97 97

-		NN									-						<u> </u>				60		20105																	
ZH-		- A -	NON		CLIS				MED 09-	·6-0	\530	208 HIGH			ULTRA	нын		ET 3	200			MED	09-	ε-a		5		ULTRA	ндн		ULS	20		MED 09	-8-				ULTRA	нын
		CRHEATER***A00		NONE	288A	291A 294A	NONE	288A	291A	294A	NONE	288A 291A	294A	NONE		291A 294A	NONE	289A	292A	295A	NONE	289A	295A 295A	NONE	289A	292A 295A	NONE		292A	JINON	203A	296A	NONE	293A	296A		296A			
ELEC. HTR		Nom (kW)		I	7.5/10.0	12.4/16.5 25.2/33.5	1	7.5/10.0	12.4/16.5	25.2/33.5	I	7.5/10.0 12 4/16.5	25.2/33.5	1	7.5/10.0	12.4/16.5 25.2/33.5	. 1	10.0	16.5	33.5	I	10.0	33.5 33.5	I	10.0	16.5 33.5	ı	10.0	16.5 20 F	0.00	1 9 F	33.5	,	16.5	33.5		33.5 33.5	ı	16.5	33.5
	FLA			I	20.9/24.1	34.4/39.7 69.9/80.6	1	20.9/24.1	34.4/39.7	69.9/80.6	I	20.9/24.1 34 4/39 7	69.9/80.6	1	20.9/24.1	34.4/39.7 69.9/80.6		12.0	19.9	40.3	-	12.0	19.9 40.3	1	12.0	19.9 40.3	1	12.0	19.9	0.01	1 15 0	32.2	1	15.9	32.2	1 1	9.c1 32.2	1	15.9	32.2
			MCA	45/45	45/45	57/57 108/108	45/45	45/45	57/57	108/108	50/50	50/50 62/62	113/113	53/53	53/53	66/66 117/117	24	24	29	54	24	24	54 23	26	26	31 57	28	28	ŝ	8	77	2 4	20	24	4	3 8	20 46	24	28	48
	Ň	HACR	BRKR	60/60	60/60	60/60 110/110	60/60	60/60	60/60	110/110	60/60	60/60 70/70	125/125	60/60	60/60	70/70 125/125	30	30	8	60	30	8	09 09	30	30	35 60	30	30	35	90	8 K	45	25	25	45	S S	20 90	25	30	50
	NO P.E.	DISC	FLA	46/46	46/46	46/52 87/99	46/46	46/46	46/52	87/99	52/51	52/51 52/57	93/104	55/54	55/54	55/60 96/107	25	25	26	50	25	55	20 20	28	28	29 52	29	29	90 I	5 5	- 8	4 6	21	22	40	38	52 23	25	25	4
NO C.O. or I		DISC. SIZE	LRA	227	227/227	227/227 227/227	227	227/227	227/227	227/227	281	281/281 281/281	281/281	292	292/292	292/292 292/292	113	113	113	113	113	113	113 113	141	141	141 141	146	146	146	140 84	5 8	84	84	84	84	97	97 97	111	111	111
NO C.O. or UNPWR C.O.			MCA	49/49	49/49	62/62 113/113	49/49	49/49	62/62	113/113	54/54	54/54 67/67	118/118	56/56	56/56	71/71 122/122	26	26	31	57	26	26	31 57	28	28	34 59	30	30	36	10	24 20	49	24	29	49	c, 7	51	27	33	53
	w/ P.E. (pwrd fr/unit)	HACR	BRKR	60/60	60/60	70/70 125/125	60/60	60/60	70/70	125/125	60/60	60/60 70/70	125/125	60/60	60/60	80/80 125/125	30	30	35	60	30	30	33 09	30	30	35 60	35	35	40	7.0 2.5	00	50	25	30	50	0.5	6 09	30	35	60
	/rd fr/unit)	DISC. SIZE	FLA	51/50	51/50	51/56 91/104	51/50	51/50	51/56	91/104	56/55	56/55 56/61	97/108	60/59	60/59	60/65 100/112	27	27	28	52	27	27	28	30	30	31	31	31	32	ос 2	63 K	45	25	26	45	72	28 47	29	30	49
		SIZE	LRA	231	231/231	231/231 231/231	231	231/231	231/231	231/231	285	285/285 285/285	285/285	296	296/296	296/296 296/296	115	115	115	115	115	115	115	143	143	143 143	148	148	148	041	8 8	8 8	88	88	88	5	101 101	115	115	115
			MCA	50/50	50/50	63/63 114/114	50/50	50/50	63/63	114/114	55/55	55/55 68/68	119/119	57/57	57/57	72/72 123/123	27	27	32	57	27	27	32	29	29	34 60	30	30	36	30 66	7 40	46	22	26	46	R S	28 48	25	30	51
	NO P.E.	HACR	BRKR	60/60	60/60	70/70 125/125	60/60	60/60	70/70	125/125	60/60	60/60 70/70	125/125	70/70	70/70	80/80 125/125	30	30	35	60	30	30	с <u></u> 09	35	35	35 60	35	35	40	2 ч	00	20	25	30	50	S, S	20 20	30	30	60
	ΕĒ	DISC. SIZE	FLA	52/52	52/52	52/58 93/105	52/52	52/52	52/58	93/105	58/56	58/56 58/62	98/109	61/60	61/60	61/66 102/113	28	28	29	52	28	28	29	30	30	31 55	32	32	33	00	S 8	42	23	23	42	07 I	cz 44	27	27	46
w/ PWRD C.O.		size	LRA	232	232/232	232/232 232/232	232	232/232	232/232	232/232	286	286/286 286/286	286/286	297	297/297	297/297 297/297	115	115	115	115	115	115	115	143	143	143 143	148	148	148	0+1 BR	8	8 8	86	86	86	3	6 6	113	113	113
0.0.0	-		MCA	53/53	53/53	68/68 119/119		53/53		119/119	58/58	58/58 73/73	-	61/61	61/61	77/77 128/128	28	28	34	59	28	28	34 59	30	30	36 62	32	32	38	40 24	0.5	51	25	31	51	72	23 23	29	35	55
	w/ P.E. (pwrd fr/unit)	HACR	BRKR	60/60	60/60	70/70 125/125	60/60	60/60	70/70	125/125	70/70	70/70 80/80		70/70	70/70	80/80 150/150	30	30	35	60	30	30	с <u>с</u> 09	35	35	40 70	35	35	40	30	35	8 09	30	35	60	0.5	6 9 00	35	35	60
	d fr/unit)	DISC. SIZE	FLA	56/56	56/56	56/62 97/109	56/56	56/56	56/62	97/109	62/61	62/61 62/67	103/114	65/64	65/64	65/70 106/117	30	30	31	54	30	80	31 54	32	32	33 57	34	34	35	20	12 28	47	27	28	47	67. O	30 49	31	32	50
		SIZE	LRA	236	236/236	236/236 236/236	236	236/236	236/236	236/236	290	290/290	290/290	301	301/301	301/301 301/301	117	117	117	117	117	117	711	145	145	145 145	150	150	150			06	06	06	06	103	103 103	117	117	117

# Table 9 - Unit Wire Sizing Data with Factory Installed HACR Breaker (cont)

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Breaker
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Installed
Factory
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Data
Sizing
Wire
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Table 9 -

***A00         Nom         FLA         MCA         HACR         DISC.            -         -         51/51         60/60         52/52         DISC.            -         51/51         60/60         52/52         DISC.         DISC.            -         -         51/51         60/60         52/52         DISC.            -         -         52/52         60/60         52/52         DISC.            -         -         52/52         60/60         54/53         DISC.            -         -         52/52         60/60         54/53         DISC.           75/10.0         209/24.1         52/52         60/60         54/53         DISC.           75/10.0         209/24.1         52/57         70/70         59/58         DICC           75/10.0         209/24.1         52/57         70/70         59/58         DICC           75/10.0         209/24.1         57/57         70/70         59/58         DICC           75/10.0         104.3/120.3         148/148         150/150         136/147         137/147           7         - <t< th=""><th>┝</th><th>z</th><th></th><th>ELE</th><th>ELEC. HTR</th><th></th><th></th><th></th><th></th><th>NO C.O. or UNPWR C.O.</th><th>NTWD C.C.</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th><u>ز</u>ز</th><th></th><th></th><th></th></t<>	┝	z		ELE	ELEC. HTR					NO C.O. or UNPWR C.O.	NTWD C.C.								<u>ز</u> ز			
↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓		H-r										-	(start) of the second s			04				(in the second for the second se	(almin) at	
Mole	TIN				щсN			2				w/ r.e. (pv	wra rr/unic)							w/ P.E. (pw	a II/IUII)	
Q         NONE         -         -         -         51/51         60/60           STD         288A         7.5/10.0         20.9/24.1         51/51         60/60           STD         288A         7.5/10.0         20.9/24.1         51/51         60/60           281A         7.5/10.0         20.9/24.1         51/51         60/60           281A         7.5/10.0         20.9/24.1         55/52         60/60           281A         7.5/10.0         20.9/24.1         55/52         60/60           281A         7.5/10.0         20.9/24.1         55/52         60/60           281A         7.5/10.0         20.9/24.1         55/12         70/70           281A         7.5/10.0         20.9/24.1         55/12         70/70           281A         7.5/10.0         20.9/24.1         55/57         70/70           281A         7.5/10.0         20.9/24.1         126/126         70/70           281A         7.5/10.0         20.9/24.1         126/126         70/70           281A         7.5/10.0         20.9/24.1         126/126         70/70           281A         7.5/70.0         20.9/24.1         126/126         70/70	n			HEATER***A00	(MA)	FLA	MCA	HACR	DISC.	SIZE	MCA	HACR	DISC. SIZE	SIZE	MCA	HACR	DISC.	SIZE	MCA	HACR	DISC. SIZE	SIZE
NONE         -         -         -         5151         6000           288A         757100         209,24.1         51,51         6000           291A         72,81A         32,6335         69,903         110/110         10/110           291A         291A         75,100         209,24.1         55,52         6000         6000           291A         75,100         209,24.1         52,52         6000         6000         6000           291A         75,10.0         209,24.1         52,52         6000         6000         6000           291A         75,10.0         209,24.1         57,57         7070         7070           291A         291A         12,416.5         34,439.7         6000         6000         6000           291A         291A         25,165         14,141.1         12,1171         12,1171         12,1712		ON						BRKR	FLA	LRA		BRKR	FLA	LRA		BRKR	FLA	LRA		BRKR	FLA	LRA
SBA         7.5/10.0         209,24.1         5.151         60/60           291A         12,4/16.5         34,4/30.5         140/140         160/10           291A         25123.55         69/90.65         140/140         160/10           291A         25153.55         69/90.66         140/140         160/10           291A         7.5/10.0         209/24.1         55/52         60/60           291A         7.5/10.0         209/24.1         55/52         60/60           291A         22.333.5         69/90.66         111/111         125/125           291A         22.333.5         69/90.66         111/111         125/125           291A         22.416.5         3.4.38.7         66/66         7070           291A         291A         12.4/16.5         3.4.38.7         7070           292         291A         12.4/16.5         3.4.38.7         7070           291A         291A         12.4/16.5				NONE	ł	1	51/51	60/60	52/52	252	54/54	60/60	56/56	256	55/55	60/60	58/57	257	59/59	70/70	62/62	261
STD         291A         12.4/16.5         3.4,39.7         59/59         60/60           294A         25.233.5         69.9/80.6         10/110         10/110         10/110           291A         200NE         7.5/10.0         22/33.5         69.9/80.6         11/111         12/125           MED         294A         25.2/33.5         69.9/80.6         11/1111         12/125           200N2         2.5/10.0         209/24.1         52/52         60/60           294A         25.2/33.5         69.9/80.6         11/1111         12/125           201A-294A         25.2/33.5         69.9/80.6         11/1111         12/125           201A-294A         25.2/33.5         69.9/80.6         11/1111         12/125           201A         294A         25.2/33.5         69.9/80.6         <				288A	7.5/10.0	20.9/24.1	51/51	60/60	52/52	252/252	54/54	60/60	56/56	256/256	55/55	60/60	58/57	257/257	59/59	70/70	62/62	261/261
294A         25,233,5         698,06,5         10/110         10/110         10/110           291A+294A         37,6/50,0         104,3/120,3         140/140         150/150           291A+294A         37,6/50,0         104,3/120,3         140/140         150/150           291A         294A         25,2/33,5         69.9/60,6         60/60           291A         294A         25,2/33,5         69.9/60,6         11/111         125/125           291A         12,4/16,5         34,4/39,7         60/60         60/60         60/60           291A         25,2/33,5         69.9/60,6         11/1111         125/125         70/70           291A         291A         37,6/50,0         104,3/120,3         140/148         150/150           NONE         -         -         25,33,5         69.9/60,6         11/111         125/125           291A         291A         37,6/50,0         104,3/120,3         140/148         150/150           NONE         -         -         291A         37,6/50,0         104,3/120,3         140/148         150/150           NONE         291A+294A         37,6/50,0         104,3/120,3         140/148         150/150           291A+294A		Ω.	STD	291A	12.4/16.5	34.4/39.7	59/59	60/60	52/53	252/252	63/63	70/70	56/58	256/256	65/65	70/70	58/59	257/257	69/69	70/70	62/63	261/261
MED         280A+294A         57,6900         104,301         150,150           MED         291A+294A         57,6900         104,3170.3         140/140         150/150           NONE         -         5552         60/60         60/60         60/60           291A         25.2/33.5         69.9/80.6         111/111         125/125         7070           291A         291A         25.2/33.5         69.9/80.6         111/111         125/125           201A+294A         37.6/50.0         104.3/120.3         142/142         150/150           NONE         -         -         57/57         7070           291A         214/16.5         34.4/39.7         60/60         7070           291A         75/10.0         20.2/4.1         57/57         7070           291A         12.4/16.5         34.4/39.7         60/60         7070           292A+295A         50.0         10.0         12.0         30         30           291A         292A         16.5         143/145         150/150         12.4/142         150/150           292A+295A         50.0         10.43/120.3         148/148         150/150         12.2/155           292A+295A				294A	25.2/33.5	69.9/80.6	110/110	110/110	89/101	252/252	114/114	125/125	93/105	256/256	116/116	125/125	94/106	257/257	120/120	125/125	98/110	261/261
MED         288.8         7.5/10.0         20.924.1         52.52         60/60           MED         2914         7.5/10.0         20.924.1         52.52         60/60           294.4         2.5/10.0         20.914.1         12.4/16.5         344.93.7         70/70           294.4         37.6/50.0         104.3/120.3         142/142         150/150           294.4         25.2/33.5         69.9/80.6         111/111         125/157         70/70           294.4         25.7/10.0         20.9/24.1         57/57         70/70         29/14           291.4         291.4         12.4/16.5         344.93.7         66/66         70/70           294.4         25.7/50.5         69.9/80.6         111/111         125/157         70/70           294.4         25.6/50.0         10.43.1/20.3         148/148         16/0/150         20/70           292.4         112.4/16.5         34.4/30.7         66/66         70/70         21/150           292.4         16.5         19.9         37.6/50.0         104.31/20.3         148/148         16/0/150           292.4         16.5         19.9         37.6/50.0         10.31/20.3         148/148         16/0/160				291A+294A	37.6/50.0	104.3/120.3	140/140	150/150	128/146	252/252	144/144	150/150	132/151	256/256	146/146	150/150	134/152	257/257	150/150	175/175	138/156	261/261
2008/200-31         208A         7.5/10.0         2014.1         5.57.2         60/60           291A         12.4/16.5         3.4/39.7         60/60         60/60           291A         12.4/16.5         3.4/39.7         60/60         60/60           291A         12.4/16.5         3.4/39.7         60/60         60/60           291A+294A         37.6/50.0         104.3/120.3         142/142         155/15           NONE         -         -         57/57         70/70           291A+294A         37.6/50.0         104.3/120.3         148/148         150/150           291A+294A         37.6/50.0         104.3/120.3         148/148         150/150           291A+294A         37.6/50.0         104.3/120.3         148/148         150/150           201A+294A         37.6/50.0         104.3/120.3         148/148         150/150           291A+294A         37.6/50.0         104.3/120.3         148/148         150/150           288A         10.0         12.4         12.6         26         30           288A         10.0         12.0         2.2         30         30           288A         10.0         12.0         2.2         30 <t< th=""><th></th><th>09-</th><th></th><th>NONE</th><th>1</th><th>1</th><th>52/52</th><th>60/60</th><th>54/53</th><th>278</th><th>56/56</th><th>20/20</th><th>58/57</th><th>282</th><th>57/57</th><th>70/70</th><th>59/58</th><th>283</th><th>61/61</th><th>70/70</th><th>64/63</th><th>287</th></t<>		09-		NONE	1	1	52/52	60/60	54/53	278	56/56	20/20	58/57	282	57/57	70/70	59/58	283	61/61	70/70	64/63	287
200         MED         291A         12.4/16.5         3.4.493.7         600.00         6060				288A	7.5/10.0	20.9/24.1	52/52	60/60	54/53	278/278	56/56	70/70	58/57	282/282	57/57	70/70	59/58	283/283	61/61	70/70	64/63	287/287
294A         252/335         699/80.6         111/11         122/125           291A+294A         37.6/50.0         104.3/120.3         142/142         150/150           HIGH         291A         7.5/10.0         203/24.1         57/57         70/70           NONE         -         -         57/57         70/70         70/70           NONE         -         -         57/57         70/70         70/70           291A         12.4/16.5         34.403.7         66/66         7070         70/70           NONE         -         -         -         57/57         70/70         70/70           291A         12.4/16.5         34.403.7         66/66         7070         70/70         70/70           NONE         -         -         -         -         26         30         30         30           291A         201A-295A         33.5         40.3         56         66         30         30           292A+295A         50.0         60.2         66.2         66         70         96         70           292A+295A         50.0         60.2         66.2         66         70         96         96         90 <th></th> <th></th> <td>(ED</td> <td></td> <td>12.4/16.5</td> <td>34.4/39.7</td> <td>60/60</td> <td>60/60</td> <td>54/55</td> <td>278/278</td> <td>65/65</td> <td>02/02</td> <td>58/59</td> <td>282/282</td> <td>66/66</td> <td>70/70</td> <td>59/60</td> <td>283/283</td> <td>71/71</td> <td>80/80</td> <td>64/65</td> <td>287/287</td>			(ED		12.4/16.5	34.4/39.7	60/60	60/60	54/55	278/278	65/65	02/02	58/59	282/282	66/66	70/70	59/60	283/283	71/71	80/80	64/65	287/287
		2/802			25.2/33.5 37 6/50 0	69.9/80.6 104.3/120.3	111/111 142/142	125/125	90/102 130/147	278/278 278/278	116/116 146/146	125/125	95/106 134/152	282/282 282/282	117/117 148/148	125/125	96/107 135/153	283/283 283/283	122/122 159/159	125/125 175/175	100/112	287/287 287/287
1         1		 ;			-		57/57	70/70	59/58	313	61/61	80/80	64/63	317	62/62	80/80	65/64	318	66/66	80/80	69/68	322
HIGH         291A         12.4/16.5         3.4/39.7         66/66         7070           294A         291A         12.4/16.5         3.4/39.7         66/66         7070           294A         291A         37.6/50.0         104.3/120.3         148/148         150/150           294A         25.2/33.5         69.9/80.6         117/117         125/125           294A         37.6/50.0         104.3/120.3         148/148         150/150           201         2292A         16.5         19.9         30         30           292A         16.5         10.0         12.0         26         30           292A+295A         50.0         60.2         65         70           292A+295A         50.0         60.2         65         70           10.0         12.0         12.0         26         30           292A+295A         50.0         60.2         65         70           10.0         12.0         12.0         26         70           293A+295A         50.0         60.2         65         70           292A+295A         50.0         60.2         65         70           292A+295A         292A+295A				288A	7.5/10.0	20.9/24.1	57/57	70/70	59/58	313/313	61/61	80/80	64/63	317/317	62/62	80/80	65/64	318/318	66/66	80/80	69/68	322/322
$ \frac{294}{10} = \frac{294}{37.6/50.0} + \frac{25.2/33.5}{10.43/120.3} + \frac{291/4}{148} + \frac{125/125}{100150} + \frac{125/125}{148/148} + \frac{125/125}{160150} + \frac{104.3/120.3}{148/148} + \frac{125/125}{160150} + \frac{104.3/120.3}{148/148} + \frac{150/150}{1601} + \frac{120}{120} + \frac{26}{10} + \frac{30}{30} + \frac{30}{30$		Í	IGH	291A	12.4/16.5	34.4/39.7	66/66	70/70	59/60	313/313	71/71	80/80	64/65	317/317	72/72	80/80	65/66	318/318	77/77	80/80	69/70	322/322
				294A	25.2/33.5	69.9/80.6	117/117	125/125	96/107	313/313	122/122	125/125	100/112	317/317	123/123	125/125	102/113	318/318	128/128	150/150	106/117	322/322
NONE         -         -         26         30           STD         289A         10.0         12.0         26         30           280A         10.0         12.0         26         30         30           280A         10.0         12.0         26         30         30           292A         16.5         18.9         30         30         30           292A+295A         50.0         60.2         65         70         30           NONE         -         -         -         -         266         30         30           NONE         -         -         -         -         -         265         60         30         30           NONE         -         -         -         -         -         -         266         30         30           NONE         292A+295A         50.0         60.2         65         70         35           HIGH         292A+295A         50.0         60.2         65         70         35           293A+295A         50.0         60.2         69         30         35         35         35           165         293A+29			-		37.6/50.0	104.3/120.3	148/148	150/150	136/153	313/313	153/153	175/175	140/157	317/317	154/154	175/175	141/158	318/318	159/159	175/175	145/163	322/322
2884       10.0       12.0       26       30         STD       292A       16.5       19.9       30       30         STD       292A       16.5       19.9       30       30         STD       292A       33.5       40.3       56       60       30         STD       292A+295A       33.5       40.3       56       60       30         NONE       -       -       -       2224+295A       50.0       60.2       65       70         NONE       -       -       -       -       -       -       265       30       30         NONE       -       292A+295A       16.5       19.9       30       30       30       30         NONE       -       -       -       -       -       -       200       60.2       30       30         NONE       -       <	1			NONE	1	1	26	30	27	126	28	30	29	128	28	30	30	128	30	35	32	130
STD       292A       16.5       19.9       30       30         295A       33.5       40.3       56       60       30         295A       33.5       40.3       56       60       30         295A       33.5       40.3       56       60       60       60         295A       33.5       40.3       50.0       60.2       65       70       30         NONE       -       -       -       -       289       10.0       12.0       266       30       30         NONE       289A       10.0       12.0       228A       33.5       40.3       56       60       30       30         NONE       292A+295A       50.0       60.2       65       70       30       30         NONE       -       -       16.5       19.9       30				289A	10.0	12.0	26	30	27	126	28	30	29	128	28	30	30	128	30	35	32	130
295A       33.5       40.3       56       60         292A+2954       50.0       60.2       65       70         NONE       -       -       222A+2954       50.0       60.2       65       70         NONE       -       -       -       -       226       30       30       30       30         NONE       -       -       -       -       -       266       30 <th></th> <th>່ ຜ</th> <td>3TD</td> <td>292A</td> <td>16.5</td> <td>19.9</td> <td>30</td> <td>30</td> <td>27</td> <td>126</td> <td>32</td> <td>35</td> <td>29</td> <td>128</td> <td>33</td> <td>35</td> <td>30</td> <td>128</td> <td>35</td> <td>35</td> <td>32</td> <td>130</td>		່ ຜ	3TD	292A	16.5	19.9	30	30	27	126	32	35	29	128	33	35	30	128	35	35	32	130
292A+295A         50.0         60.2         65         70           NONE         -         -         26         30           NONE         -         -         -         26         30           NONE         -         -         -         26         30           289A         10.0         12.0         26         30         30           289A         10.0         12.0         266         30         30           292A+295A         50.0         60.2         65         70         35           NONE         -         -         -         293         35         40.3         35           292A+295A         50.0         60.2         69         30         35           800         90.0         10.0         12.0         22         25           803         33.5         40.3         33.5         25         25           800         90.0         90.0         20.3				295A	33.5	40.3	56	60	51	126	58	60	53	128	58	60	53	128	61	70	55	130
	2			292A+295A	50.0	60.2	65	70	74	126	68	80	76	128	68	80	76	128	70	80	78	130
289A         10.0         12.0         26         30           MED         292/A         16.5         19.9         30         30           289A         10.0         12.0         26         30         30           292/A         16.5         19.9         30         30         30           292/A+295A         50.0         60.2         65         70         30           NONE         -         -         292/A+295A         50.0         60.2         65         70           NONE         -         10.0         12.0         29         35         70         30           NONE         -         292/A+295A         50.0         60.2         65         70         35           293/A+295A         50.0         60.2         69         33         35         35           293/A+296A         50.0         60.2         293         35         25         25           NONE         -         -         -         233         35         35         35           293/A+296A         50.0         60.2         283         35         25         25           10.0         16.5         15.	·8*			NONE	ı	1	26	30	27	140	28	30	29	142	28	30	30	142	30	35	32	144
→         →	ого			289A	10.0	12.0	26	30	27	140	28	30	29	142	28	30	30	142	30	35	32	144
295A         33.5         40.3         56         60           292A+295A         50.0         60.2         65         70           NONE         -         -         292         65         70           HIGH         292A+295A         50.0         60.2         65         70           NONE         -         -         29         35         70           PIGH         292A         16.5         17.0         29         35           NONE         -         -         29         35         35           STD         292A         50.0         60.2         65         70           STD         292A         50.0         60.2         65         70           NONE         -         -         -         25         25           NONE         -         -         23         25         25           MED         293A         16.5         15.9         26         30           293A+296A         50.0         48.1         53         25         25           293A+296A         50.0         48.1         53         25         25           293A+296A         50.0	9		<b>IED</b>	292A	16.5	19.9	30	30	27	140	32	35	29	142	33	35	30	142	35	35	32	144
292A+295A         50.0         60.2         65         70           NONE         -         -         29         35           HIGH         289A         10.0         12.0         29         35           289A         10.0         12.0         29         35           HIGH         292A         16.5         19.9         33         35           NONE         -         -         29         35         35           NONE         16.5         16.9         33         35         35           NONE         -         -         29         80         80         80           S1D         293A         30.5         30.2         48.1         53         60         80           MED         293A+296A         50.0         48.1         53         60         80           NONE         -         -         -         23         25         25         30           MED         293A         16.5         15.9         26         30         80           NONE         -         -         -         23         25         30         30           293A+296A         50.0		09t		295A	33.5	40.3	56	60	51	140	58	60	53	142	58	09	53	142	61	70	55	144
NONE         -         -         29         35           289A         10.0         12.0         29         35           289A         16.5         19.9         33         35           292A+295A         50.0         60.2         60         80           293A         50.0         60.2         69         80           NONE         -         -         22         25           293A+296A         50.0         48.1         53         25           293A+296A         50.0         48.1         53         25           MED         293A+296A         50.0         48.1         53         25           293A+296A         50.0         48.1         54         60         30           293A+296A         50.0         48.1         54         50         55           293A+296A         50.0         48.1         54         50         56           293A+296A         50.0		,		292A+295A	50.0	60.2	65	70	74	140	68	80	76	142	68	80	76	142	70	80	78	144
289A         10.0         12.0         29         35           HIGH         292A         16.5         19.9         33         35           NONE         292A+295A         50.0         60.2         60         80           S1D         292A+295A         50.0         60.2         60         80           VONE         -         -         -         222         55         60           S1D         298A         16.5         15.9         22         55         60           NONE         -         -         -         22         55         55         55           S1D         298A         16.5         15.9         25         25         25         56           NONE         -         -         -         2233A+296A         50.0         48.1         53         56         56           MED         298A         16.5         15.9         26         30         25         57           NONE         -         -         -         23         25         50         50           293A+296A         50.0         48.1         53         25         50         50         50				NONE	ı	ı	29	35	30	157	30	35	32	159	31	35	33	159	33	40	35	161
HIGH         292A         16.5         19.9         33         35           295A         33.5         40.3         59         60           295A         33.5         40.3         59         60           87D         292A+295A         50.0         60.2         69         80           87D         293A         16.5         15.9         22         55         60           87D         298A         33.5         48.1         57         25         25           87D         298A         33.5         32.2         45         45         45           87D         298A         50.0         48.1         53         25         25           980         203A+296A         50.0         48.1         53         25         30           980         293A+296A         50.0         48.1         53         25         30           980         293A+296A         50.0         48.1         54         50         50           980         293A+296A         50.0         48.1         54         50         50         55           980         293A+296A         50.0         48.1         54				289A	10.0	12.0	29	35	30	157	30	35	32	159	31	35	33	159	33	40	35	161
295A         33.5         40.3         59         60           292A+295A         50.0         60.2         69         80           STD         292A+295A         50.0         60.2         69         80           NONE         -         -         -         222         25         25           STD         298A         16.5         15.9         26         80         80           NONE         -         -         -         22         25         25           293A+296A         50.0         48.1         53         25         45         45           293A+296A         50.0         48.1         53         25         30         25           MED         293A         16.5         15.9         26         30         25         25           NONE         -         -         -         23         25         30         25           MED         293A+296A         50.0         48.1         54         60         30           200         203         48.1         54         60         30         30           200         -         -         -         25 <t< th=""><th></th><th>Ť</th><th>IIGH</th><th>292A</th><th>16.5</th><th>19.9</th><th>33</th><th>35</th><th>30</th><th>157</th><th>36</th><th>40</th><th>32</th><th>159</th><th>36</th><th>40</th><th>33</th><th>159</th><th>38</th><th>40</th><th>35</th><th>161</th></t<>		Ť	IIGH	292A	16.5	19.9	33	35	30	157	36	40	32	159	36	40	33	159	38	40	35	161
292A+295A         50.0         60.2         69         80           NONE         -         -         22         25           STD         293A         16.5         15.9         25         25           STD         296A         33.5         32.2         45         45           VONE         -         -         22         25         25           STD         296A         33.5         32.2         45         45           293A+296A         50.0         48.1         53         60         30           NONE         -         -         23         25         30         25           MED         298A         16.5         15.9         26         30         30           233A+296A         50.0         48.1         54         60         30           293A+296A         50.0         48.1         54         60         30           200K         -         -         -         25         30         30           293A+296A         50.0         48.1         54         60         30           200K         -         -         -         25         30 <th></th> <th></th> <th></th> <th>295A</th> <th>33.5</th> <th>40.3</th> <th>59</th> <th>60</th> <th>54</th> <th>157</th> <th>61</th> <th>70</th> <th>56</th> <th>159</th> <th>62</th> <th>02</th> <th>56</th> <th>159</th> <th>64</th> <th>20</th> <th>58</th> <th>161</th>				295A	33.5	40.3	59	60	54	157	61	70	56	159	62	02	56	159	64	20	58	161
NONE         -         -         22         25           \$TD         283A         16.5         15.9         25         25           296A         33.5         32.2         45         45         45           293A+296A         50.0         48.1         53         25         25           293A+296A         50.0         48.1         53         60         45           NONE         -         -         23         25         30           NONE         -         -         23         25         30           293A+296A         50.0         48.1         53         25         30           293A+296A         50.0         48.1         54         60         30           293A+296A         50.0         48.1         54         60         30           293A+296A         50.0         48.1         54         60         30           200NE         -         -         25         30         30           293A         16.5         15.9         26         30         30				292A+295A	50.0	60.2	69	80	77	157	71	80	79	159	71	80	79	159	74	80	81	161
STD         283A         16.5         15.9         25         25           296A         33.5         32.2         45         45           296A         33.5         32.2         45         45           298A         50.0         48.1         53         60           NONE         -         -         23         25         80           NONE         -         -         23         25         80           293A         16.5         15.9         26         30           293A         33.5         32.2         46         50           293A+296A         50.0         48.1         54         60           293A+296A         50.0         48.1         54         60           293A+296A         50.0         48.1         54         60           200NE         -         -         25         30         25           203A+296A         50.0         48.1         54         60         25           203A+296A         50.0         25         25         30         25         30           203A+296A         50.0         26.1         26.1         26         30				NONE	ı	1	22	25	23	107	26	30	27	111	24	25	25	109	28	30	29	113
296A         33.5         32.2         45         45         45           293A+296A         50.0         48.1         53         60           NONE         -         -         23         25         60           MED         293A         16.5         15.9         26         30           VEN         233.5         33.5         22.2         46         50           VEN         293A+296A         50.0         48.1         54         60           293A+296A         50.0         48.1         54         60         15.9         25         30           20NNE         -         -         -         25         30         15.9         26         30           200NE         -         -         -         25         30         15.9         28         30		5	L,	293A	16.5	15.9	25	25	23	107	29	30	27	111	27	30	25	109	32	35	29	113
293A+296A         50.0         48.1         53         60           NONE         -         -         23         25         60           NONE         -         -         -         23         25         50           MED         293A         16.5         15.9         26         30         25         26         30           294         33.5         33.5         32.2         4.6         50         30           293A+296A         50.0         48.1         54         60         30           NONE         -         -         25         30         30           293A         16.5         15.9         26         30         30		)		296A	33.5	32.2	45	45	41	107	50	50	45	111	47	50	43	109	52	60	47	113
NONE         -         -         23         25         25           293A         16.5         15.9         26         30           296A         33.5         32.2         46         50           298A         50.0         48.1         54         60           293A+296A         50.0         48.1         54         60           NONE         -         -         25         30           203A         16.5         15.9         28         30			•	293A+296A	50.0	48.1	53	60	59	107	58	60	64	111	55	09	61	109	60	60	66	113
MED         293A         16.5         15.9         26         30           296A         33.5         15.9         26         30           296A         33.5         32.2         46         50           293A+296A         50.0         48.1         54         60           NONE         -         -         253         32         30           203A         16.5         16.9         26         30         30		0		NONE	1		23	25	24	116	27	30	28	120	25	30	26	118	29	30	30	122
WEU         296A         33.5         32.2         46         50           293A+296A         50.0         48.1         54         60           NONE         -         -         25         30           293A         16.5         15.9         28         30			4	293A	16.5	15.9	26	30	24	116	31	35	28	120	28	30	26	118	33	35	30	122
293A+296A         50.0         48.1         54         60           NONE         -         -         25         30           MIGH         293A         16.5         15.9         28         30			μED	296A	33.5	32.2	46	50	42	116	51	60	47	120	48	50	44	118	53	60	49	122
NONE         -         -         25         30           293A         16.5         15.9         28         30		29	-	293A+296A	50.0	48.1	54	60	60	116	59	60	65	120	56	09	62	118	61	70	67	122
293A 16.5 15.9 28 30				NONE	ı	ı	25	30	26	130	29	30	30	134	26	30	28	132	30	35	32	136
		2		293A	16.5	15.9	28	30	26	130	33	35	30	134	30	30	28	132	35	35	32	136
296A 33.5 32.2 48 50		=		296A	33.5	32.2	48	50	44	130	53	60	49	134	51	09	46	132	55	60	50	136
				293A+296A	50.0	48.1	56	60	62	130	61	70	67	134	58	09	64	132	63	70	69	136

## Legend and Notes for Tables 8 and 9

LEGEND:		
BRKR		Circuit breaker
CO	-	Convenient outlet
DISC	-	Disconnect
FLA	-	Full load amps
IFM	-	Indoor fan motor
LRA	-	Locked rotor amps
MCA	-	Minimum circuit amps
PE	-	Power exhaust
PWRD CO	-	Powered convenient outlet
UNPWR CO	-	Unpowered convenient outlet
NOTES:		
1. In compli	ance	with NEC requirements for multim

 In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. Canadian units may be fuse or circuit breaker.

 Unbalanced 3-Phase Supply Voltage
 Never operate a motor where a phase imbalance in supply
 voltage is greater than 2%. Use the following formula to determine the percentage of voltage imbalance.

% Voltage Imbalance = 100 x average voltage

## **Smoke Detectors**

Smoke detectors are available as factory-installed options on 50LC\*B08-12 units. Smoke detectors may be specified for Supply Air only or for Return Air without or with economizer or in combination of Supply Air and Return Air. Return Air smoke detectors are arranged for vertical return configurations only. All components necessary for operation are factory-provided and mounted. The unit is factory-configured for immediate smoke detector shutdown operation; additional wiring or modifications to the Integrated Staging Control (ISC) board may be necessary to complete the unit and smoke detector configuration to meet project requirements.

Units equipped with factory-optional Return Air smoke detectors require a relocation of the sensor module at unit installation. See Fig. 54 for the as shipped location.

## **Completing Installation of Return Air Smoke Sensor:**

- 1. Unscrew the two screws holding the Return Air Smoke Detector assembly. See Fig. 55, Step 1. Save the screws.
- 2. Turn the assembly 90 and then rotate end to end. Make sure that the elbow fitting is pointing down. See Fig. 55, Step 2.
- 3. Screw the sensor and detector plate into its operating position using screws from Step 1. See Fig. 55, Step 3.
- 4. Connect the flexible tube on the sampling inlet to the sampling tube on the basepan.

Example: Supply voltage is 230-3-60



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Determine maximum deviation from average voltage. (AB) 227 - 224 = 3 v(BC) 231 - 227 = 4 v(AC) 227 - 226 = 1 vMaximum deviation is 4 v. Determine percent of voltage imbalance.

= 100 x = 1.76%

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

**IMPORTANT**: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

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Fig. 54 - Return Air Smoke Detector, Shipping Position

## Additional Application Data —

Refer to Catalog No. HKRNKA-1XA for discussions on additional control features of these smoke detectors including multiple u nit coordination.



Fig. 55 - Completing Installation of Return Air Smoke Sensor

## Step 13 — Adjust Factory-Installed Options

## Smoke Detectors —

Smoke detector(s) will be connected at the Integrated Staging Control (ISC) board, at terminals marked "Smoke Shutdown". Remove jumper JMP 3 when ready to energize unit.

## Step 14 — Install Accessories

Available accessories include:

Roof Curb (must be installed before unit)

Thru-base connection kit (must be installed before unit is set on curb)

Power Exhaust

Outdoor enthalpy sensor

Differential enthalpy sensor Outdoor coil protector grille Electric Heaters Single Point kits CO<sub>2</sub> sensor Louvered hail guard Phase monitor control

Refer to separate installation instructions for information on installing these accessories.

## Pre-Start and Start-Up ----

This completes the mechanical installation of the unit. Refer to the unit's Service Manual for detailed Pre-Start and Start-Up instructions. Download the latest versions from HVAC Partners (www.hvacpartners.com).

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Replaces: New

## UNIT START-UP CHECKLIST (Remove and Store in Job File)

	MODEL NO.:		SERIAL NO.:							
I.	PRE-START-UP									
	UVERIFY THAT ALL PACKAGIN	NG MATERIALS HAV	E BEEN REMOVED FRO	OM UNIT						
	□ VERIFY INSTALLATION OF DUCT PRESSURE TRANSDUCER AND SUPPLY AIR TEMPERATURE SE									
	□ VERIFY INSTALLATION OF OUTDOOR AIR HOOD									
	UVERIFY INSTALLATION OF FI	LUE EXHAUST AND	INLET HOOD							
	UVERIFY THAT CONDENSATE	CONNECTION IS INS	STALLED PER INSTRUC	TIONS						
	UVERIFY THAT ALL ELECTRIC	CAL CONNECTIONS	AND TERMINALS ARE	FIGHT						
	CHECK THAT INDOOR-AIR F	ILTERS ARE CLEAN	AND IN PLACE							
	□ CHECK THAT OUTDOOR AIR INLET SCREENS ARE IN PLACE									
	□ VERIFY THAT UNIT IS LEVEL									
	□ CHECK FAN WHEELS AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE AND VERIFY SETSCREW IS TIGHT									
	$\Box$ VERIFY THAT FAN SHEAVES	ARE ALIGNED AND	BELTS ARE PROPERLY	TENSIONED						
	UVERIFY THAT SCROLL COMP	PRESSORS ARE ROTA	ATING IN THE CORRREC	CT DIRECTION						
II.	START-UP									
	ELECTRICAL									
	SUPPLY VOLTAGE	L1-L2	L2-L3	L3-L1						
	COMPRESSOR AMPS 1	L1	L2	L3						
	COMPRESSOR AMPS 2	L1	L2	L3						
	SUPPLY FAN AMPS	L1	L2	L3						
	TEMPERATURES									
	OUTDOOR-AIR TEMPERATURE		°F DB (DRY BULB)							
	<b>RETURN-AIR TEMPERATURE</b>		°F DB	°F WB (WET BULB)						
	COOLING SUPPLY AIR TEMP	ERATURE	°F							
	PRESSURES									
	<b>REFRIGERANT SUCTION</b>	CIRCUIT A	PSIG							
		CIRCUIT B	PSIG							
	REFRIGERANT DISCHARGE	CIRCUIT A	PSIG							
		CIRCUIT B	PSIG							
	UERIFY REFRIGERANT CHARG	E USING CHARGING	CHARTS							
	GENERAL									
	ECONOMIZER MINIMUM VENT	AND CHANGEOVER	SETTINGS TO JOB REQU	IREMENTS (IF EQUIPPED)						
	UVERIFY SMOKE DETECTOR UN	NT SHUTDOWN BY U	TILIZING MAGNET TEST	. , , , , , , , , , , , , , , , , , , ,						

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