

Installation, Start-Up, and Service Instructions

GENERAL

IMPORTANT:

1. Tune all loops **BEFORE** starting these units. Refer to Control Loop Checkout section on page 74 for information on tuning loops.
2. The accessory HSIO (Human sensor input/output) keypad and display module is required for initial start-up of these units. All units are shipped in standby mode, and the accessory HSIO must be used to change unit to run mode. Once the unit is in run mode, the HSIO is not

required for normal operation. However, any time the unit needs to be transferred back to standby mode, such as when servicing the unit, it must be done using the accessory HSIO.

3. The 48NPE (high heat) units are intended for constant volume applications only.
4. The Data Reset function should be performed any time one or more of the values is configured. See Table 17 on page 51 for more details.

SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes, including ANSI (American National Standards Institute) Z223.1. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguisher available for all brazing operations.

⚠ WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury.

FOR YOUR SAFETY WHAT TO DO IF YOU SMELL GAS

Do not try to light any appliance. Do not touch any electrical switch; do not use any phone in your building. Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

FOR YOUR SAFETY

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

⚠ WARNING

Improper installation, adjustment, alteration, service, or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information, consult a qualified installer, service agency, or the gas supplier.

⚠ CAUTION

Disconnect gas piping from unit when leak testing at pressures greater than 0.5 psig. Pressures greater than 0.5 psig will cause gas valve damage resulting in a hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig, it must be replaced. When pressure testing field-supplied gas piping at pressures of 0.5 psig or less, the unit connected to such piping must be isolated by manually closing the gas valve.

⚠ CAUTION

On VAV applications, the evaporator fan can start at any time after the initialization period when the time clock places the unit in the occupied mode. Always turn power to unit off before performing any service or maintenance.

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INSTALLATION

IMPORTANT: These units are not designed to be handled by forklift trucks.

Rigging and Unit Placement — Inspect unit for transportation damage. File claim with transportation agency. Do not drop unit; keep upright. Use spreader bars over unit to prevent sling or cable damage. Rollers may be used to move unit across a roof. See Fig. 1 for additional rigging information. Unit weight is shown in Tables 1 and 2.

Roof Curb — Assemble and install as described in instructions shipped with the accessory. Install insulation, cant strips, roofing and counter flashing as required. For unit drains to function properly, curb must be level or within tolerances shown in Fig. 2. See Fig. 3A and 3B for accessory roof curb dimensions and installation details.

Roof Mount — Check building codes for weight distribution requirements. Unit weight is shown in Tables 1 and 2. Unit may be mounted on class A, B, or C roofing material.

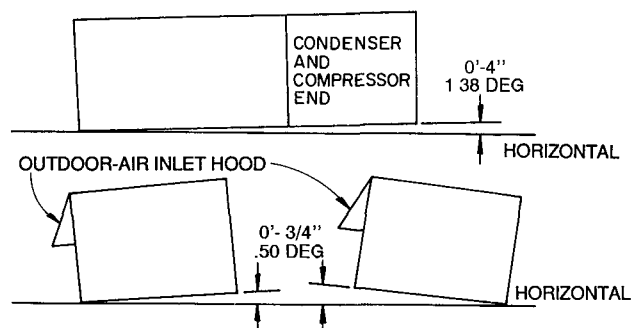
Slab Mount — Provide a level concrete slab that extends beyond unit cabinet at least 6 inches. Make a slab 8 in. thick with 4 in. above grade. For condensate drain to function properly, slab must be at least 4 in. above grade. Use gravel apron in front of condenser coil air inlet to prevent grass and foilage from obstructing airflow.

NOTES:

1. Rig with 4 cables and spread with two 95 in (2413 mm) and 2 "A" long suitable spreader bars
2. Center of gravity and unit weight include economizer

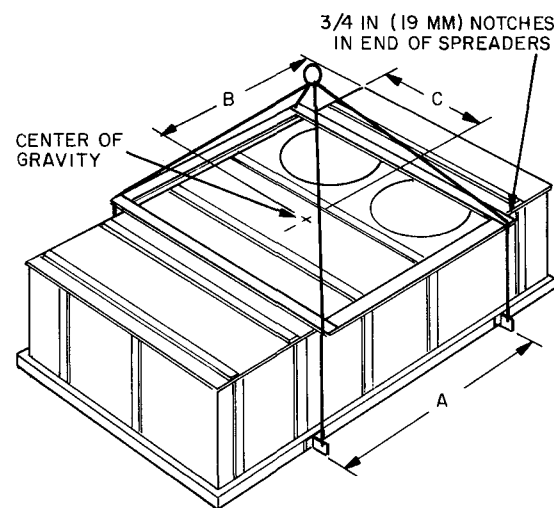
⚠ CAUTION

1. All panels must be in place when rigging.
2. Unit is not designed for handling by forklift truck.



NOTE: To prevent the hazard of stagnant water build-up in the drain pan of the indoor-air section, unit can only be pitched as shown.

Fig. 2 — Unit Leveling Tolerances



NOTICE TO RIGGERS

UNIT	UNIT WEIGHT*		A		B		C	
	Lb	Kg	In.	mm	In.	mm	In.	mm
48NPD024	2910	1322.7	85 91	2182	61	1549	43	1092
48NPE024	2990	1359.0	85 91	2182	61	1549	43	1092
48NPD028	3360	1527.3	97 24	2470	66	1676	43	1092
48NPE028	3440	1563.6	97 24	2470	66	1676	43	1092
48NPD030	3400	1545.5	97 24	2470	66	1676	43	1092
48NPE030	3480	1581.8	97.24	2470	66	1676	53	1346
50NP024	2580	1172.7	66 14	1680	49	1245	44	1118
50NB024	2790	1268.2	85.91	2182	61	1549	43	1092
50NP028	3040	1381.8	77 01	1956	53	1346	44	1118
50NB028	3240	1472.7	97.24	2470	66	1676	43	1092
50NP030	3070	1395.5	77 01	1956	53	1346	44	1118
50NB030	3280	1490.9	97 24	2470	66	1676	43	1092

*Includes optional economizer, but not rainhood.

ACCESSORY/OPTION WEIGHTS

ROOF CURB		ECONOMIZER WITHOUT HOOD		ECONOMIZER HOOD		BAROMETRIC RELIEF HOOD		MODULATING POWER EXHAUST HOOD	
Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg
280	127	140	63.6	155	70.3	130	59.1	140	63.6

Fig. 1 — Rigging Label

Table 1 – Physical Data, 48NP Units

BASE UNIT 48NP	D024	E024	D028	E028	D030	E030
NOMINAL CAPACITY (tons)	20	20	25	25	27	27
OPERATING WEIGHT (lb)*	2770	2850	3220	3300	3260	3340
COMPRESSORS (2 each unit) Capacity Steps (%)	Semi-Hermetic, 06D Type, 1750 Rpm 21, 42, 62, 80, 100 20, 40, 60, 73, 86, 100 19, 38, 57, 71, 86, 100					
REFRIGERANT Operating Charge (lb), Sys 1/Sys 2 Without Optional Hot Gas Bypass With Optional Hot Gas Bypass	R-22 Controlled by Thermostatic Expansion Valve 23 1/18 1 22.6/16 3 22 3/18.3 25.2/18 1 24.6/16 3 24 3/18.3					
CONDENSER COILS Face Area (sq ft) Fins Per in. (Aluminum) (Copper)	3-Row, 3/8-in. Tube Diameter 24.75 17 0 19.0 19 0 15 7 17.5 17 5					
EVAPORATOR COILS Face Area (sq ft) Fins Per in.	4-Row, 1/2-in. Tube Diameter 20.1 23.4 23 4 15					
FURNACE SECTION Number of Heat Exchangers Input (MBtuh) Output (MBtuh) Temperature Rise Range (°F) Burner Orifice Diameter (in. ...drill no.) Pilot Orifice Diameter (in. ...drill no.) Firing Stages Number of Gas Valves	5 242 194 10-40 136 .29 .046 .56 2 1	10 475 380 30-60 136...29 055...54 2 2	5 242 194 10-40 136 .29 .046 56 2 1	10 475 380 30-60 136...29 055.. 54 2 2	5 242 194 10-40 136. 29 .046. .56 2 1	10 475 380 30-60 136...29 055..54 2 2
CONDENSER FANS (2 each unit) Nominal Cfm Nominal Hp Watts Input (Total)	Propeller Type, 30-in. Diameter, 1140 Rpm 10,000 13,000 15,000 3/4 1 1 1700 2400 2900					
EVAPORATOR FANS (1 each unit)† Nominal Cfm Maximum Allowable Cfm Maximum Allowable Rpm	Centrifugal Type, 18 x 15 in., 1750 Rpm 8,000 10,000 10,800 10,000 12,500 12,500 1,200 1,200 1,200					
Standard Motor and Drive Motor Hp Full Load Efficiency (%) Standard High Motor Frame Size Fan Pulley Pitch Diameter (in.) Motor Pulley Pitch Diameter (in.) Pulley A Pulley B Resulting Fan Rpm Pulley A Pulley B Belts Quantity Length (in.)	1 438-in. Fan Pulley Bore 7 1/2 10 84.3 84.8 87 4 86.5 88 5 89 5 184T 213T 215T 10 6 8.0 8.0 4.75 4.12 4 50 5 30 4.50 5.00 780 900 980 875 980 1090 2 2 3 85 85 85					
Optional Motor and Drive Motor Hp Full Load Efficiency (%) Standard High Motor Frame Size Fan Pulley Pitch Diameter (in.) Motor Pulley Pitch Diameter (in.) Pulley A Pulley B Resulting Fan Rpm Pulley A Pulley B Belts Quantity Length (in.)	1.438-in. Fan Pulley Bore 10 15 84.8 87.4 85 7 88.5 89 5 90 0 213T 215T 254T 8.0 8.0 8 0 4 12 4.50 5.00 4 50 5.00 5.30 900 980 1090 980 1090 1160 2 3 3 80 85 85					
Optional Power Exhaust** Motors...Hp Fans...Diameter (in.)	Propeller Type, 1140 Rpm 1.. 1 1 .1 1.. 1 1. 24 1 .30 1. 30					
Filters (Quantity...L x W x D) 20% Standard Efficiency Throwaway	2...18 x 24 x 2 2 18 x 24 x 2 2...18 x 24 x 2 4.. 24 x 24 x 2 6. 20 x 24 x 2 6...20 x 24 x 2					

*Weights do not include economizer See page 3 for weights of options and accessories

†Standard fan motor is supplied with standard fan drive, pulleys, and belts. Optional fan motor is supplied with optional fan drive, pulleys, and belts. Other combinations are field supplied. Pulley A is installed in base unit. Pulley B is shipped with base unit.

**Optional power exhaust unit-mounted on vertical supply/return applications only. Accessory power exhaust can be duct mounted on horizontal supply/return applications

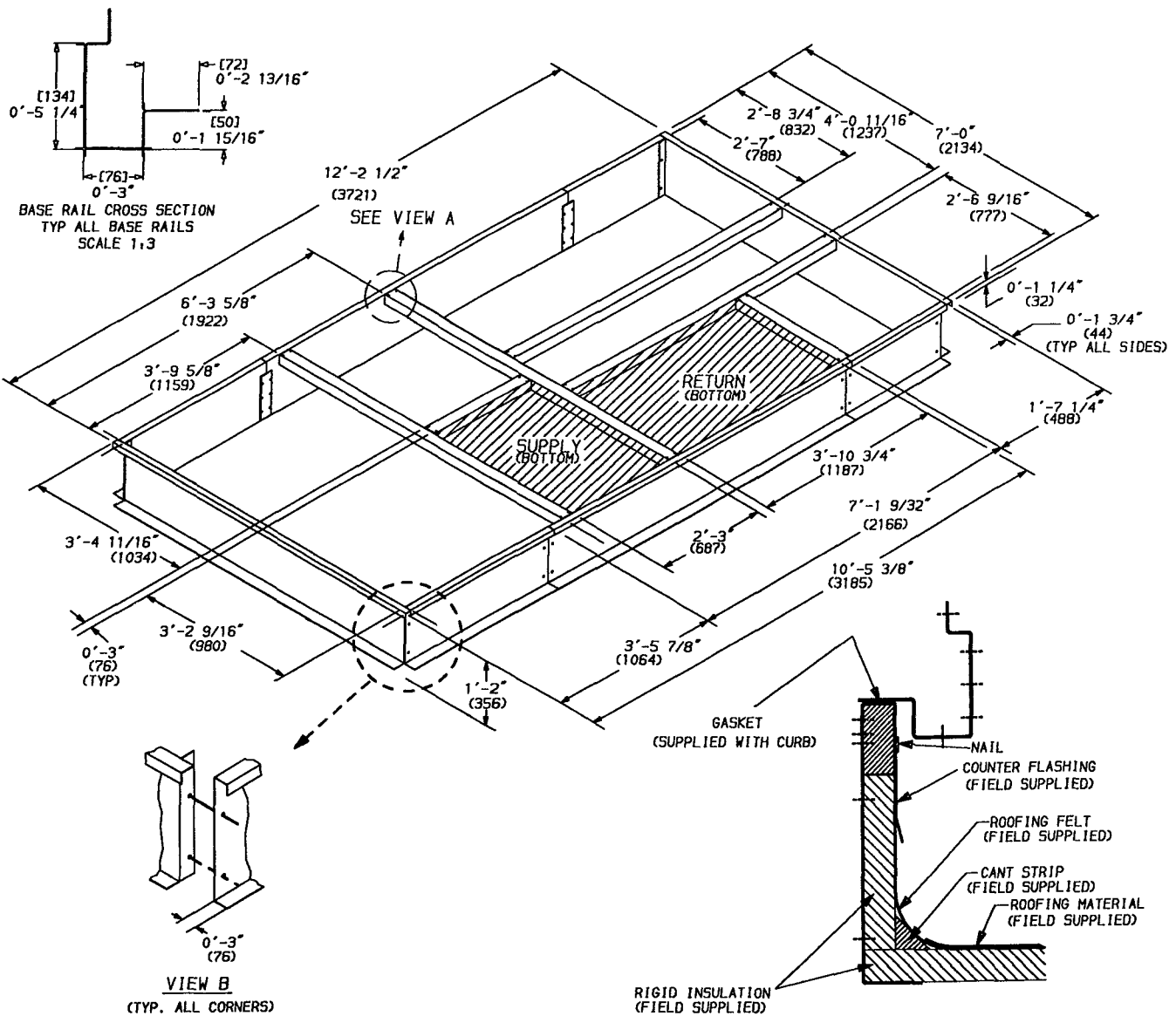
Table 2 – Physical Data, 50NB,NP Units

BASE UNIT 50	NP024	NB024	NP028	NB028	NP030	NB030
NOMINAL CAPACITY (tons)	20	20	25	25	27	27
OPERATING WEIGHT (lb)*	2440	2650	2900	3100	2930	3140
COMPRESSORS (2 each unit) Capacity Steps (%)	Semi-Hermetic, 06D Type, 1750 Rpm 21, 42, 62, 80, 100 20, 40, 60, 73, 86, 100 19, 38, 57, 71, 86, 100					
REFRIGERANT Operating Charge (lb), Sys 1/Sys2 Without Optional Hot Gas Bypass With Optional Hot Gas Bypass	R-22, Controlled by Thermostatic Expansion Valve 23.1/18.1 22.6/16.3 22.3/18.3 25.2/18.1 24.6/16.3 24.3/18.3					
CONDENSER COILS Face Area (sq ft) Fins Per In. (Aluminum) (Copper)	3-Row, 3/8-in. Tube Diameter 24.75 17.0 19.0 19.0 15.7 17.5 17.5					
EVAPORATOR COILS Face Area (sq ft) Fins Per In.	4-Row, 1/2-in. Tube Diameter 20.1 23.4 23.4 15 15 15					
CONDENSER FANS (2 each unit) Nominal Cfm Nominal Hp Watts Input (Total)	Propeller Type, 30-in. Diameter, 1140 Rpm 10,000 13,000 15,000 3/4 (208/230, 460 v), 1 (575 v) 1 1 1700 2400 2900					
EVAPORATOR FAN (1 each unit)† Nominal Cfm Maximum Allowable Cfm Maximum Allowable Rpm	Centrifugal Type, 18 x 15-in. 8,000 10,000 10,800 10,000 12,500 12,500 1,200 1,200 1,200					
Standard Motor and Drive Motor Hp Full Load Efficiency (%) Standard High Motor Frame Size Fan Pulley Pitch Diameter (in.) Motor Pulley Pitch Diameter (in.) Pulley A Pulley B Resulting Fan Rpm Pulley A Pulley B Belts Quantity Length (in.)	1.438-in. Fan Pulley Bore, Service Factor 1.15 5 7 1/2 10 84.3 84.8 87.4 86.5 88.5 89.5 184T 213T 215T 10.6 8.0 8.0 4.75 4.12 4.50 5.30 4.50 5.00 780 900 980 875 980 1090 2 2 3 56 85 47 85 47 85					
Optional Motor and Drive Motor Hp Full Load Efficiency (%) Standard High Motor Frame Size Fan Pulley Pitch Diameter (in.) Motor Pulley Pitch Diameter (in.) Pulley A Pulley B Resulting Fan Rpm Pulley A Pulley B Belts Quantity Length (in.)	1.438-in. Fan Pulley Bore, Service Factor 1.15 7 1/2 10 15 84.8 87.4 85.7 88.5 89.5 90.0 213T 215T 254T 8.0 8.0 8.0 4.12 4.50 5.00 4.50 5.00 5.30 900 980 1090 980 1090 1160 2 2 3 47 80 47 85 50 85					
Optional Power Exhaust** Motors...Hp Fans...Diameter (in.)	Propeller Type, 1140 Rpm 1 1 1 1 1...1 1 24 1 30 1...30 NA NA					
Filters (Quantity...L x W x D) 20% Standard Efficiency Throwaway	2 .18 x 24 x 2 2 .18 x 24 x 2 2 .18 x 24 x 2 4 .24 x 24 x 2 6 .20 x 24 x 2 6...20 x 24 x 2					

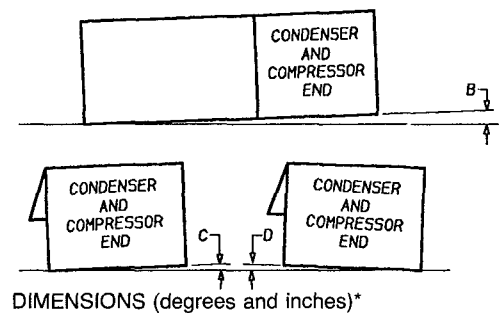
*Weights do not include economizer. See page 3 for weights of options and accessories

†Standard fan motor is supplied with standard fan drive, pulleys, and belts. Optional fan motor is supplied with optional fan drive, pulleys, and belts. Other combinations are field supplied. Pulley A is installed in base unit. Pulley B is shipped with base unit.

**Optional unit-mounted power exhaust not available (NA) on Model 50NB. Accessory modulating power exhaust may be duct mounted on 50NB installations.



NOTE To prevent the hazard of stagnant water build-up in the drain pan of the indoor-air section, unit can only be pitched as shown

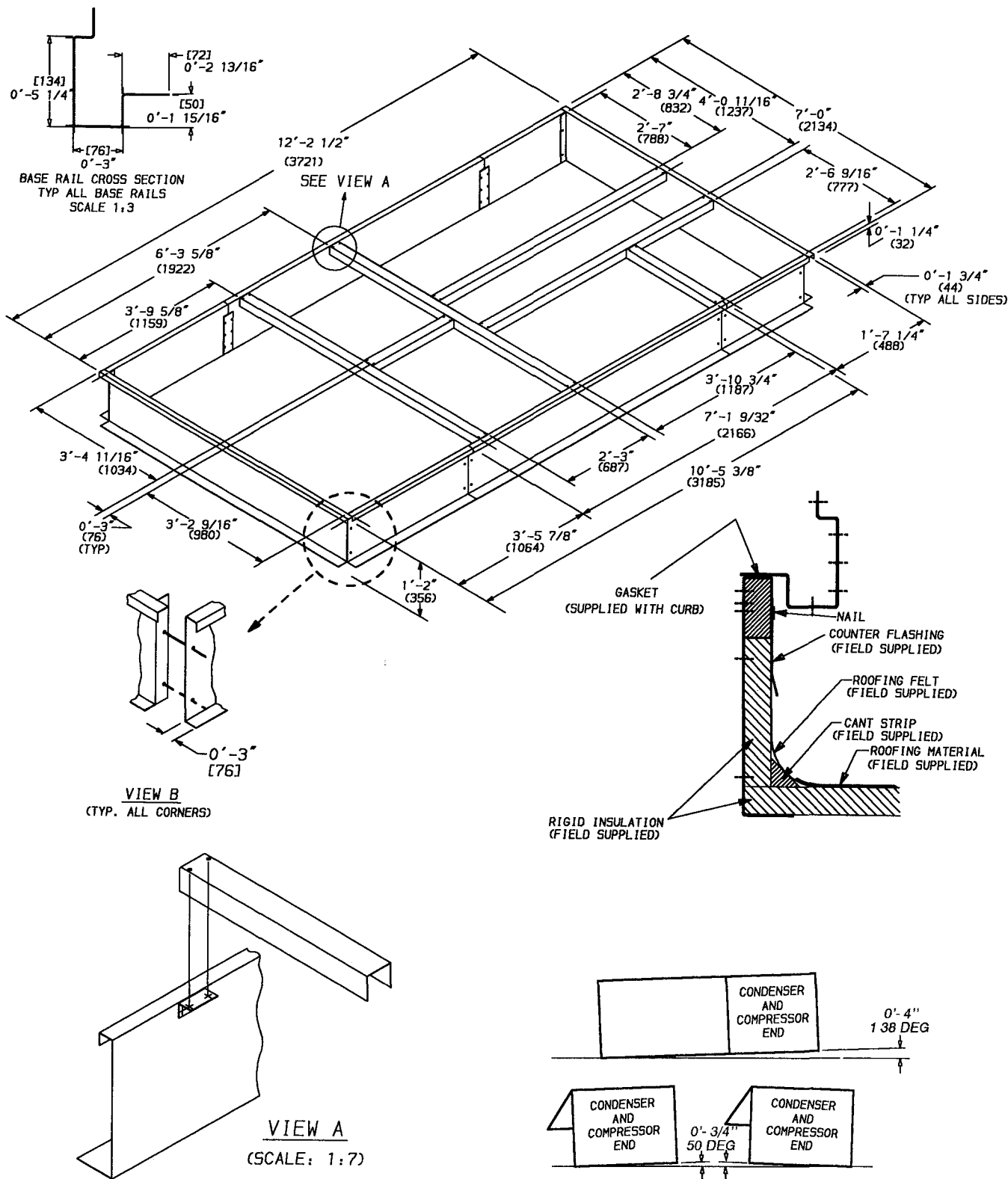


NOTES:

1. Roof curb accessory 50DJ900401 is shipped unassembled.
2. Dimensions in () are millimeters
3. Roof curb: 16 gage (VA03-56) steel
4. The 028 and 030 units overhang the roof curbs on the return-air end

UNIT LEVELING TOLERANCES
*From edge of unit to horizontal

Fig. 3A — Accessory Roof Curb Dimensions, 48/50NP024-030



NOTES:

1. Roof curb accessory 50DJ900401 is shipped unassembled.
2. Dimensions in () are millimeters.
3. Roof curb: 16 gage (VA03-56) steel
4. The 028 and 030 units overhang the roof curbs on the return-air end.

Fig. 3B – Accessory Roof Curb Dimensions, 50NB024-030

Alternate Unit Support Methods — Where the preferred curb or slab mount cannot be used, support unit with sleepers on perimeter, using curb support area. However, if sleepers cannot be used, support long sides of unit (see Fig. 4A-4C) with three equally spaced 4-in. x 4-in. pads. Refer to Fig. 3A and 3B for base rail detail. Unit may sag if supported by corners only.

Positioning — Whenever possible, unit should be installed over a non-critical area with respect to sound and vibration. Provide clearance around and above unit for airflow, safety, and service access. Allow 12 ft above the unit, and at least 4 ft on all sides for rated performance and code compliance. If unit has economizer, allow 6-ft clearance on that side. For proper service access, allow 6-ft clearance on all sides.

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

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

IMPORTANT: Always line up the condenser end of the unit tight against the roof curb. On 028 and 030 size units, the evaporator end of unit will overlap roof curb by 15 inches.

Field-Fabricated Ductwork — The 48/50NP units are field-convertible. They are shipped from the factory as vertical supply/return, but may be field converted to horizontal supply/return using accessory package.

VERTICAL SUPPLY/RETURN UNITS — Attach field-fabricated ductwork to the roof curb. The return-air duct connection (inside dimensions) is 46.75 in. long x 30.59 in. wide; the supply-air duct connection (inside dimensions) is 38.63 in. long x 27 in. wide. Connect ductwork to 16-gage roof curb material. Secure all ducts to the building structure, using flexible duct connectors between roof curb and ducts as required. Be sure to isolate ducts from ceiling and walls so that air turbulence in ducts doesn't transmit sound to the building structure. Ducts passing through an unconditioned space must be insulated and covered with a vapor barrier. Outlet grilles must not lie directly below unit discharge. The return duct must have a 90-degree elbow before opening into the occupied building space if unit is equipped with power exhaust.

Vertical discharge ducts are designed to be attached to accessory roof curb. If unit is mounted on dunnage, the ducts should be supported by cross braces as shown for accessory roof curbs.

HORIZONTAL SUPPLY/RETURN UNITS — Units may be connected to horizontal supply/return ductwork with the use of the accessory horizontal conversion package.

Condensate Drain — See Fig. 4A-4C for drain location. A drain assembly consisting of a 10-gage plate with 1-1/4 in. half coupling welded to it is shipped inside the base unit, taped to the basepan in the filter section. Open the access door marked FILTER SECTION and find drain assembly and the 4 screws required to mount it in the left-hand corner. After unit has been set in place on the roof, remove drain assembly and attach it to the bottom of the unit base rail using the screws provided. See Fig. 5. Use a trap at least 4 in. deep and protect against freeze-up.

On slab mount applications, and when mounted on sleepers, seal hole in bottom of base rail and attach drain assembly as low as possible to side of base rail.

NOTE: Drain hole must be drilled in rail. There is no factory-supplied drain hole in the side of the base rail.

Outdoor-Air Inlet Adjustments

ECONOMIZER SETTINGS

Enthalpy Sensor (Fig. 6) — This sensor is located on the partition separating the outdoor air from the return air. See Fig. 7. The enthalpy setting adjustment is on the enthalpy control. For maximum benefit of outdoor air, set enthalpy sensor control to the A setting. See Fig. 8 and 9.

Minimum Damper Position Set Point — Minimum economizer position is set using the accessory HSIO keypad and display module (or Building Supervisor). Refer to Table 11 (page 31) and Economizer section on page 53 for more details.

Install Outdoor Hoods

ECONOMIZER HOODS — These hoods are shipped separately from the base unit, in a crate marked 50DJ900051. This carton contains:

- 3 preassembled economizer hoods
 - 1 filter angle
 - 3 filter retainers
 - 6 aluminum mesh cleanable filters, 16-in. x 20-in. x 2-in.
 - 2 channel panels
 - 1 channel clip
 - 1 fastener package (taped to a hood)
 - 1 channel clip
- } See Fig. 10 for cross-section

The fastener package contains:

- 8 capscrew bolts, 1/4 - 20 x 1/2-in. long
- 8 nuts, 1/4 - 20
- 18 screws, 1/4 AB x 5/8-in. long
- 8.3 ft of 1/8-in. thick x -in. wide seal strip with pressure-sensitive adhesive on one side

1. Remove the lag screws holding the economizer hoods and channel panels to the shipping skid. (There are 4 lag screws per side.)
2. Remove the lag screws holding the filter angle and channel clip to the shipping skid. (There are 2 lag screws per part.)
3. The filters are wrapped to prevent shipping damage. Remove the screws holding the filter retainers to the hoods. (There are 4 screws per retainer.)
4. Remove wrap from filters. Do not reinstall until after the hoods are mounted to the unit.

IMPORTANT: If unit is to be equipped with either barometric relief or power exhaust, the barometric relief/power exhaust hood must be installed prior to the installation of the economizer hoods. If installing barometric relief or power exhaust, proceed to the next section, Barometric Relief/Power Exhaust Hood and install before proceeding any further. Then return to this point

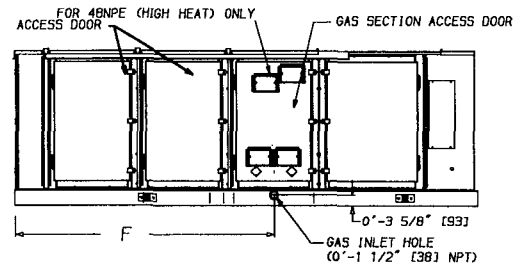
5. Place the hoods on a flat surface.
6. Insert the top flange of the middle hood flush with the bottom flange of the top hood AND the top flange of the bottom hood flush with the bottom flange of the middle hood. When properly laid out, the side flanges of the 3 hoods should form one continuous flange.
7. See Fig. 10, and insert the capscrew bolts through the flange holes as shown, from the back side, threads facing outward. Note that though there are 12 holes (4 per hood) per side, only the 3 shown per side are to be used.
8. If unit is not to be equipped with barometric relief or power exhaust, discard the channel clip. If unit is to be equipped with barometric relief or power exhaust, discard one of the channel panels.

UNIT SIZE	WEIGHT*		A		B		C		D		E		F		G	
	lb	kg	mm	ft-in.	mm	ft-in.	mm	ft-in.	mm	ft-in.	mm	ft-in.	mm	ft-in.	mm	ft-in.
48NPD024	2910	1322.7	1549.4	5-1	2182.0	7-1 $\frac{1}{8}$	682.0	2-2 $\frac{7}{8}$	3909.0	12-9 $\frac{7}{8}$	533.5	1-9	2187.0	7-2 $\frac{7}{8}$	807.0	2-7 $\frac{3}{4}$
48NPE024	2990	1359.0	1549.4	5-1	2182.0	7-1 $\frac{1}{8}$	682.0	2-2 $\frac{7}{8}$	3909.0	12-9 $\frac{7}{8}$	533.5	1-9	2187.0	7-2 $\frac{7}{8}$	807.0	2-7 $\frac{3}{4}$
48NPD028	3360	1527.3	1676.4	5-6	2470.0	8-1 $\frac{1}{4}$	810.0	2-7 $\frac{7}{8}$	4165.0	13-8	379.5	1-2 $\frac{1}{8}$	2443.0	8-0 $\frac{1}{8}$	935.0	0-3 $\frac{1}{8}$
48NPE028	3440	1563.6	1676.4	5-6	2470.0	8-1 $\frac{1}{4}$	810.0	2-7 $\frac{7}{8}$	4165.0	13-8	379.5	1-2 $\frac{1}{8}$	2443.0	8-0 $\frac{1}{8}$	935.0	0-3 $\frac{1}{8}$
48NPD030	3400	1545.5	1676.4	5-6	2470.0	8-1 $\frac{1}{4}$	810.0	2-7 $\frac{7}{8}$	4165.0	13-8	379.5	1-2 $\frac{1}{8}$	2443.0	8-0 $\frac{1}{8}$	935.0	0-3 $\frac{1}{8}$
48NPE030	3480	1581.8	1676.4	5-6	2470.0	8-1 $\frac{1}{4}$	810.0	2-7 $\frac{7}{8}$	4165.0	13-8	379.5	1-2 $\frac{1}{8}$	2443.0	8-0 $\frac{1}{8}$	935.0	0-3 $\frac{1}{8}$

CONN — Connection
DIM — Dimension
PIC — Product Integrated Controls

NOTES:

- Dimensions in [] are in millimeters
- Center of gravity
- Allow 12'-0" (3658) at top and 6'-0" (1829) on sides for service and operational clearance
- On multiunit applications, allow 12'-0" (3658) between adjacent condensers and economizers
- For smaller service and operational clearances, contact Carrier Application Engineering Department
- Bottom ducts designed to be attached to accessory roof curb. If unit is mounted on dunnage, it is recommended the ducts be supported by cross braces as done on the accessory roof curb
- Always line up condenser end of unit tight against the roof curb
- Units with bottom return and power exhaust require a 90 degree elbow in return air duct
- Units with bottom supply and electric heat require a 90 degree elbow in supply air duct
- When unit is slab mounted, locate the condensate drain as low as possible on vertical face of base rail at the same location as the standard condensate drain using factory supplied fitting. Plug factory drilled condensate hole



VIEW G-G

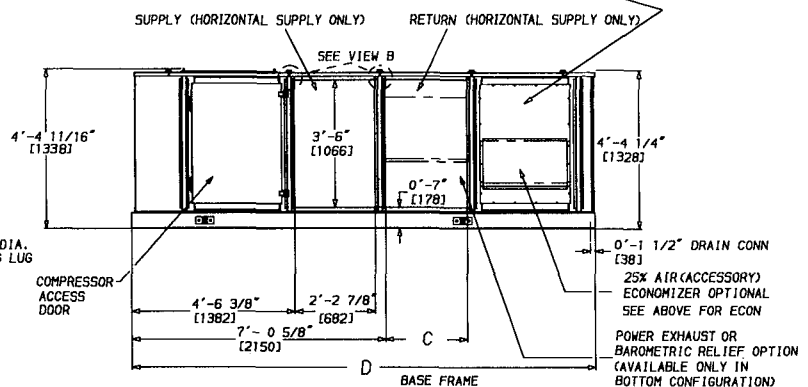
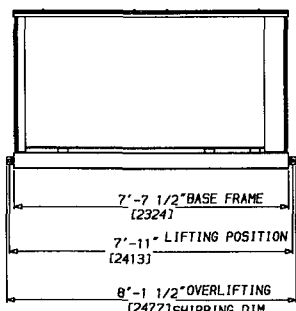
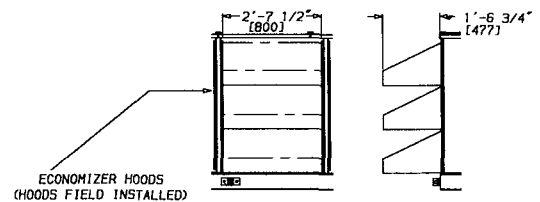
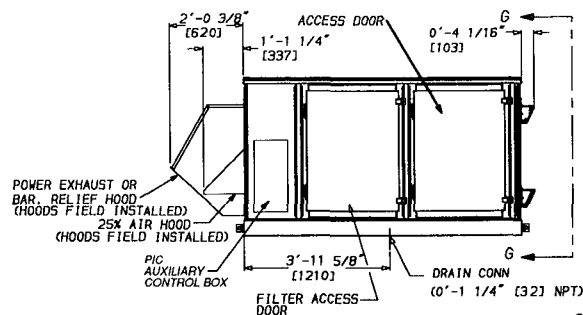
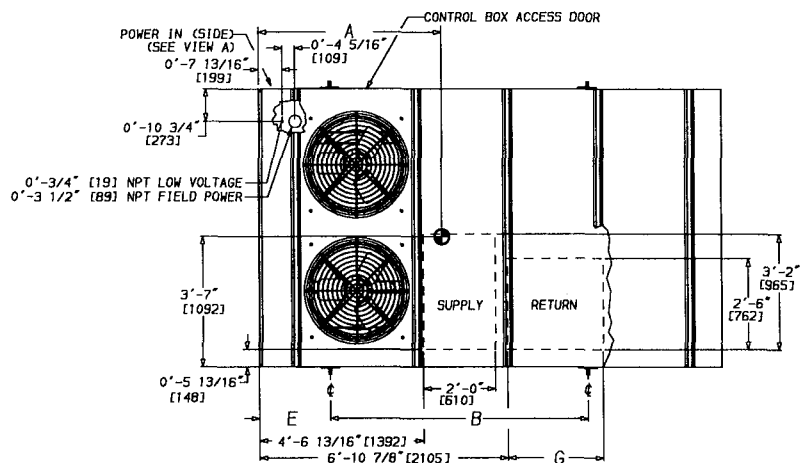
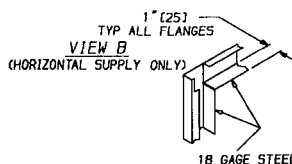
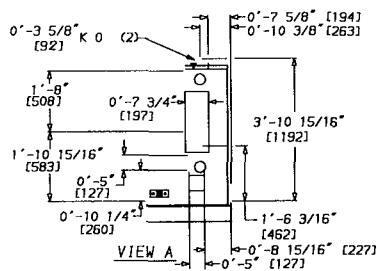


Fig 4A — Base Unit Dimensions, 48NP024-030

CONN — Connection
 DIM — Dimension
 PIC — Product Integrated Controls

NOTES:

- 1 Dimensions in [] are in millimeters
- 2  Center of gravity
- 3 Allow 12'-0" (3658) at top and 6'-0" (1829) on sides for service and operational clearance
- 4 On multiunit applications, allow 12'-0" (3658) between adjacent condensers and economizers
- 5 For smaller service and operational clearances, contact Carrier Application Engineering Department
- 6 Bottom ducts designed to be attached to accessory roof curb. If unit is mounted on dunnage, it is recommended the ducts be supported by cross braces as done on the accessory roof curb
- 7 Always line up condenser end of unit tight against the roof curb
- 8 Units with bottom return and power exhaust require a 90 degree elbow in return air duct
- 9 Units with bottom supply and electric heat require a 90 degree elbow in supply air duct
- 10 When unit is slab mounted, locate the condensate drain as low as possible on vertical face of base rail at the same location as the standard condensate drain using factory supplied fitting. Plug factory drilled condensate hole

UNIT SIZE	WEIGHT		A		B		C		D		E		F	
	Lb	Kg	mm	Ft.-In.	mm	Ft.-In.	mm	Ft.-In.	mm	Ft.-In.	mm	Ft.-In.	mm	Ft.-In.
50NP024	2580	1172.7	1244.6	4-1	1680.0	5-6 1/8	3141.0	10-3 1/16	525.5	1-8 1/16	807.0	2-7 3/4	2048.0	6- 8 5/8
50NP028	3040	1381.8	1346.2	4-5	1956.0	6-5	3397.0	11-1 3/4	382.5	1-3 1/16	935.0	3-0 1/16	2131.0	6-11 1/8
50NP030	3070	1395.5												

*Weights include economizer, but not rainhood

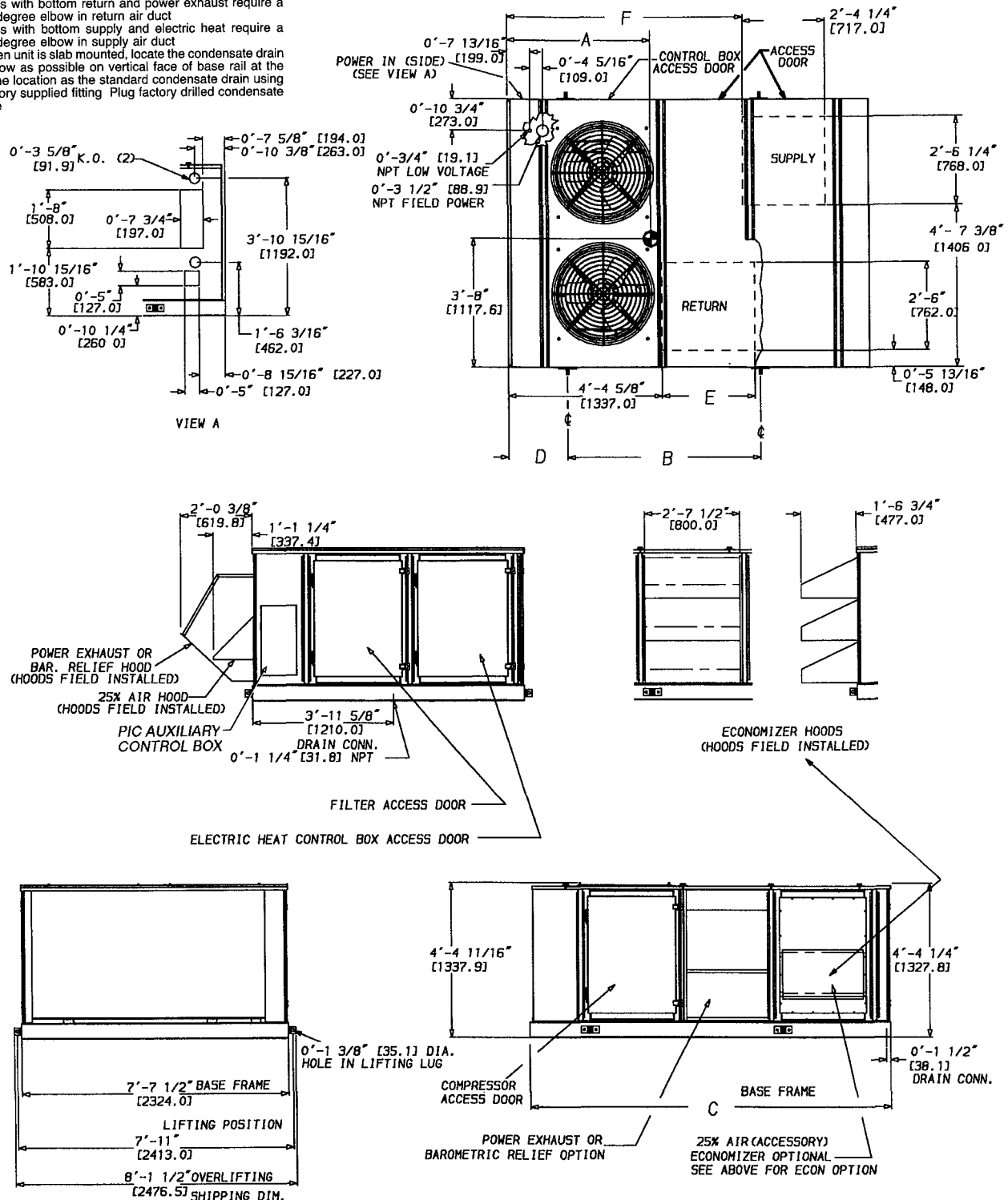


Fig. 4B — Base Unit Dimensions, 50NP024-030

CONN — Connections
 DIM — Dimensions
 PIC — Product Integrated Controls

NOTES:

- 1 Dimensions in [] are in millimeters
- 2  Center of gravity
- 3 Allow 12'-0" (3658) at top and 6'-0" (1829) on sides for service and operational clearance.
- 4 On multiunit applications, allow 12'-0" (3658) between adjacent condensers and economizers
- 5 For smaller service and operational clearances, contact Carrier Application Engineering Department
- 6 Always line up condenser end of unit tight against the roof curb.
- 7 When unit is slab mounted, locate the condensate drain as low as possible on vertical face of base rail at the same location as the standard condensate drain using factory supplied fitting. Plug factory drilled condensate hole

UNIT SIZE	WEIGHT*		A		B		C		D		E	
	Lb	Kg	mm	Ft-in	mm	Ft-in	mm	Ft-in	mm	Ft-in	mm	Ft-in
50NB024	2790	1268.2	1549.4	5-1	2182.0	7-1 7/8	682.0	2-2 1/8	3909.0	12-9 7/8	533.5	1-9
50NB028	3240	1472.7	1676.4	5-6	2470.0	8-1 1/4	810.0	2-7 7/8	4165.0	13-8	379.5	1-2 1/16
50NB030	3280	1490.9										

*Weight includes economizer, but not rainhood

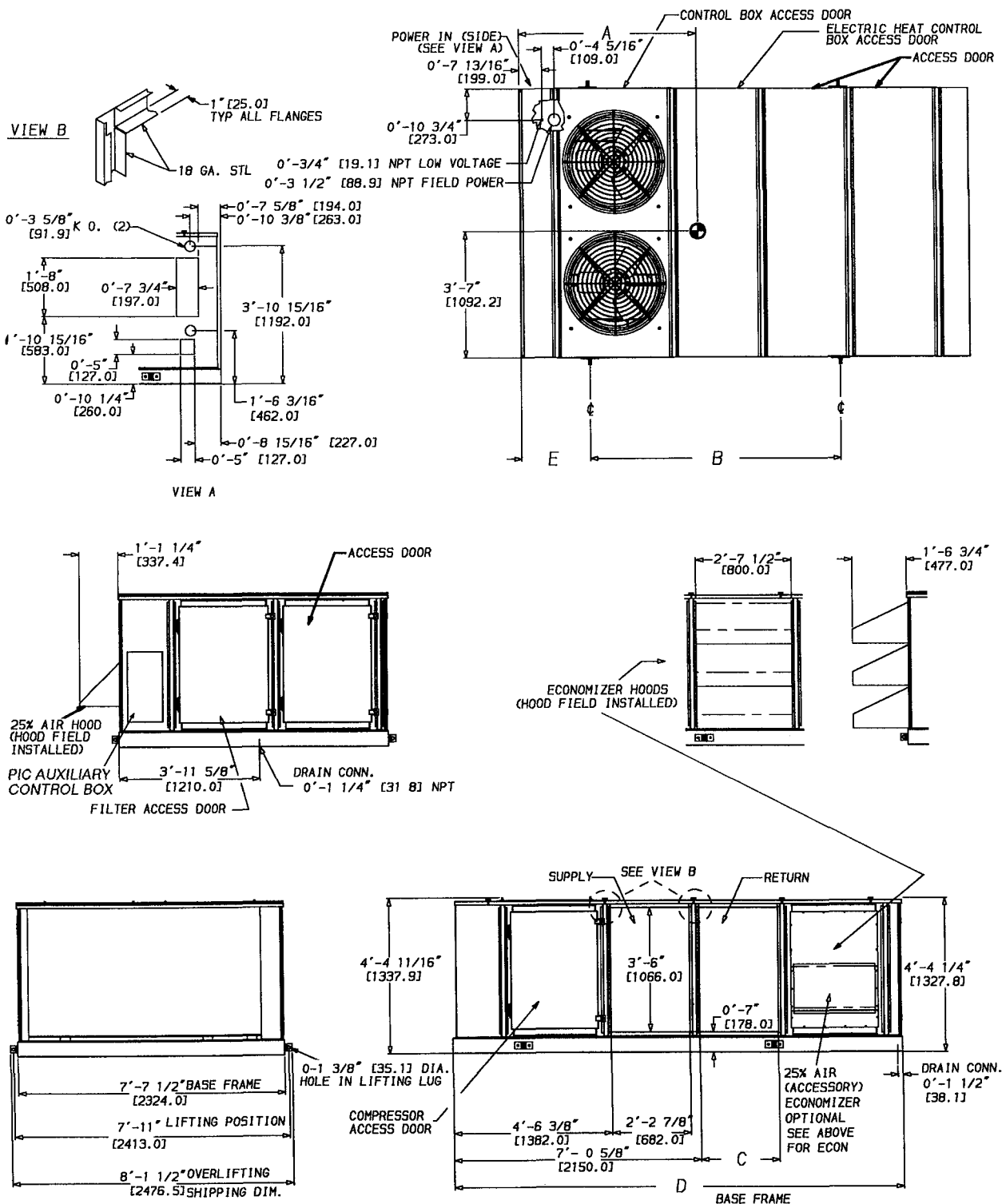


Fig. 4C — Base Unit Dimensions, 50NB024-030

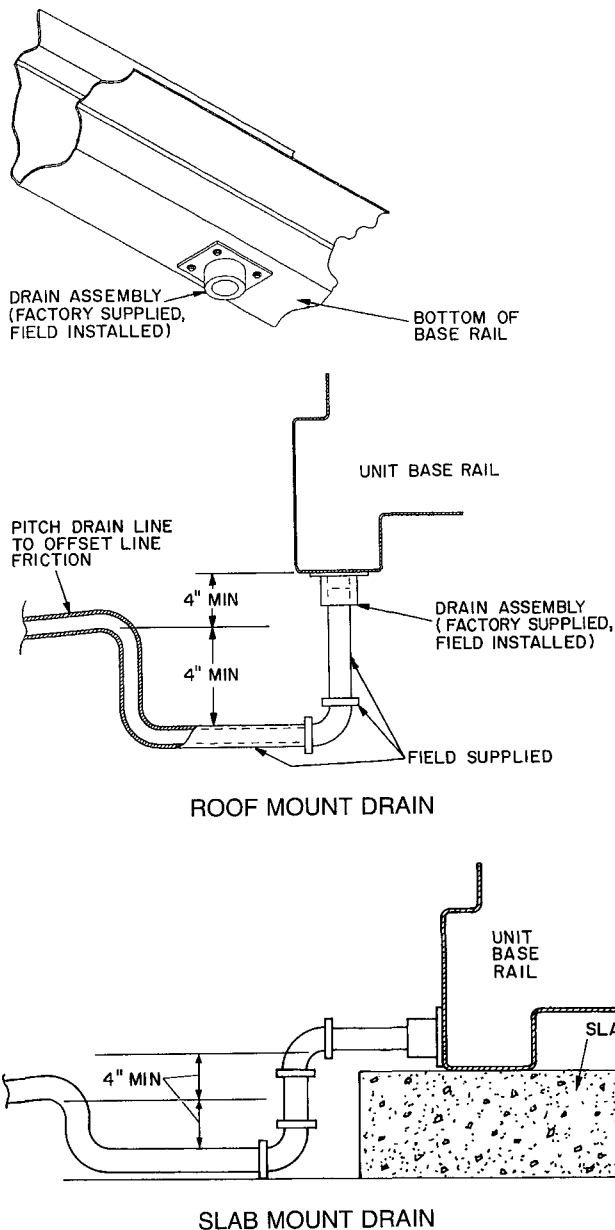


Fig. 5 – Condensate Drain Piping Details

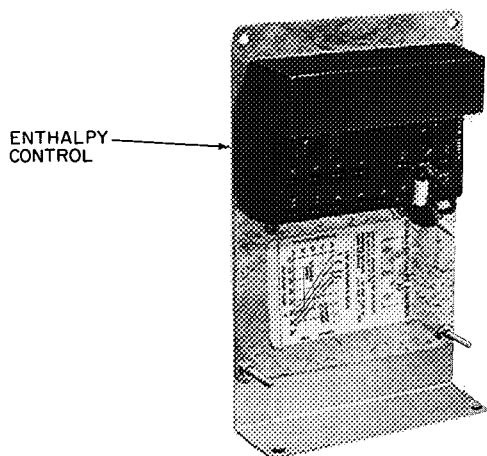


Fig. 6 – Enthalpy Sensor

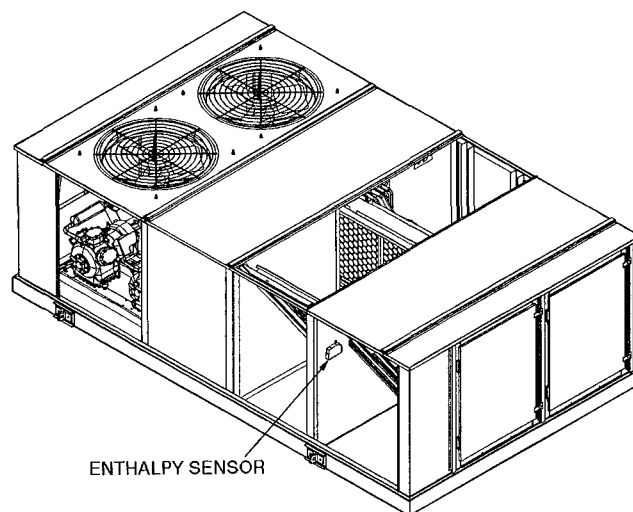
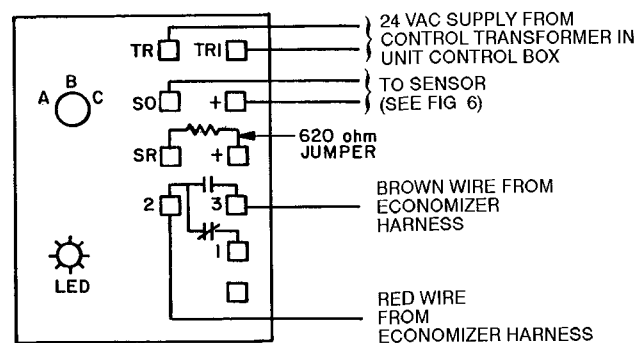


Fig. 7 – Enthalpy Sensor Location



LED — Light-Emitting Diode

NOTES:

1. Switches shown in high enthalpy state. Terminals 2 and 3 close on enthalpy decrease.
2. When standard economizer is used with accessory differential enthalpy sensor, turn enthalpy control clockwise past "D" setting.

Fig. 8 – Wiring Connections for Solid State Enthalpy Sensor (HH57AC977)

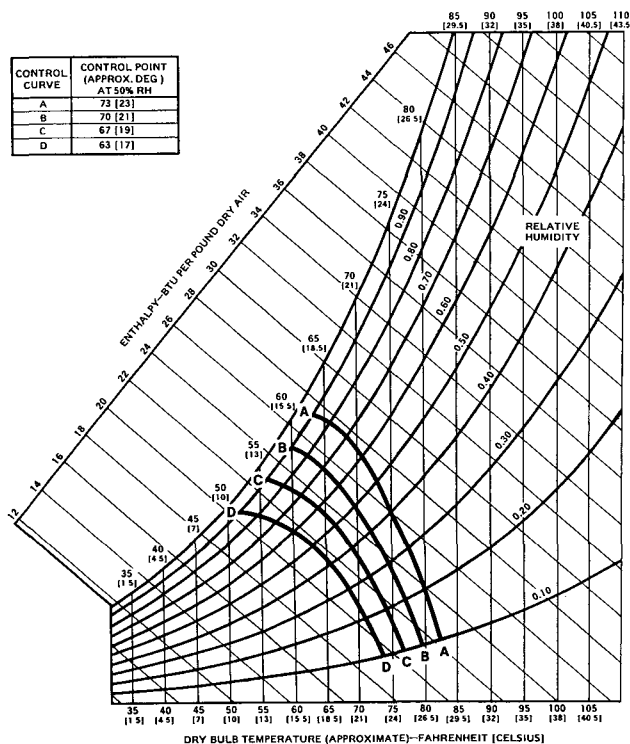


Fig. 9 – Psychrometric Chart for Enthalpy Control

CROSS-SECTION
OF
CHANNEL PANEL/CHANNEL CLIP

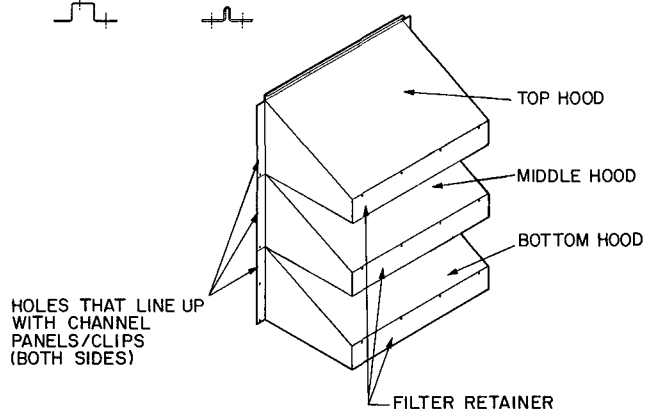


Fig. 10 — Economizer Hood Assembly Holes

9. Cut 2 pieces of seal strip 43¾-in. long for placement on the channel panels (or one channel panel and one channel clip if barometric relief or power exhaust is used) on the flanges with the holes. Begin one in. from the top of the flange and center the seal strip on the flange, covering the holes.

NOTE: If seal strip is too high or too low, water leakage may occur. Maintain the one-in. dimension for placement.

10. Using a punch or other tool, make holes in the seal strip for screws.
11. Place channel panels on the hood flanges, using the middle 3 holes. If using barometric relief or power exhaust, use the channel clip in place of the previously discarded channel panel, attaching it to the left side of the economizer hoods (left side when facing hoods).
12. Secure channel panels and/or channel clip to the hoods using 6 of the nuts from the fastener package.
13. See Fig. 11 and place economizer hood assembly over outdoor-air opening.

⚠ CAUTION

Economizer hood assembly is heavy. At least two people should handle it.

14. Line up the holes in the right channel panel with the holes in the flange of the corner post. On vertical supply/return units, line up the holes on the left channel panel with the holes on the flange of the panel next to the economizer section. On horizontal supply/return units, line up the holes on the left channel panel with the holes in the flange of the return duct flange. On units with barometric relief or power exhaust, line up the holes in the channel clip with the holes in the fan deck. (It is necessary to remove the top and bottom screws from the fan deck to install economizer hood assembly.)
15. Once economizer hood assembly is in place, secure it using 10 of the screws from the fastener package (5 per side).
16. Using 2 of the screws from the fastener package, attach the top flange of the economizer hood assembly to the unit top rail. The holes in the top rail are behind the top rail gasket.
17. Using 4 screws from the fastener package, attach top and bottom of the channel panels and/or clips to the top rail and the base rail. Again, the holes in the top rail and the base rail will be covered by gasketing.
18. Attach filter angle to base rail, using 2 screws from fastener package. Since the holes are covered by the base rail gasket, locate and punch them out before attaching the filter angle.

19. Seal any small gaps between flanges and at the top with RTV sealant to prevent water leakage.
20. Reinstall filters and filter retainers.

BAROMETRIC RELIEF HOOD — The barometric relief hood is shipped separately from the base unit, in cartons marked 50DJ900371 for 024 units, and 50DJ900381 for 028 and 030 units.

Barometric relief can only be unit mounted on vertical supply/return installations. It may be duct mounted on horizontal supply/return applications.

Cartons contain:

- 1 preassembled hood/damper assembly
- 1 fastener package (taped to inside of hood)

The fastener package contains:

- 6 screws, ¼ AB x 5/8-in. long.
- 2 seal strips, 36-in. long x 1-in. wide x 1/8-in. thick, with pressure-sensitive adhesive on one side
- 2 seal strips, 33-in. long x 1-in. wide x 1/8-in. thick, with pressure-sensitive adhesive on one side

1. Remove the lag screws holding hood assembly to shipping skid. See Fig. 12.
2. Remove the channel panel attached to the barometric relief/power exhaust fan deck and the compressor access door.
3. Remove the middle 2 screws holding the fan deck to the base rail.
4. Refer to Fig. 12 and add seal strip to hood as shown.
5. Install hood onto unit.

Static Pressure Control Plastic Tubing — On units with inlet guide vanes and/or modulating power exhaust, a ¼-in. OD plastic tubing must be run from the high-pressure tap on the pressure transducer into the building.

The pressure tube for units with optional inlet guide vanes must be connected to a tap in the supply-air duct. This tap is usually located two-thirds of the way out on the main trunk duct.

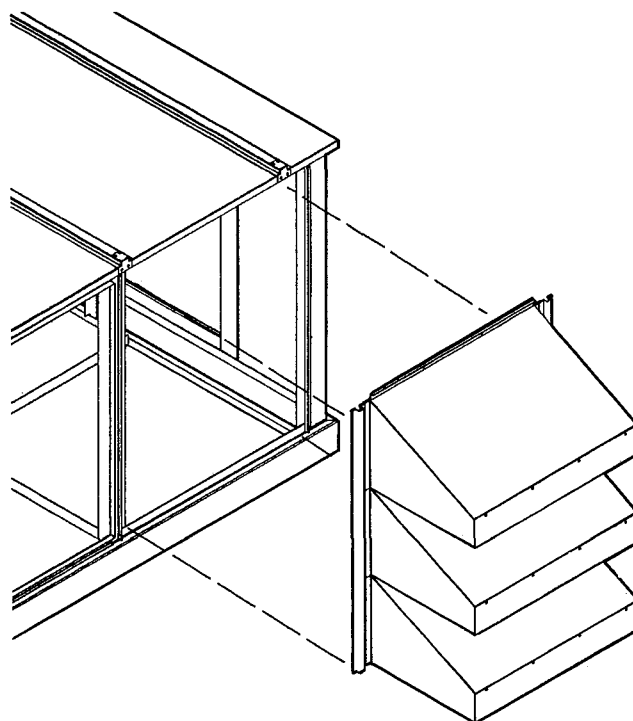


Fig. 11 — Economizer Hood Installation

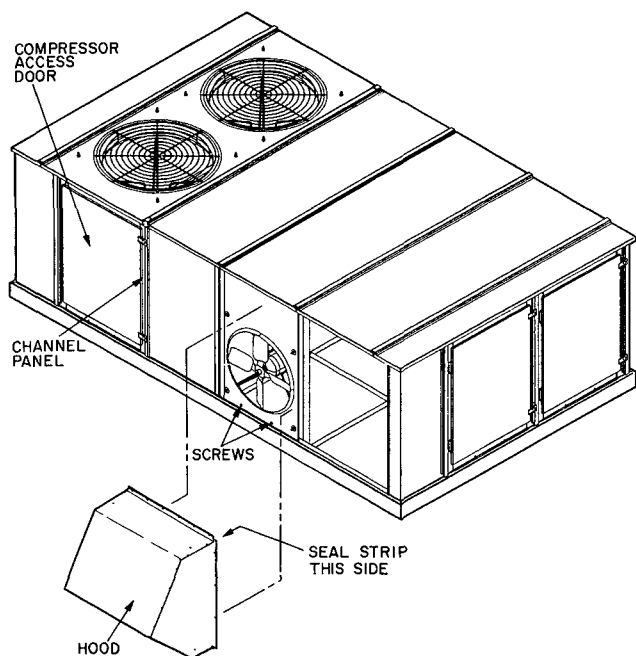


Fig. 12 — Power Exhaust/Barometric Relief Hood

On units with optional/accessory modulating power exhaust, the pressure tube for the power exhaust must be terminated in the conditioned space where a constant pressure is required. This location is usually in an entrance lobby so that the building exterior doors will open and close properly.

Field Wire Routing — Field wiring can be brought into the unit from the bottom (through basepan and roof curb) or through the side of unit (corner post next to control box).

A 3½-in. NPT coupling for field power wiring and a ¾-in. NPT coupling for 24-v control wiring are provided in basepan. In the side post, there are two 3⅝-in. knockouts for the field power wiring. See Fig. 4A-4C. If control wiring is to be brought in through the side of unit, a ⅞-in. diameter hole must be drilled in the condenser side post next to the control box.

There are 2 large block-off plates in the corner post. See Fig. 4A-4C. The smaller block-off (5 in. x 5 in.) is used to provide access to main unit control box during installation of power wiring. The larger block-off (7¾-in. wide by 20-in. high) is located between the two 3⅝-in. knockouts and is used when a 400-amp disconnect box is required.

If disconnect box is mounted to corner post, be careful not to drill any screws into the condenser coil. The corner post is marked to indicate the area where it is safe to drill holes and install screws.

ROUTING THROUGH BOTTOM OF UNIT — If wiring is brought in through bottom of unit, use field-supplied watertight conduit to run power wiring from basepan out through bottom 3⅝-in. knockout to the disconnect box and back into unit to the main control box. When 200-amp or smaller disconnect is used, the disconnect box should be located so that wiring can be run from back of disconnect box to unit through top 3⅝-in. knockout. Watertight strain relief (field supplied) must be used in knockout. When 400-amp disconnect is used, remove 7¾-in. x 20-in. block-off in corner post and use field-supplied elbow to route conduit through corner post to the control box.

Use strain relief going into control box through 4½-in. diameter hole provided. After wires are in unit control box,

connect to power terminal block (see Power Wiring section below).

Low-voltage wiring must be run in watertight conduit from the basepan to control box and through one-in. diameter hole provided in upper right-hand corner of unit control box. Field-supplied strain relief must be used going into the box. After wiring is in control box, make connections to proper terminals on terminal blocks (see Control Wiring section on page 20).

ROUTING THROUGH SIDE OF UNIT — When 200-amp or smaller disconnect is used, route power wiring in field-supplied watertight conduit into unit through 3⅝-in. knockout. Strain relief (field supplied) must be used in knockout. When 400-amp disconnect is used, remove 7¾-in. x 20-in. block-off in corner post and use field-supplied elbow to route conduit through corner post to the control box.

Use field-supplied strain relief going into control box through 4½-in. diameter hole provided. After wires are in unit control box, connect to power terminal block (see Power Wiring section below).

Bring low-voltage control wiring through field drilled ⅞-in. diameter hole in condenser side post. Use strain relief going into one-in. diameter hole in upper right-hand corner of unit control box.

After wiring is in control box, make connection to proper terminals on terminal blocks (see Control Wiring section on page 20).

Field Electrical Connections

IMPORTANT: The 48NP/50NB,NP units generate, use, and can radiate radio frequency energy. If units are not installed and used in accordance with these instructions, they may cause radio interference. They have been tested and found to comply with limits of a Class A computing device as defined by FCC (Federal Communications Commission) regulations, Subpart J of Part 15, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

POWER WIRING (All Units) — Units are factory wired for the voltage shown on the unit nameplate. The main terminal block is suitable for use with aluminum or copper wires. Maximum wire size is 3/0 AWG (American Wire Gage).

When installing units, provide a disconnect per NEC (National Electrical Code) of adequate size (MOCP [maximum overcurrent protection] of unit is on the informative plate). All field wiring must comply with NEC and all local codes. Size wire based on MCA (minimum circuit amps) on the unit informative plate. See Fig. 13 for power wiring connections to the unit power terminal block and equipment ground.

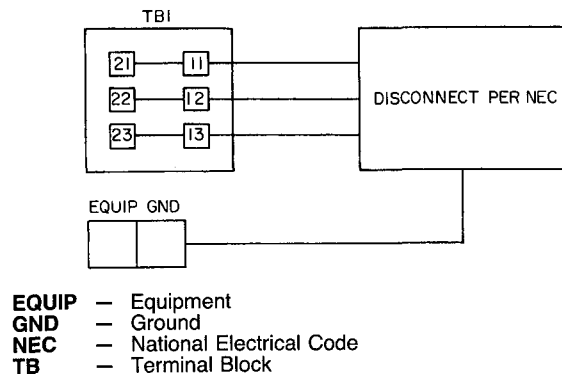


Fig. 13 — Field Power Wiring Connections

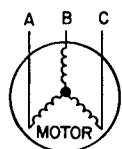
Operating voltage to the compressor must be within the voltage range indicated on the unit nameplate. Voltages between phases must be balanced within 2%, and the current must be balanced within 10%. See Tables 3A-4C for electrical data.

Use the following formula to determine the percent voltage imbalance.

% Voltage Imbalance

$$= 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 460-3-60



AB = 452 v

BC = 464 v

AC = 455 v

$$\begin{aligned} \text{Average Voltage} &= \frac{452 + 464 + 455}{3} \\ &= \frac{1371}{3} \\ &= 457 \end{aligned}$$

Determine maximum deviation from average voltage:

$$(AB) 457 - 452 = 5 \text{ v}$$

$$(BC) 464 - 457 = 7 \text{ v}$$

$$(AC) 457 - 455 = 2 \text{ v}$$

Maximum deviation is 7 v.

Determine percent voltage imbalance:

$$\begin{aligned} \% \text{ Voltage Imbalance} &= 100 \times \frac{7}{457} \\ &= 1.53\% \end{aligned}$$

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 local utility immediately.

Unit failure as a result of 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.

Table 3A – Electrical Data, 48NP024

NOMINAL V-PH-HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OFM	IFM		POWER EXHAUST FAN MOTOR*	POWER SUPPLY	
	Min	Max	RLA	LRA	RLA	LRA		Hp	FLA	FLA	MCA	MOCP Fuse Only
208/230-3-60	187	254	43.3	228	31.5	160	6.4	5.0†	15.2	— 6.6/6.0	108.5/108.5 115.1/114.5	150/150 150/150
								7.5†	22.0	— 6.6/6.0	115.3/115.3 121.9/121.3	150/150 150/150
								5.0**	12.4	— 6.6/6.0	105.7/105.7 112.3/111.7	125/125 150/150
								7.5**	19.6	— 6.6/6.0	112.9/112.9 119.5/118.9	150/150 150/150
460-3-60	414	508	22.1	114	15.7	80	3.2	5.0†	7.2	— 3.0	53.7 56.7	70 70
								7.5†	10.5	— 3.0	57.0 60.0	70 80
								5.0**	6.2	— 3.0	52.7 55.7	70 70
								7.5**	9.8	— 3.0	56.3 59.3	70 80
575-3-60	518	632	17.9	91	12.6	64	4.8	5.0†	5.6	— 2.4	45.4 47.8	60 60
								7.5†	8.6	— 2.4	48.4 50.8	60 60

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Evaporator) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

*Unit mounted on vertical discharge applications.

†Standard efficiency

**High efficiency.



Table 3B — Electrical Data, 48NP028

NOMINAL V-PH-HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OFM	IFM		POWER EXHAUST FAN MOTOR*	POWER SUPPLY	
	Min	Max	RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	FLA	MCA	MOCP Fuse Only
208/230-3-60	187	254	63.6	266	39.7	198	10.8	7.5†	22.0	— 6.6/6.0	152.0/152.0 158.6/158.0	200/200 200/200
								10.0†	26.4	— 6.6/6.0	156.4/156.4 163.0/162.4	200/200 225/225
								7.5**	19.6	— 6.6/6.0	149.6/149.6 156.2/155.6	200/200 200/200
								10.0**	24.2	— 6.6/6.0	154.2/154.2 160.8/160.2	200/200 200/200
460-3-60	414	508	28.6	120	19.9	99	5.4	7.5†	10.5	— 3.0	71.5 74.5	100 100
								10.0†	12.5	— 3.0	73.5 76.5	100 100
								7.5**	9.8	— 3.0	70.8 73.8	90 100
								10.0**	12.2	— 3.0	73.2 76.2	100 100
575-3-60	518	632	22.9	96	15.9	79	4.8	7.5†	8.6	— 2.4	57.9 60.3	80 80
								10.0†	11.6	— 2.4	60.9 63.3	80 80

Table 3C — Electrical Data, 48NP030

NOMINAL V-PH-HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OFM	IFM		POWER EXHAUST FAN MOTOR*	POWER SUPPLY	
	Min	Max	RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	FLA	MCA	MOCP Fuse Only
208/230-3-60	187	254	63.6	266	44.3	228	10.8	10.0†	26.4	— 6.6/6.0	161.0/161.0 167.6/167.0	200/200 225/225
								15.0†	42.0	— 6.6/6.0	176.6/176.6 183.2/182.6	225/225 225/225
								10.0**	24.2	— 6.6/6.0	158.8/158.8 165.4/164.8	200/200 225/225
								15.0**	36.6	— 6.6/6.0	171.2/171.2 177.8/177.2	225/225 225/225
460-3-60	414	508	30.0	120	22.1	114	5.4	10.0†	12.5	— 3.0	77.5 80.5	100 110
								15.0†	20.0	— 3.0	85.0 88.0	110 110
								10.0**	12.2	— 3.0	77.2 80.2	100 110
								15.0**	18.3	— 3.0	83.3 86.3	110 110
575-3-60	518	632	22.9	96	17.9	91	4.8	10.0†	11.6	— 2.4	62.9 65.3	80 80
								15.0†	15.4	— 2.4	66.7 69.1	80 90

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Evaporator) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

*Unit mounted on vertical discharge applications.

†Standard efficiency

**High efficiency.



Table 4A — Electrical Data, 50NB,NP024

NOMINAL V-PH-HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OFM	IFM		POWER EXHAUST FAN MOTOR	ELECTRIC HEAT		POWER SUPPLY	
	Min	Max	RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	FLA	kW	FLA	MCA	MOCF Fuse Only
208/230-3-60	187	254	43.3	228	31.5	160	6.4	5.0*	15.2	— 6.6/6.0 — 6.6/6.0 — 6.6/6.0 —	— 15/18 15/18 29/36 29/36 59/72** 59/72** 74/90††	— 40.9/ 45.2 40.9/ 45.2 81.8/ 90.4 81.8/ 90.4 163.6/181.0 163.6/181.0 204.5/225.9	108.5/108.5 115.1/114.5 108.5/108.5 115.1/114.5 121.2/132.0 121.2/132.0 223.5/245.2 223.5/245.2 274.6/301.4	150/150 150/150 150/150 150/150 150/150 150/150 225/250 225/250 300/350
										— 6.6/6.0 — 6.6/6.0 — 6.6/6.0 —	— 15/18 15/18 29/36 29/36 59/72** 59/72** 74/90††	— 40.9/ 45.2 40.9/ 45.2 81.8/ 90.4 81.8/ 90.4 163.6/181.0 163.6/181.0 204.5/225.9	115.3/115.3 121.9/121.3 115.3/115.3 121.9/121.3 129.8/140.5 129.8/140.5 232.0/253.8 232.0/253.8 274.6/301.4	150/150 150/150 150/150 150/150 150/175 150/175 250/300 250/300 250/300
								5.0†	12.4	— 6.6/6.0 — 6.6/6.0 — 6.6/6.0 —	— 15/18 15/18 29/36 29/36 59/72** 59/72** 74/90††	— 40.9/ 45.2 40.9/ 45.2 81.8/ 90.4 81.8/ 90.4 163.6/181.0 163.6/181.0 204.5/225.9	105.7/105.7 112.3/111.7 105.7/105.7 112.3/111.7 117.7/128.5 117.7/128.5 220.0/241.7 220.0/241.7 271.1/297.9	125/125 150/150 125/125 150/150 125/125 150/150 225/250 225/250 300/300
										— 6.6/6.0 — 6.6/6.0 — 6.6/6.0 —	— 15/18 15/18 29/36 29/36 59/72** 59/72** 74/90††	— 40.9/ 45.2 40.9/ 45.2 81.8/ 90.4 81.8/ 90.4 163.6/181.0 163.6/181.0 204.5/225.9	112.9/112.9 119.5/118.9 112.9/112.9 119.5/118.9 126.7/137.5 126.7/137.5 229.0/250.7 229.0/250.7 280.1/306.9	150/150 150/150 150/150 150/150 150/150 150/150 250/300 250/300 300/350
								7.5†	19.6	— 6.6/6.0 — 6.6/6.0 — 6.6/6.0 —	— 15/18 15/18 29/36 29/36 59/72** 59/72** 74/90††	— 40.9/ 45.2 40.9/ 45.2 81.8/ 90.4 81.8/ 90.4 163.6/181.0 163.6/181.0 204.5/225.9	112.9/112.9 119.5/118.9 112.9/112.9 119.5/118.9 126.7/137.5 126.7/137.5 229.0/250.7 229.0/250.7 280.1/306.9	150/150 150/150 150/150 150/150 150/150 150/150 250/300 250/300 300/350
										— 6.6/6.0 — 6.6/6.0 — 6.6/6.0 —	— 15/18 15/18 29/36 29/36 59/72** 59/72** 74/90††	— 40.9/ 45.2 40.9/ 45.2 81.8/ 90.4 81.8/ 90.4 163.6/181.0 163.6/181.0 204.5/225.9	112.9/112.9 119.5/118.9 112.9/112.9 119.5/118.9 126.7/137.5 126.7/137.5 229.0/250.7 229.0/250.7 280.1/306.9	150/150 150/150 150/150 150/150 150/150 150/150 250/300 250/300 300/350
								5.0*	7.2	— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	53.7 56.7 53.7 56.7 65.5 65.5 150.2 150.2	70 70 70 70 70 70 175 175
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	57.0 60.0 57.0 60.0 69.6 69.6 154.4 154.4	70 80 70 80 80 80 175 175
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	52.7 55.7 52.7 55.7 64.2 64.2 149.0 149.0	70 70 70 70 70 70 150 150
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	56.3 59.3 56.3 59.3 68.7 68.7 153.5 153.5	70 80 70 80 80 80 175 175
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	56.3 59.3 56.3 59.3 68.7 68.7 153.5 153.5	70 80 70 80 80 80 175 175
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	56.3 59.3 56.3 59.3 68.7 68.7 153.5 153.5	70 80 70 80 80 80 175 175
460-3-60	414	508	22.1	114	15.7	80	3.2	5.0*	7.2	— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	53.7 56.7 53.7 56.7 65.5 65.5 150.2 150.2	70 70 70 70 70 70 175 175
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	57.0 60.0 57.0 60.0 69.6 69.6 154.4 154.4	70 80 70 80 80 80 175 175
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	52.7 55.7 52.7 55.7 64.2 64.2 149.0 149.0	70 70 70 70 70 70 150 150
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	56.3 59.3 56.3 59.3 68.7 68.7 153.5 153.5	70 80 70 80 80 80 175 175
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	56.3 59.3 56.3 59.3 68.7 68.7 153.5 153.5	70 80 70 80 80 80 175 175
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	56.3 59.3 56.3 59.3 68.7 68.7 153.5 153.5	70 80 70 80 80 80 175 175
								5.0†	6.2	— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	52.7 55.7 52.7 55.7 64.2 64.2 149.0 149.0	70 70 70 70 70 70 150 150
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	52.7 55.7 52.7 55.7 64.2 64.2 149.0 149.0	70 70 70 70 70 70 150 150
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	52.7 55.7 52.7 55.7 64.2 64.2 149.0 149.0	70 70 70 70 70 70 150 150
										— 3.0 — 3.0 — 3.0 — 3.0	— 18 18 22.6 22.6 36 36 45.2 45.2 90 90 113.0 113.0	— 22.6 22.6 45.2 45.2 113.0 113.0	52.7 55.7 52.7 55.7 64.2 64.2 149.0 149.0	70 70 70 70 70 70 150 150
575-3-60	518	632	17.9	91	12.6	64	4.8	5.0*	5.6	— 2.4 — 2.4 — 2.4 — 2.4	— 36 36 72** 72** 72** 72** 90††	— 36.1 36.1 72.3 72.3 72.3 72.3 90.4	45.4 47.8 52.1 52.1 97.4 97.4 120.0	60 60 60 60 125 125 125
										— 2.4 — 2.4 — 2.4 — 2.4	— 36 36 72** 72** 72** 72** 90††	— 36.1 36.1 72.3 72.3 72.3 72.3 90.4	48.4 50.8 55.9 55.9 101.1 101.1 123.7	60 60 70 70 125 125 125
										— 2.4 — 2.4 — 2.4 — 2.4	— 36 36 72** 72** 72** 72** 90††	— 36.1 36.1 72.3 72.3 72.3 72.3 90.4	48.4 50.8 55.9 55.9 101.1 101.1 123.7	60 60 70 70 125 125 125
										— 2.4 — 2.4 — 2.4 — 2.4	— 36 36 72** 72** 72** 72** 90††	— 36.1 36.1 72.3 72.3 72.3 72.3 90.4	48.4 50.8 55.9 55.9 101.1 101.1 123.7	60 60 70 70 125 125 125
										— 2.4 — 2.4 — 2.4 — 2.4	— 36 36 72** 72** 72** 72** 90††	— 36.1 36.1 72.3 72.3 72.3 72.3 90.4	48.4 50.8 55.9 55.9 101.1 101.1 123.7	60 60 70 70 125 125 125
										— 2.4 — 2.4 — 2.4 — 2.4	— 36 36 72** 72** 72** 72** 90††	— 36.1 36.1 72.3 72.3 72.3 72.3 90.4	48.4 50.8 55.9 55.9 101.1 101.1 123.7	60 60 70 70 125 125 125
								7.5*	8.6	— 2.4 — 2.4 — 2.4 — 2.4	— 36 36 72** 72** 72** 72** 90††	— 36.1 36.1 72.3 72.3 72.3 72.3 90.4	48.4 50.8 55.9 55.9 101.1 101.1 123.7	60 60 70 70 125 125 125
										— 2.4 — 2.4 — 2.4 — 2.4	— 36 36 72** 72** 72** 72** 90††	— 36.1 36.1 72.3 72.3 72.3 72.3 90.4	48.4 50.8 55.9 55.9 101.1 101.1 123.7	60 60 70 70 125 125 125
										— 2.4 — 2.4 — 2.4 — 2.4	— 36 36 72** 72** 72** 72** 90††	— 36.1 36.1 72.3 72.3 72.3 72.3 90.4	48.4 50.8 55.9 55.9 101.1 101.1 123.7	60 60 70 70 125 125 125
										— 2.4 — 2.4 — 2.4 — 2.4	— 36 36 72** 72** 72** 72** 90††	— 36.1 36.1 72.3 72.3 72.3 72.3 90.4	48.4 50.8 55.9 55.9 101.1 101.1 123.7	60 60 70 70 125 125 125

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Evaporator)
Fan Motor
LRA — Locked Rotor Amps

MCA — Minimum Circuit Amps (for wire sizing)
MOCF — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

*Standard efficiency
†High efficiency
**NP units only.
††NB units only



Table 4B — Electrical Data, 50NB,NP028

NOMINAL V-PH-HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OFM	IFM		POWER EXHAUST FAN MOTOR	ELECTRIC HEAT		POWER SUPPLY	
	Min	Max	RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	FLA	kW	FLA	MCA	MOCP Fuse Only
208/230-3-60	187	254	63.6	266	39.7	198	10.8	7.5*	22.0	—	—	—	152.0/152.0	200/200
										6.6/6.0	—	—	158.6/158.0	200/200
										—	15/18	40.9/ 45.2	152.0/152.0	200/200
										6.6/6.0	15/18	40.9/ 45.2	158.6/158.0	200/200
										—	29/36	81.8/ 90.4	152.0/152.0	200/200
										6.6/6.0	29/36	81.8/ 90.4	158.6/158.0	200/200
										—	59/72**	163.6/181.0	232.0/253.8	250/300
										6.6/6.0	59/72**	163.6/181.0	232.0/253.8	250/300
										—	74/90††	204.5/225.9	283.1/309.9	300/350
								10.0*	26.4	—	—	—	156.4/156.4	200/200
										6.6/6.0*	—	—	163.0/162.4	225/225
										—	15/18	40.9/ 45.2	156.4/156.4	200/200
										6.6/6.0*	15/18	40.9/ 45.2	163.0/162.4	225/225
										—	29/36	81.8/ 90.4	156.4/156.4	200/200
										6.6/6.0*	29/36	81.8/ 90.4	163.0/162.4	225/225
										—	59/72**	163.6/181.0	237.5/259.2	250/300
										6.6/6.0*	59/72**	163.6/181.0	237.5/259.2	250/300
										—	74/90††	204.5/225.9	288.6/315.4	300/350
								7.5†	19.6	—	—	—	149.6/149.6	200/200
										6.6/6.0*	—	—	156.2/155.6	200/200
										—	15/18	40.9/ 45.2	149.6/149.6	200/200
										6.6/6.0*	15/18	40.9/ 45.2	156.2/155.6	200/200
										—	29/36	81.8/ 90.4	149.6/149.6	200/200
										6.6/6.0*	29/36	81.8/ 90.4	156.2/155.6	200/200
										—	59/72**	163.6/181.0	229.0/250.7	250/300
										6.6/6.0*	59/72**	163.6/181.0	229.0/250.7	250/300
										—	74/90††	204.5/225.9	280.1/306.9	300/350
								10.0†	24.2	—	—	—	154.2/154.2	200/200
										6.6/6.0*	—	—	160.8/160.2	200/200
										—	15/18	40.9/ 45.2	154.2/154.2	200/200
										6.6/6.0*	15/18	40.9/ 45.2	160.8/160.2	200/200
										—	29/36	81.8/ 90.4	154.2/154.2	200/200
										6.6/6.0*	29/36	81.8/ 90.4	160.8/160.2	200/200
460-3-60	414	508	28.6	120	19.9	99	5.4	7.5*	10.5	—	—	—	71.5	100
										3.0	—	—	74.5	100
										—	18	22.6	71.5	100
										3.0	18	22.6	74.5	100
										—	36	45.2	71.5	100
										3.0	36	45.2	74.5	100
										—	90**	113.0	154.4	175
										3.0	90**	113.0	154.4	175
										—	108††	135.6	182.6	200
								10.0*	12.5	—	—	—	73.5	100
										3.0	—	—	76.5	100
										—	18	22.6	73.5	100
										3.0	18	22.6	76.5	100
										—	36	45.2	73.5	100
										3.0	36	45.2	76.5	100
										—	90**	113.0	156.9	175
										3.0	90**	113.0	156.9	175
										—	108††	135.6	185.1	200
								7.5†	9.8	—	—	—	70.8	90
										3.0	—	—	73.8	100
										—	18	22.6	70.8	90
										3.0	18	22.6	73.8	100
										—	36	45.2	70.8	90
										3.0	36	45.2	73.8	100
										—	90**	113.0	153.5	175
										3.0	90**	113.0	153.5	175
										—	108††	135.6	181.7	200
								10.0†	12.2	—	—	—	73.2	100
										3.0	—	—	76.2	100
										—	18	22.6	73.2	100
										3.0	18	22.6	76.2	100
										—	36	45.2	73.2	100
										3.0	36	45.2	76.2	100
575-3-60	518	632	22.9	96	15.9	79	4.8	7.5*	8.6	—	—	—	57.9	80
										2.4	—	—	60.3	80
										—	36	36.1	57.9	80
										2.4	36	36.1	60.3	80
										—	72**	72.3	101.1	125
										2.4	72**	72.3	101.1	125
										—	108††	108.4	146.2	150
								10.0*	11.6	—	—	—	60.9	80
										2.4	—	—	63.3	80
										—	36	36.1	60.9	80
										2.4	36	36.1	63.3	80
										—	72**	72.3	104.9	150
										2.4	72**	72.3	104.9	150
										—	108††	108.4	150.0	150

Table 4C – Electrical Data, 50NB,NP030

NOMINAL V-PH-HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OFM Total FLA	IFM		POWER EXHAUST FAN MOTOR FLA	ELECTRIC HEAT		POWER SUPPLY	
	Min	Max	RLA	LRA	RLA	LRA		Hp	FLA		kW	FLA	MCA	MOCP Fuse Only
208/230-3-60	187	254	63.6	266	44.3	228	10.8	10.0*	26.4	— 6.6/6.0 — 15/18 6.6/6.0 — 29/36 6.6/6.0 — 59/72** 6.6/6.0 — 74/90††	— — 15/18 40.9/ 45.2 — 29/36 81.8/ 90.4 — 59/72** 163.6/181.0 — 59/72** 163.6/181.0 — 74/90††	— — 40.9/ 45.2 — 81.8/ 90.4 — 163.6/181.0 — 204.5/225.9	161.0/161.0 167.6/167.0 161.0/161.0 200/200 167.6/167.0 225/225 161.0/161.0 200/200 167.6/167.0 225/225 237.5/259.2 250/300 237.5/259.2 250/300 288.6/315.4 300/350	200/200 225/225 200/200 225/225 200/200 225/225 250/300 250/300 300/350
										— 6.6/6.0 — 15/18 6.6/6.0 — 29/36 6.6/6.0 — 59/72** 6.6/6.0 — 74/90††	— — 40.9/ 45.2 — 81.8/ 90.4 — 163.6/181.0 — 204.5/225.9	— — 40.9/ 45.2 — 81.8/ 90.4 — 163.6/181.0 — 204.5/225.9	176.6/176.6 183.2/182.6 176.6/176.6 225/225 183.2/182.6 225/225 176.6/176.6 225/250 183.2/182.6 225/250 257.0/278.8 300/300 257.0/278.8 300/300 308.1/334.9 350/350	225/225 225/225 225/225 225/225 225/250 225/250 300/300 300/300 300/350
								10.0†	24.2	— 6.6/6.0 — 15/18 6.6/6.0 — 29/36 6.6/6.0 — 59/72** 6.6/6.0 — 74/90††	— — 40.9/ 45.2 — 81.8/ 90.4 — 163.6/181.0 — 204.5/225.9	— — 40.9/ 45.2 — 81.8/ 90.4 — 163.6/181.0 — 204.5/225.9	158.8/158.8 165.4/164.8 158.8/158.8 200/200 165.4/164.8 225/225 158.8/158.8 200/200 165.4/164.8 225/225 234.7/256.5 250/300 234.7/256.5 250/300 285.9/312.6 300/350	200/200 225/225 200/200 225/225 200/200 225/225 250/300 250/300 300/350
								15.0†	36.6	— 6.6/6.0 — 15/18 6.6/6.0 — 29/36 6.6/6.0 — 59/72** 6.6/6.0 — 74/90††	— — 40.9/ 45.2 — 81.8/ 90.4 — 163.6/181.0 — 204.5/225.9	— — 40.9/ 45.2 — 81.8/ 90.4 — 163.6/181.0 — 204.5/225.9	171.2/171.2 177.8/177.2 171.2/171.2 225/225 177.8/177.2 225/225 171.2/171.2 225/225 177.8/177.2 225/225 250.2/272.0 300/300 250.2/272.0 300/300 301.4/328.1 350/350	225/225 225/225 225/225 225/225 225/225 225/225 300/300 300/300 300/350
								10.0*	12.5	— 3.0 — 18 3.0 — 36 3.0 — 90** 3.0 — 108††	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	77.5 80.5 77.5 80.5 77.5 80.5 156.9 156.9 185.1	100 110 100 110 100 110 175 175 200
								15.0*	20.0	— 3.0 — 18 3.0 — 36 3.0 — 90** 3.0 — 108††	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	85.0 88.0 85.0 88.0 85.0 88.0 166.2 166.2 194.5	110 110 110 110 125 125 175 175 200
								10.0†	12.2	— 3.0 — 18 3.0 — 36 3.0 — 90** 3.0 — 108††	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	77.2 80.2 77.2 80.2 77.2 80.2 156.5 156.5 184.7	100 110 100 110 100 110 175 175 200
								15.0†	18.3	— 3.0 — 18 3.0 — 36 3.0 — 90** 3.0 — 108††	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	83.3 86.3 83.3 86.3 83.3 86.3 164.1 164.1 192.4	110 110 110 110 110 110 175 175 200
460-3-60	414	508	30.0	120	22.1	114	5.4	10.0*	12.5	— 3.0 — 18 3.0 — 36 3.0 — 90** 3.0 — 108††	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	77.5 80.5 77.5 80.5 77.5 80.5 156.9 156.9 185.1	100 110 100 110 100 110 175 175 200
								15.0*	20.0	— 3.0 — 18 3.0 — 36 3.0 — 90** 3.0 — 108††	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	85.0 88.0 85.0 88.0 85.0 88.0 166.2 166.2 194.5	110 110 110 110 125 125 175 175 200
								10.0†	12.2	— 3.0 — 18 3.0 — 36 3.0 — 90** 3.0 — 108††	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	77.2 80.2 77.2 80.2 77.2 80.2 156.5 156.5 184.7	100 110 100 110 100 110 175 175 200
								15.0†	18.3	— 3.0 — 18 3.0 — 36 3.0 — 90** 3.0 — 108††	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	— — 22.6 — 22.6 — 45.2 — 45.2 — 113.0 — 113.0 — 135.6	83.3 86.3 83.3 86.3 83.3 86.3 164.1 164.1 192.4	110 110 110 110 110 110 175 175 200
								10*	11.6	— 2.4 — 36 36 — 72** 72** — 108††	— — 36.1 36.1 — 72.3 72.3 — 108.4	— — 36.1 36.1 — 72.3 72.3 — 108.4	62.9 65.3 62.9 65.3 104.9 104.9 150.0 150.0	80 80 80 80 150 150 150
								15*	15.4	— 2.4 — 36 36 — 72** 72** — 108††	— — 36.1 36.1 — 72.3 72.3 — 108.4	— — 36.1 36.1 — 72.3 72.3 — 108.4	66.7 69.1 66.7 69.1 109.6 109.6 154.7 154.7	80 90 90 90 125 125 175
								10*	11.6	— 2.4 — 36 36 — 72** 72** — 108††	— — 36.1 36.1 — 72.3 72.3 — 108.4	— — 36.1 36.1 — 72.3 72.3 — 108.4	62.9 65.3 62.9 65.3 104.9 104.9 150.0 150.0	80 80 80 80 150 150 150
								15*	15.4	— 2.4 — 36 36 — 72** 72** — 108††	— — 36.1 36.1 — 72.3 72.3 — 108.4	— — 36.1 36.1 — 72.3 72.3 — 108.4	66.7 69.1 66.7 69.1 109.6 109.6 154.7 154.7	80 90 90 90 125 125 175
								10*	11.6	— 2.4 — 36 36 — 72** 72** — 108††	— — 36.1 36.1 — 72.3 72.3 — 108.4	— — 36.1 36.1 — 72.3 72.3 — 108.4	62.9 65.3 62.9 65.3 104.9 104.9 150.0 150.0	80 80 80 80 150 150 150
								15*	15.4	— 2.4 — 36 36 — 72** 72** — 108††	— — 36.1 36.1 — 72.3 72.3 — 108.4	— — 36.1 36.1 — 72.3 72.3 — 108.4	66.7 69.1 66.7 69.1 109.6 109.6 154.7 154.7	80 90 90 90 125 125 175
								10*	11.6	— 2.4 — 36 36 — 72** 72** — 108††	— — 36.1 36.1 — 72.3 72.3 — 108.4	— — 36.1 36.1 — 72.3 72.3 — 108.4	62.9 65.3 62.9 65.3 104.9 104.9 150.0 150.0	80 80 80 80 150 150 150

LEGEND

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor (Evaporator) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

*Standard efficiency.
 †High efficiency
 **NP units only
 ††NB units only



(208/230, 460 v only)

CONTROL WIRING — See Fig. 14-16 for connections to main and auxiliary control boxes. The recommended types of control wiring for NB,NP unit devices is as follows (see Table 5):

Sensors — Sensors should be wired using single twisted pairs of 20 AWG conductor cable rated for the application. **NOTE:** Humidity and CO₂ sensors need to be powered from an isolated 24-v power supply.

Humidity Control and Hot Water and Steam Valves — These devices require 20 AWG twisted pair conductor cables rated for the application for the 4-20 mA signal.

Space Temperature Sensor (T55) — The space temperature sensor is shipped standard with every unit, and is located in the main control box. Space temperature sensor wires are to be connected to terminals in the unit main control box. The space temperature sensor includes a terminal block (TB1), a jumper between pins E2 and E3, and an RJ11 female connector. The RJ11 connector is used to tap into the Carrier Comfort Network (CCN) at the sensor. See RJ11 Plug Wiring section on page 24 to connect the RJ11 connector to the CCN.

⚠ CAUTION

Jumper **MUST** be in place between pins E2 and E3 or inaccurate readings could result.

To connect the space temperature sensor:

1. Connect 1 wire of the twisted pair to terminal T1 and connect the other wire to terminal T2 on terminal block 1 (TB1) located on the cover of the space temperature sensor using a 20 AWG twisted pair conductor cable rated for the application.
2. Connect the other ends of the wires to terminals 1 and 2 on TB2 located in the unit main control box.

NOTE: This sensor should be installed for all applications. For VAV (variable-air volume) applications, it is used to control heating and cooling during unoccupied periods. For DAV (digital air volume) applications, it is used to maintain control of the space during linkage failures with the TSM (terminal system manager).

NOTE: Either the T55 or T56 sensor must be connected for CV (constant volume) applications to function properly.

Space Temperature Sensor (T56) (CV applications only) — Space temperature sensor wires are to be connected to terminals in the unit main control box. The space temperature sensor includes a terminal block (TB1), a jumper between pins E2 and E3, and an RJ11 female connector. The RJ11 connector is used to tap into the CCN at the sensor. See RJ11 Plug Wiring section on page 24 to connect the RJ11 connector to the CCN.

⚠ CAUTION

Jumper **MUST** be in place between pins E2 and E3 or inaccurate readings could result.

To connect the space temperature sensor:

1. Connect 1 wire of the twisted pair to terminal TH, 1 wire to terminal COM, and the other wire to terminal SW on terminal block 1 (TB1) located on the cover of the space temperature sensor using a 20 AWG twisted pair conductor cable rated for the application.
2. Connect the other ends of the wires to terminals 1, 2, and 7 on TB2 located in the unit main control box. The wire from terminal SW **MUST** be connected to terminal 7 for all sizes.

NOTE: Either the T55 or the T56 sensor must be connected for CV applications to function properly.

Table 5 — Recommended Sensor and Device Wiring*

MANUFACTURER	PART NO.	
	Regular Wiring	Plenum Wiring
Alpha	1895	—
American	A21451	A48301
Belden	8205	884421
Columbia	D6451	—
Manhattan	M13402	M64430
Quabik	6130	—

*Non-shielded wire.

CARRIER COMFORT NETWORK INTERFACE — The NB,NP units can be connected to the Carrier Comfort Network (CCN) if desired. The communication bus wiring is supplied and installed in the field. It consists of shielded, 3-conductor cable with drain wire.

The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it, the negative pins must be wired to the negative pins, and the signal pins must be wired to signal ground pins. Wiring connections for CCN should be made at the 4-pin plug (COMM) located at the bottom right side of the fuse bracket in the main control box. Consult CCN Contractor's Manual for further information.

NOTE: Conductors and drain wire must be 20 AWG minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of -20 C to 60 C is required. See Table 6 for cables that meet the requirements.

Table 6 — CCN Connection Approved Cables*

MANUFACTURER	CABLE PART NO.
Alpha	2413 or 5463
American	A22503
Belden	8772
Columbia	02525

*Shielded wire.

IMPORTANT: When connecting the CCN communication bus to a system element, use a color coding system for the entire network to simplify installation and checkout.

The following color code is recommended:

SIGNAL TYPE	CCN BUS CONDUCTOR INSULATION COLOR	COMM1 PLUG PIN NO.
+	RED	1
GROUND	WHITE	2
-	BLACK	3

NOTE: If a cable with a different color scheme is selected, a similar color code should be adopted for the entire network.

At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to a ground at one point only. If the communication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building (1 point per building only).

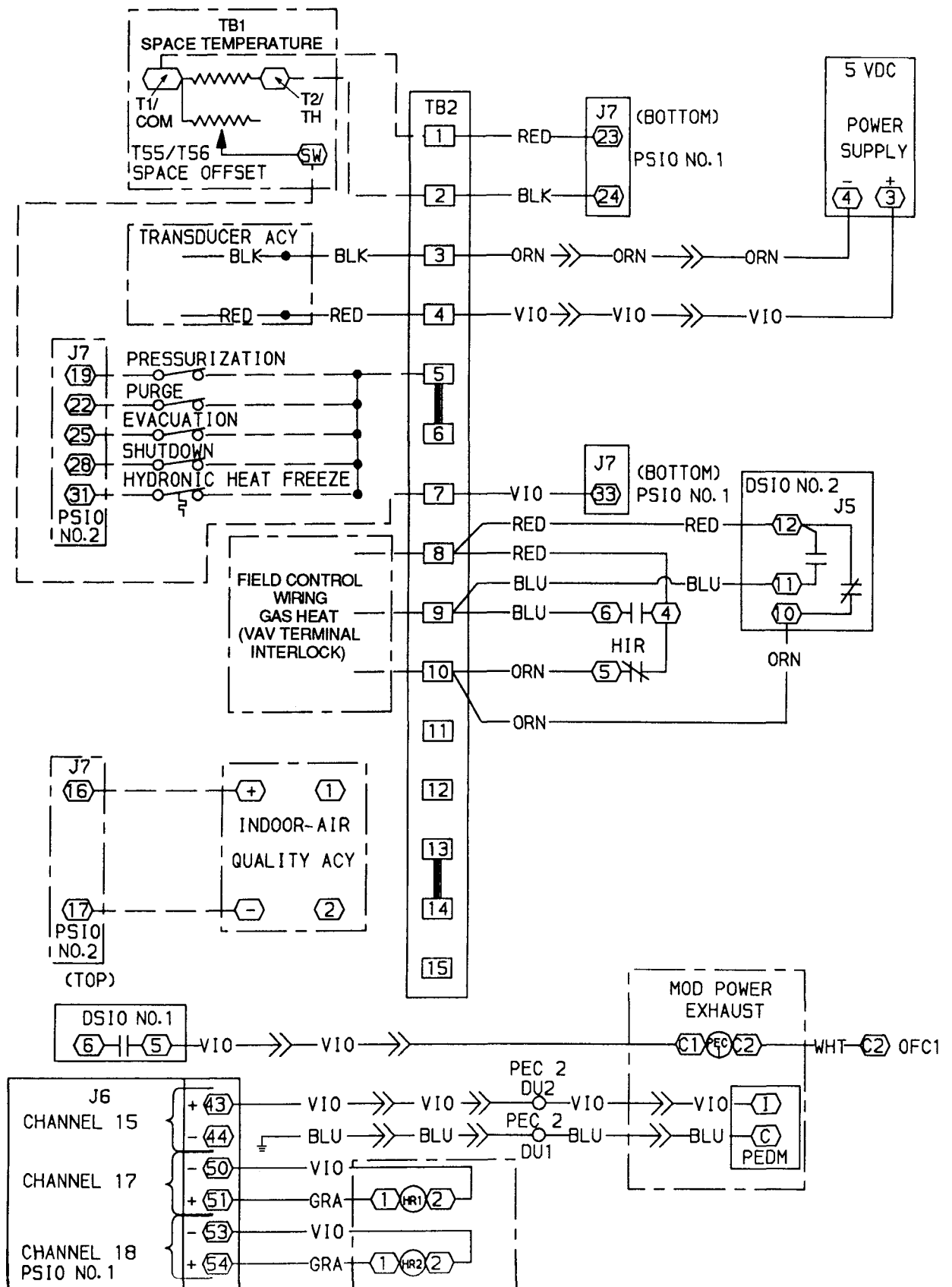
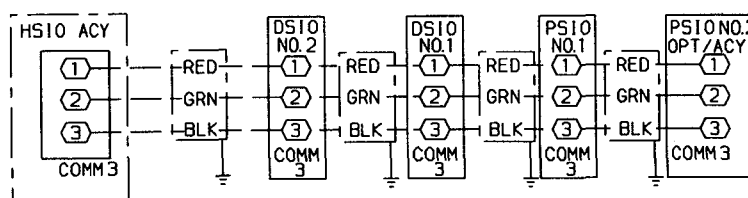
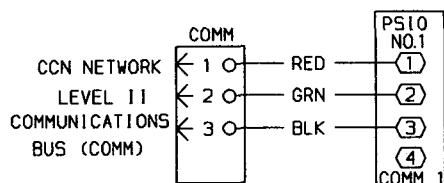
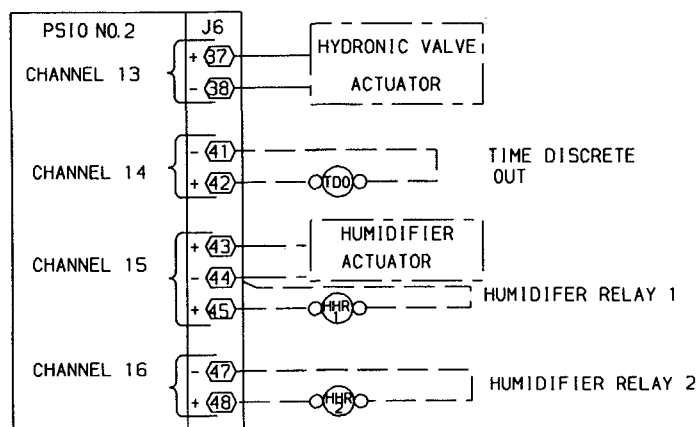
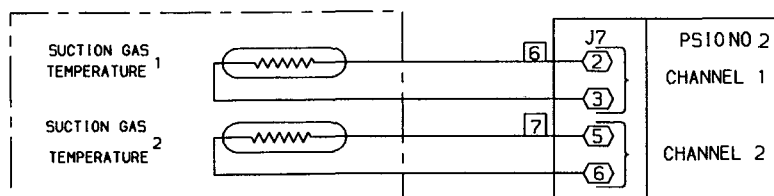
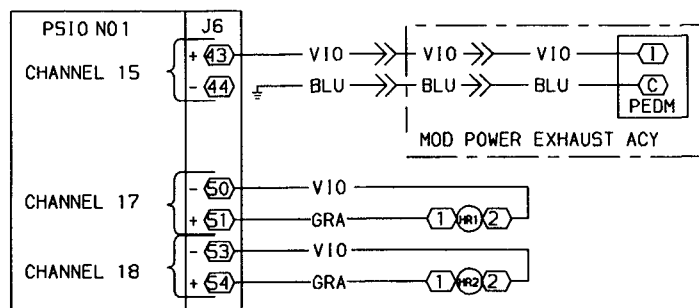
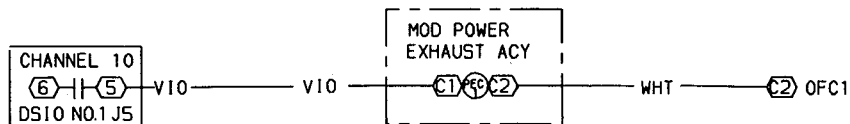


Fig. 14 – Field Control Terminal Block Wiring – Main Control Box

(See Page 22 for Legend.)



LEGEND FOR FIG. 14-16

C	— Contactor
CCN	— Carrier Comfort Network
COM	— Common Motor
COMM	— Communication Plug
DSIO	— High-Voltage Relay Module
DU	— Dummy Terminal
HHR	— Hydronic Humidifier Relay
HIR	— Heat Interlock Relay
HR	— Heater Relay
HSIO	— Keypad and Display Module
IFC	— Indoor (Evaporator) Fan Contactor
IGV	— Inlet Guide Vanes
MOD	— Modulating
MPER	— Modulating Power Exhaust Relay
NC	— Normally Closed
NO	— Normally Open
OFC	— Outdoor (Condenser) Fan Contactor
PEC	— Power Exhaust Contactor
PEDM	— Power Exhaust Damper Motor
PER	— Power Exhaust Relay
PSIO NO. 1	— Standard Processor Module
PSIO NO. 2	— Accessory/Optional Processor Module
SW	— Switch
TB	— Terminal Block
TDO	— Timed Discrete Output
TRAN	— Transformer
VAV	— Variable Air Volume
---	Field Wiring
—	Factory Wiring
---	Field Supplied

NOTE: All wiring should be done per local electrical codes

Fig. 16 — Field Control Wiring — Main Control Box

To connect the unit to the network:

1. Turn off power to the control box.
2. Cut the CCN wire and strip the ends of the red (+), white (ground) and black (–) conductors. (If a different network color scheme is used, substitute appropriate colors.)
3. Remove the 4-pin female plug from the fuse and control circuit breaker bracket in the main control box, and connect the wires to the 4-pin plug as follows:
 - a. Insert and secure the red (+) wire to terminal 1 of the 4-pin plug.
 - b. Insert and secure the white (ground) wire to terminal 2 of the 4-pin plug.
 - c. Insert and secure the black (–) wire to terminal 3 of the 4-pin plug.
4. Insert the plug into the existing 4-pin mating connector on the fuse or control circuit breaker bracket in the main control box.

IMPORTANT: A shorted CCN bus cable will prevent some routines from running and may prevent unit from starting. If abnormal conditions occur, unplug the connector. If conditions return to normal, check CCN connector, and run new cable if necessary. A short in one section of the bus can cause problems with all system elements on the bus.

RJ11 Plug Wiring — Units on the CCN can be monitored from the space at the sensor through the RJ11 connector, if desired. To wire the RJ11 connector into the CCN:

IMPORTANT: The cable selected for the RJ11 connector wiring **MUST** be identical to the CCN communication bus wire used for the entire network. Refer to Table 6 for acceptable wiring.

1. Cut the CCN wire and strip ends of the red (+), white (ground), and black (–) conductors. (If another wire color scheme is used, strip ends of appropriate wires.)
2. Insert and secure the red (+) wire to pin J2 of the space temperature sensor terminal block (TB1).
3. Insert and secure the white (ground) wire to pin J3 of the space temperature sensor TB1.
4. Insert and secure the black (–) wire to pin J5 of the space temperature sensor TB1.
5. Connect the other end of the communication bus cable to the remainder of the CCN communication bus at the COMM plug located on the fuse and control circuit breaker bracket in the unit main control box.

OPTIONAL SMOKE CONTROL — When the NB,NP unit is equipped with an optional smoke control and a fire system is installed, 4 modes are provided to control smoke within areas serviced by the rooftop unit. Each mode must be energized individually from the approved building fire alarm system, and the corresponding alarm is then generated at the HSIO keypad or building supervisor.

NOTE: The unit **MUST** be equipped with an optional factory-installed economizer, the optional processor module (PSIO2), and the optional factory-installed modulating power exhaust to provide smoke control capabilities.

The building fire alarm system must provide 4 normally-open dry contact closures. These contacts must be wired between TB2-5 and the PSIO2 plug J7 (bottom) appropriate connection. Refer to the unit wiring diagram for the corresponding connection point on PSIO2, plug J7 (bottom).

Fire Shut Down Mode — The fire alarm system must provide a normally-open dry contact closure which energizes the fire shut down mode when activated.

When the fire shut down mode is energized, the unit shuts down.

This mode remains in effect as long as the input signal is maintained at the fire system panel. An alarm is generated from this input and sent to the building supervisor. In order for this mode to be initiated, the input signal must be maintained for no less than 2 seconds.

Evacuation Mode — The building fire alarm system must provide a normally-open dry contact closure which energizes the evacuation mode when activated. When the evacuation mode is energized, the supply-air fan will shut down, the supply-air fan inlet guide vanes will close, the power exhaust fan will start, the power exhaust dampers will open, and the return-air dampers will close.

This mode remains in effect for as long as the input signal is maintained at the fire system panel. An alarm is generated from this input and sent to the building supervisor. In order for this mode to be initiated, the input signal must be maintained for no less than 2 seconds.

Pressurization Mode — The building fire alarm system must provide a normally-open dry contact closure which energizes the pressurization mode when activated. When the pressurization mode is energized, the supply-air fan will start, the power exhaust fan will shut down, the economizer dampers will open, and the power exhaust dampers will close.

This mode remains in effect as long as the input signal is maintained at the fire system panel. An alarm is generated from this input and sent to the building supervisor. In order for this mode to be initiated, the input signal must be maintained for no less than 2 seconds.

Smoke Purge Mode — The building fire alarm system must provide a normally-open dry contact closure which energizes the smoke purge mode when activated.

When the smoke purge mode is energized, the supply and power exhaust fans will start, the economizer and power exhaust dampers will open, and the return-air dampers will close.

This mode remains in effect as long as the input signal is maintained at the fire system panel. An alarm is generated from this input and sent to the building supervisor. In order for this mode to be initiated, the input signal must be maintained for no less than two seconds.

HEAT INTERLOCK RELAY (HIR) FUNCTION WIRING (VAV Units Only — Not necessary for DAV applications) — Variable-air volume units using optimal start (morning warm-up) require that room terminals be controlled to go to the fully open position when the unit goes into the heating mode. The HIR function is provided for this control. The relay is located in the unit control box. When the unit goes into heating mode, the interlock relay is energized to provide switch closure or opening (depending on how the field-supplied power source is set up) to open the room terminals. The field-supplied connections for interlock relays are:

TERMINAL TYPE	TERMINAL NO.	TERMINAL BLOCK
Normally closed (NC)	8 and 10	TB2
Normally open (NO)	8 and 9	TB2

Note that a field-supplied power source is required. See Fig. 14 and unit wiring schematic for wiring details.

Gas Piping (48NP Units Only) — Unit is equipped for use with natural gas only (unless accessory LP [liquid propane] kit is installed). Installation must conform with local building codes, or in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1.

A 1/8-in NPT tapping plug, accessible for test gage connection, must be field installed immediately upstream of gas supply connection to unit. See Fig. 17.

Natural gas pressure at unit gas connection must not be less than 5 in. wg or greater than 13 in. wg.

Size gas supply piping for 0.5 in. wg maximum pressure drop. Do not use supply pipe smaller than unit gas connection.

⚠ CAUTION

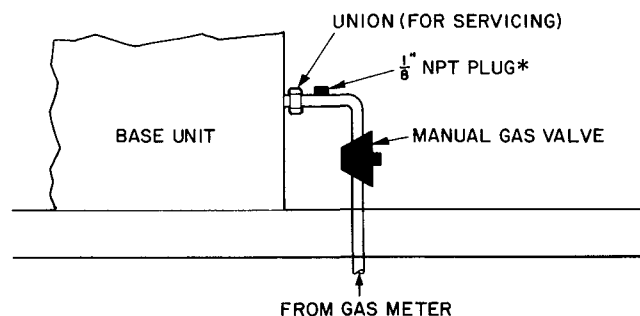
Disconnect gas piping from unit when leak testing at pressures greater than 0.5 psig. Pressures greater than 0.5 psig will cause gas valve damage resulting in a hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig, it must be replaced.

Installing Flue/Inlet Hoods (48NP Units Only)

— The flue/inlet hoods are shipped in a bag taped to the basepan under the unit fan. Remove the shipping blockoffs and install hoods as shown in Fig. 4A, using the removed fasteners. There are 4 hoods on Model 48NPE (high heat), and 3 hoods on Model 48NPD (low heat). Use RTV sealant to provide rainproof seal between hoods and door.

Installing CSA (Canadian Standards Association) Hood

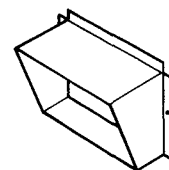
— The CSA hoods are shipped in a bag taped to the basepan under the unit fan. Remove the shipping blockoffs and install hoods over flue exhaust hoods. CSA hoods are necessary for units needing CSA certification, or for high wind applications. See Fig. 18.



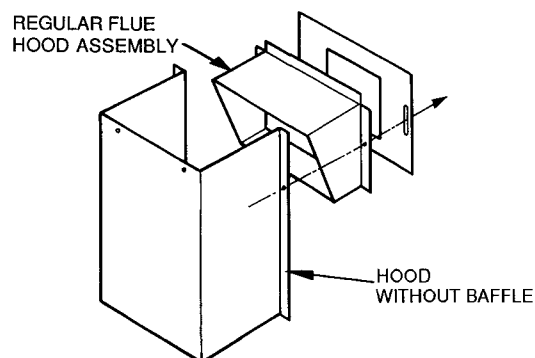
*NPT plug is field supplied

NOTE: Follow all local codes.

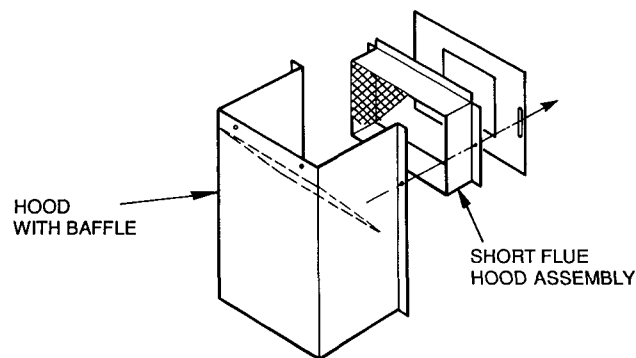
Fig. 17 — Gas Piping Details



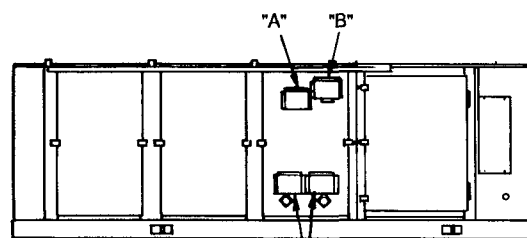
(1) REGULAR INLET HOOD



(2) HOOD WITHOUT BAFFLE (LOW HEAT ONLY)



(3) HOOD WITH BAFFLE (HIGH HEAT ONLY)



INSTALL REGULAR INLET HOODS (1)

INSTALLATION LOCATIONS FOR FLUE HOOD ASSEMBLIES AND CSA HOODS

UNIT TYPE	LOCATION	
	"A"	"B"
High Heat	Hood With Baffle (3)	Hood With Baffle (3)
Low Heat	---	Hood Without Baffle (2)

NOTE: Numbers in () refer to type of hood to install in location indicated

Fig. 18 — Flue Hood Details

CONTROL SYSTEM

General — The control system consists of the following components:

- standard processor module (PSIO 8088 or PSIO1)
- optional processor module (PSIO 8052 or PSIO2)
- two standard high-voltage relay modules (DSIO-HV or DSIO1 and DSIO2)
- accessory keypad and display module (HSIO or LID)
- enthalpy sensor
- thermistors
- pressure transducers
- accessory humidity sensors
- space temperature sensors (standard T55 and accessory T56)
- supply-air fan status switch
- check filter switch

Features

PROCESSOR MODULE NO. 1 (Standard) — The PSIO1 module monitors and processes the following inputs, outputs, and system information:

INPUTS:

- transducers
- thermistors
- switches

OUTPUTS:

- condenser-fan contactors
- optional integrated economizer motor (4-20 mA)
- optional inlet guide vanes motor (4-20 mA)
- optional modulating power exhaust dampers motor (4-20 mA)
- heat stages 1 and 2 operation

SYSTEM INFORMATION:

- generates alert and alarm information (via transducer, thermistor, and sensor inputs)
- supports level II communications
- supports digital air volume (DAV) interface

NOTE: The correct module address for the PSIO1 is 01 (S1 set at 0; S2 set at 1).

PROCESSOR MODULE NO. 2 (Option or Accessory) — The PSIO2 can be purchased on its own (as a field-installed accessory) or as part of the factory-installed control option module. The PSIO2 module supports the sensors used for:

- humidity control
- outdoor-air cfm
- indoor-air quality (IAQ)
- smoke control
- superheat monitoring (only when PSIO2 is factory-installed as part of the optional control option module)

In addition, the PSIO2 supplies the outputs for humidity and hydronic heating coil control and a discrete output with timed clock control (for outdoor building or parking lot lights).

NOTE: The correct module address for the PSIO2 is 31 (S1 set at 3; S2 set at 1).

HIGH-VOLTAGE RELAY MODULES (DSIO) — The DSIO modules close contacts to energize evaporator and condenser fan contactors. The modules also control compressor unloaders, compressor contactors, compressor crankcase heaters, heat interlock relay, power exhaust contactor, and heat stages 3 through 5 (50NB, NP only). The compressor status through the compressor lockout (CLO) relays and high-pressure switches (safety circuits) are the inputs to these modules.

NOTE: The correct module addresses for the DSIO1 and DSIO2 modules are 19 and 49, respectively. Set the switch closest to the mounting plate at 1 (DSIO1) or 4 (DSIO2), and the other switch at 9 (both modules).

KEYPAD AND DISPLAY MODULE (HSIO)

IMPORTANT: The accessory HSIO (human sensor input/output) keypad and display module is required for initial start-up of these units. All units are shipped in standby mode, and the accessory HSIO must be used to change the unit to run mode. Once the unit is in run mode, the HSIO is not required for normal operation.

The keypad and display module (local interface device or LID) is a field-installed accessory, and provides unit function information at the unit. The module consists of a keypad with 6 function keys, 5 operative keys, 10 numeric keys (0 through 9), and an alphanumeric 8-character liquid crystal display (LCD). Key usage is explained in Table 7. Each function has one or more subfunctions as shown in Table 8. Those functions are described in greater detail in the Keypad (HSIO) Operation section on pages 30-58.

The HSIO keypad and display module is installed through connection of the power and communication plugs and can be easily moved from one unit to another. Because of this flexibility, one HSIO can be used for several units.

Unit operation is controlled by the status of the RUN/STANDBY mode on the HSIO. To access the mode, press **11** **STAT** on the HSIO keypad, and then use the **↓** key. The HSIO will display either STBY YES or STBY NO. To enable the unit, press **CLR** or **•** and press **ENTR** while at the STBY YES display. To disable the unit, press **1** **ENTR** while at the STBY NO display. Clearing an alarm that has stopped unit operation is accomplished by entering the STBY YES mode.

IMPORTANT: Use the STBY YES mode when servicing the unit or running the quick test feature.

Table 7 — HSIO Keypad Key Usage

FUNCTION KEYS	USE
11 STAT	Status — To display diagnostic codes and current operating information about the unit
TEST	Quick Test — To check inputs and outputs for proper operation.
HIST	History — To check most recent alarms.
SRVC	Service — To enter specific unit configuration information.
SET	Set Point — To enter operating set points and day/time information.
SCHD	Schedule — To enter occupied/unoccupied schedules for unit operation.
OPERATIVE KEYS	USE
EXPW	Expand Display — To display a non-abbreviated expansion of the display
CLR	Clear — To clear the screen and return to previous display. Also used to enter data value of zero.
↑	Up Arrow — To return to previous display position.
↓	Down Arrow — To advance to next display position.
ENTR	To enter data.

Table 8 — HSIO Keypad and Display Module Functions and Subfunctions

SUB FUNCTION NO.	FUNCTIONS					
	Status 	History 	Schedule 	Service 	Set Point 	Test 
1	Current Alarms	Alarms	Occupied Mode Override (Unit)	Log on and Log off	System Set Point	Test of Inputs
2	Current Alerts	Maintenance	Period 1 (Unit)	Software Version	Demand Limit	Analog Outputs
3	Current Operating Modes	—	Period 2 (Unit)	Factory Configuration	Current Time	Discrete Outputs
4	Capacity Stages	—	Period 3 (Unit)	Bus Address	Daylight Savings Time	Test Compressors
5	Current Operating Set Points	—	Period 4 (Unit)	Units of Measure	Configure Holiday	Test Heat
6	System Temperatures	—	Period 5 (Unit)	User Configuration	—	Exit Test
7	System Pressures	—	Period 6 (Unit)	Heating Coil	—	—
8	Inputs	—	Period 7 (Unit)	Cooling	—	—
9	Analog Outputs	—	Period 8 (Unit)	Duct Pressure	—	—
10	Discrete Outputs	—	Occupied Mode Override (TDO)	Economizer	—	—
11	Run/Standby	—	Period 1 (TDO)	Heat	—	—
12	—	—	Period 2 (TDO)	Nighttime Free Cool	—	—
13	—	—	Period 3 (TDO)	Adaptive Optimal Start/Stop	—	—
14	—	—	Period 4 (TDO)	Temperature Reset	—	—
15	—	—	Period 5 (TDO)	Configure Loadshed	—	—
16	—	—	Period 6 (TDO)	Configure IAQ	—	—
17	—	—	Period 7 (TDO)	Configure Humidity	—	—
18	—	—	Period 8 (TDO)	Building Pressure	—	—
19	—	—	—	Alert Limits	—	—
20	—	—	—	Service History	—	—
21	—	—	—	Service Maintenance Alarm	—	—
22	—	—	—	Override History	—	—

LEGEND

IAQ — Indoor-Air Quality
TDO — Timed Discrete Output

ENTHALPY SENSOR (See Fig. 6) — The enthalpy sensor is factory-installed on the partition separating the outdoor-air section of the unit from the return-air section. See Fig. 7. The sensor is mounted in a horizontal position with the sensing element exposed to the outdoor air. For maximum benefit of outdoor air, set the enthalpy control to the "A" setting (see Fig. 8 and 9). At this setting, when the relative humidity is 50%, and the outdoor air is below 74 F, the sensor's relay contacts will be closed.

THERMISTORS AND REFRIGERANT PRESSURE TRANSDUCERS (see Table 9) — The NB,NP control system gathers information from the sensors to control the operation of the unit. The NB,NP units use 6 standard and 2 additional accessory/optional thermistors and up to 7 accessory/optional pressure transducers to monitor various temperatures and pressures at selected points throughout the system.

RELATIVE HUMIDITY (RH) SENSOR (Space Mounted)

— The accessory field-installed, wall-mounted type RH sensor measures the relative humidity of the air within the occupied space. Use a junction box to accommodate the wiring when sensor is mounted in the occupied space. Sensor must be mounted with terminals ACIN and OUT+ located at the top of the sensor. There are factory-supplied provisions for locating this sensor on the back of the auxiliary control box, so that this sensor can be used to measure return-air humidity. Supply 24 vac to this sensor from an isolated power supply.

RELATIVE HUMIDITY (RH) SENSOR (Duct Mounted)

— The accessory field-installed duct-mounted RH sensor can be installed either in the return-air ductwork or the outdoor-air ductwork. If 2 relative humidity sensors are ordered for differential enthalpy control, then the sensors will be installed in the conditioned space (CV applications) or the return air (VAV applications) and outdoor airstream. If the sensor is to be used for control of a humidifier, install the sensor in the return-air duct. Supply 24 vac to this sensor from an isolated power supply.

Table 9 — Thermistors and Pressure Transducers

SENSOR	LOCATION AND FUNCTION
Pressure Transducers	
DPT1	Compressor A1 located at the discharge service valve — Senses discharge pressure
SPT1	Compressor A1 located at the LPS connection on the compressor instead of LPS (low-pressure switch) — Senses suction pressure
DPT2	Compressor B1 located at the discharge service valve — Senses discharge pressure
SPT2	Compressor B1 located at the LPS connection on compressor instead of LPS — Senses suction pressure
Thermistors	
T1	50NB,NP VERTICAL DISCHARGE UNITS: Located below the fan housing ALL 48NP AND 50NB,NP HORIZONTAL DISCHARGE UNITS: Located in supply-air section — Senses supply-air temperature (SAT)
T2	Located in the return-air section — Senses return-air temperature (RAT)
T3	Located in condenser coil circuit no. 1 at the header end — Senses saturated condensing temperature (SCT1)
T4	Located in condenser coil circuit no. 2 at the the header end — Senses saturated condensing temperature (SCT2)
T5	48NP UNITS: Coiled at the corner post. 50NB,NP UNITS: Located at the corner post next to the control box — Senses outdoor-air temperature (OAT)
T6	Attached to compressor A1 suction line — Senses suction gas temperature (SGT1)
T7	Attached to compressor B1 suction line — Senses suction gas temperature (SGT2)

STANDARD SPACE TEMPERATURE SENSOR (T55) — The T55 sensor is a wall-mounted device used to measure space temperature and for unoccupied heating and cooling operation. It should be installed as a wall-mounted thermostat would be (in the conditioned space where it will not be subjected to either a cooling or heating source or direct exposure to sunlight, and 4 to 5 ft above the floor). It can also be used to override the occupancy schedule in the unit by pushing the button on the front. Refer to page 21 for wiring information.

ACCESSORY SPACE TEMPERATURE SENSOR (T56) — This device operates the same as the standard T55 sensor but has an additional feature of allowing the user to change the set point $\pm 5^\circ\text{F}$ from the space. The T56 sensor is applicable to CV applications only. A slide potentiometer is used to provide the space temperature offset and is located on the face of the device. The sensor is a wall-mounted device and should be installed as a wall-mounted thermostat would be (in the conditioned space where it will not be subjected to either a cooling or heating source or direct exposure to sunlight, and 4 to 5 ft above the floor). It can also be used to override the occupancy schedule in the unit by pushing the button on the front.

SPACE TEMPERATURE RESET — Variable air volume applications that require averaging multiple space temperature sensors to determine when to modify the discharge-air temperature can be satisfied using either 4 or 9 sensors as shown in Fig. 19. Single space temperature reset wiring is shown in Fig. 14.

NOTE: Only Carrier sensors may be used (part no. HH51BX001 for standard T55, or HH51BX004 for accessory T56). Sensors must be used in multiples of 1, 4, and 9 only, with total sensor wiring not to exceed 1000 ft. However, space temperature reset can be accomplished with only one sensor (provided standard with unit).

SUPPLY FAN STATUS SWITCH (FS) — A snap acting single-pole, double-throw (SPDT) differential pressure switch is factory mounted in the NB,NP auxiliary control box. The switch senses the change in pressure across the supply-air fan and provides the fan status. A length of plenum tubing connects the switch to the probe located on the fan side plate.

The switch must be set prior to unit operation. To set the switch, turn the adjustment screw on top (center) of switch clockwise to increase set point, or counterclockwise to decrease set point. The set point switch range is 0.05 to 2.0 in. wg with a deadband of 0.02 in. wg at minimum set point and 0.1 in. wg at maximum set point.

Set switch so that contact makes to NC when supply-air fan is energized. Adjust switch with inlet guide vanes closed on VAV units. The switch should make (fan on) within 1 minute after supply-air fan is energized and break (fan off) within 1 minute after the fan is deenergized.

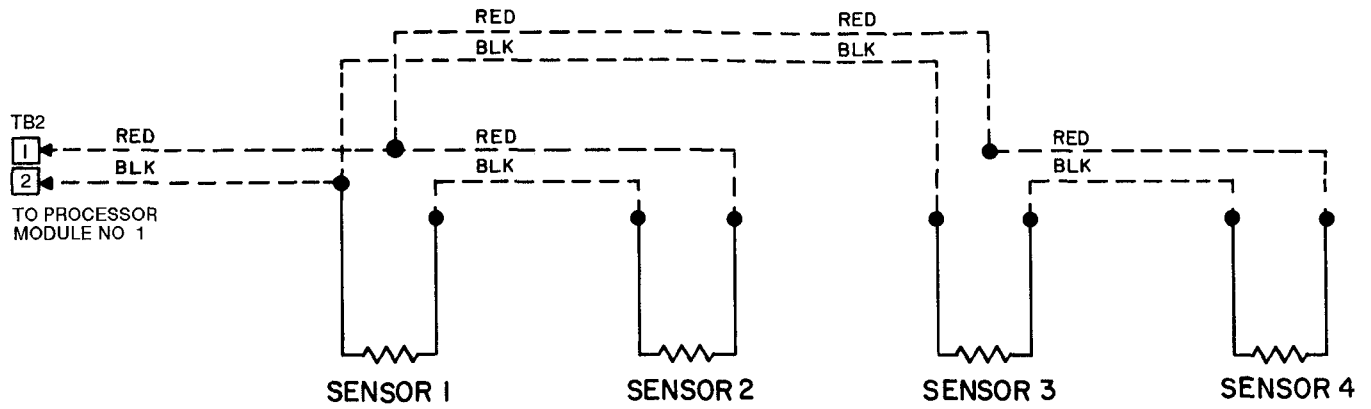
CHECK FILTER SWITCH (CFS) — A snap acting SPDT switch is factory mounted in the NB,NP auxiliary control box. The switch senses the differential pressure and provides the microprocessor module with a signal for filter status. Two lengths of plenum tubing connect the switch to probes located both upstream and downstream of the unit filters.

The switch must be set prior to unit operation. To set the switch, turn the adjustment screw on top (center) of switch slowly clockwise to find the “pivot” point where the filter status still reads clean under ☐ **B** ☐ **STAT** in the HSIO display. Check the switch operation with the supply-air fan running, the inlet guide vanes full open (if applicable), and nominal cfm delivery. See table below for clean filter pressure drops for help in locating the “pivot” point. Once this point is found, turn the screw clockwise to obtain the set point at which the filter status will be dirty. Use table below as a guide.

Filter Switch Dirty Set Point

FILTER TYPE	INCREASED PRESSURE DROP TO “DIRTY” FROM PIVOT POINT	APPROXIMATE CLOCKWISE TURNS
2-in. Throwaway	0.30 in. wg	2

SPACE TEMPERATURE RESET — 4 SENSOR APPLICATION



SPACE TEMPERATURE RESET — 9 SENSOR APPLICATION

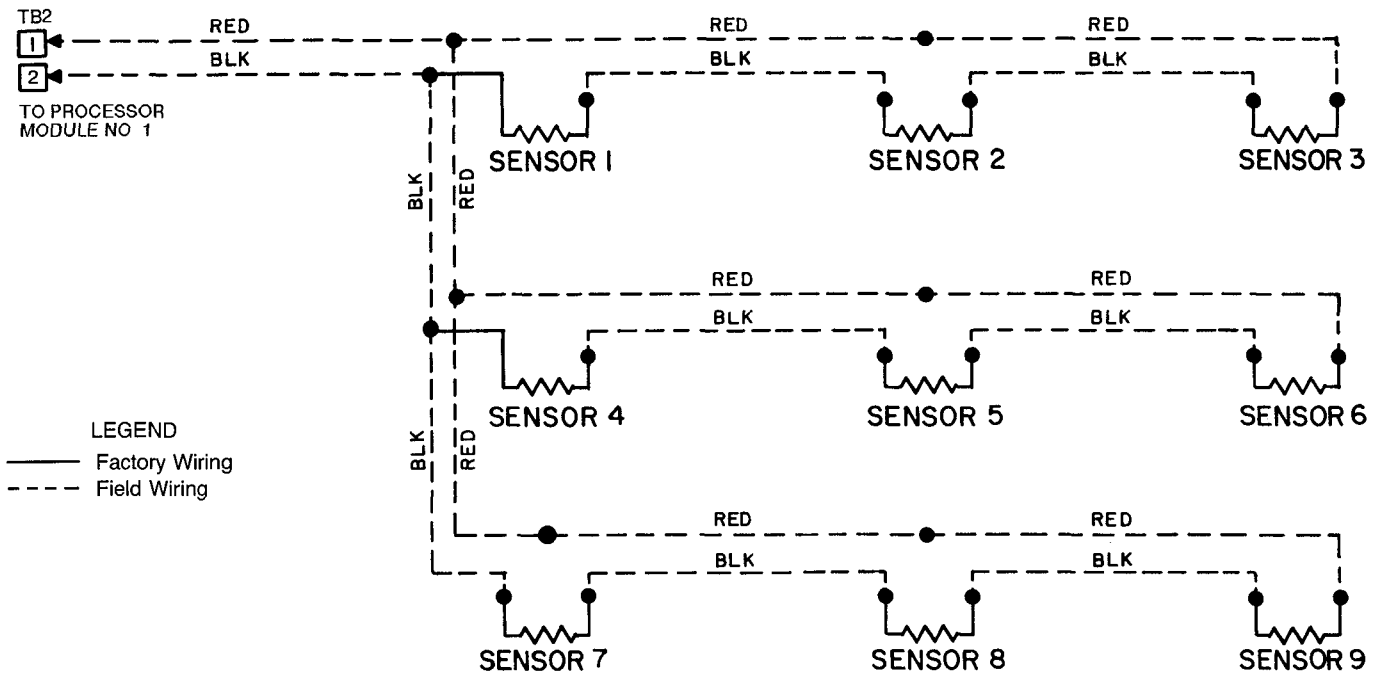


Fig. 19 — Space Temperature Reset

KEYPAD (HSIO) OPERATION

Accessing Functions and Subfunctions — See Table 10. Refer also to Table 8, which shows the functions (identified by name) and the subfunctions (identified by number). Table 11 shows the sequence of all of the elements in the subfunctions.

Functions

SUMMARY DISPLAY — Whenever the keypad has not been used for 10 minutes, the display will automatically

switch to an alternating summary display. This display has 5 parts, shown below, which alternate in continuous rotating sequence.

Display	Expansion (Press EXPN)
TUE 12:45	TODAY IS TUE, TIME IS 12:45 PM
MODE 23	OPERATING MODE IS UNOCCUPIED HEATING
COOL 1	COOLING STAGES 1
HEAT 1	HEATING STAGES 1
2 ALARMS	THERE ARE 2 ALARMS

Table 10 — Accessing Functions and Subfunctions

OPERATION	KEYPAD ENTRY	DISPLAY	DESCRIPTION
To access a function, press the subfunction number and the function name key. The display will show the subfunction group. To move to the other elements, scroll up or down using the arrow keys.	4 STAT ↓ ↓ ↓ ↓ ↓	STAGES COOL X CPC X HEAT X HPC X SMZ X	Current stages Cooling Stages Cooling percent capacity Heating stages Heating percent capacity Sum/Z ratio
When the last element in a subfunction has been displayed, the subfunction group name will be repeated.	↓	STAGES	Current stages
To move to the next subfunction, it is not necessary to use the subfunction number; pressing the function name key will advance the display through all subfunctions within a function and then back to the first.	STAT STAT STAT STAT STAT STAT STAT	SETPOINT TEMPS PRESSURE INPUTS ANLGOUT OUTPUTS STANDBY	Current operating set point System temperatures System pressures System inputs Analog outputs Discrete outputs Standby/run mode
To move to another function, either press the function name key for the desired function (display will show the first subfunction) or Access a particular subfunction by using the subfunction number and the function name key.	HIST 2 HIST	ALRMHST MTN/HIS	Alarm history Maintenance history

Table 11 — Keypad Directory

STATUS			
Subfunction	Keypad Entry	Display	Expansion (Press  key)
1 ALARMS	 	ALARMS	CURRENT ALARMS
		ALARM 50	EMERGENCY STOP
		ALARM 51	COMPRESSOR A1 FAULT
		ALARM 53	COMPRESSOR A1 STATUS
		ALARM 55	COMPRESSOR B1 FAULT
		ALARM 57	COMPRESSOR B1 STATUS
		ALARM 59	THERMISTOR FAILURE SUPPLY AIR
		ALARM 60	THERMISTOR FAILURE RETURN AIR
		ALARM 61	OUTSIDE AIR THERMISTOR FAILURE
		ALARM 62	CIRCUIT A CONDENSER THERMISTOR FAILURE
		ALARM 63	CIRCUIT B CONDENSER THERMISTOR FAILURE
		ALARM 64	COMPRESSOR A1 THERMISTOR FAILURE
		ALARM 65	COMPRESSOR B1 THERMISTOR FAILURE
		ALARM 66	SPACE THERMISTOR FAILURE
		ALARM 67	CIRCUIT A DISCHARGE TRANSDUCER FAILURE
		ALARM 68	CIRCUIT B DISCHARGE TRANSDUCER FAILURE
		ALARM 69	CIRCUIT A SUCTION TRANSDUCER FAILURE
		ALARM 70	CIRCUIT B SUCTION TRANSDUCER FAILURE
		ALARM 71	LOSS OF COMMUNICATION WITH DSIO1
		ALARM 72	LOSS OF COMMUNICATION WITH DSIO2
		ALARM 73	LOSS OF COMMUNICATION WITH OPTION BOARD 1 (PSIO2)
		ALARM 74	LOW PRESSURE CIRCUIT A
		ALARM 75	LOW PRESSURE CIRCUIT B
		ALARM 76	HIGH PRESSURE CIRCUIT A
		ALARM 77	HIGH PRESSURE CIRCUIT B
		ALARM 78	SUPPLY FAN FAILURE
		ALARM 80	LOW CIRCUIT A SATURATED SUCTION TEMP
		ALARM 81	LOW CIRCUIT B SATURATED SUCTION TEMP
		ALARM 82	HIGH CIRCUIT A SUCTION SUPERHEAT
		ALARM 83	HIGH CIRCUIT B SUCTION SUPERHEAT
		ALARM 84	LOW CIRCUIT A SUCTION SUPERHEAT
		ALARM 85	LOW CIRCUIT B SUCTION SUPERHEAT
		ALARM 86	ILLEGAL CONFIGURATION
		ALARM 87	UNIT CONFIGURATION REQUIRED
		ALARM 88	HYDRONIC COIL FREEZE STAT
		ALARM 89	PRESSURIZATION
		ALARM 90	EVACUATION
		ALARM 91	SMOKE PURGE
		ALARM 92	FIRE SHUTDOWN
		ALARM 93	LINKAGE FAILURE
		ALARM 94	BUILDING PRESSURE
		ALARM 95	DUCT STATIC PRESSURE
		ALARM 97	INDOOR AIR QUALITY FAILURE

See legend and notes on page 33

Table 11 – Keypad Directory (cont)

STATUS (cont)			
Subfunction	Keypad Entry	Display	Expansion (Press  key)
2 ALERTS		ALERTS	CURRENT ALERTS
		ALERT 150	SUPPLY AIR TEMP LOW LIMIT
		ALERT 151	SUPPLY AIR TEMP HIGH LIMIT
		ALERT 152	RETURN AIR TEMP LOW LIMIT
		ALERT 153	RETURN AIR TEMP HIGH LIMIT
		ALERT 154	OUTSIDE AIR TEMP LOW LIMIT
		ALERT 155	OUTSIDE AIR TEMP HIGH LIMIT
		ALERT 156	SPACE TEMP LOW LIMIT
		ALERT 157	SPACE TEMP HIGH LIMIT
		ALERT 158	STATIC PRESSURE LOW LIMIT
		ALERT 159	STATIC PRESSURE HIGH LIMIT
		ALERT 160	RELATIVE HUMIDITY LOW LIMIT
		ALERT 161	RELATIVE HUMIDITY HIGH LIMIT
		ALERT 162	OUTSIDE AIR RELATIVE HUMIDITY LOW LIMIT
		ALERT 163	OUTSIDE AIR RELATIVE HUMIDITY HIGH LIMIT
		ALERT 164	FILTER STATUS
		ALERT 165	BUILDING PRESSURE LOW LIMIT
		ALERT 166	BUILDING PRESSURE HIGH LIMIT
		ALERT 167	OUTSIDE AIR CFM LOW LIMIT
		ALERT 168	OUTSIDE AIR CFM HIGH LIMIT
		ALERT 169	INDOOR AIR QUALITY LOW LIMIT
		ALERT 170	INDOOR AIR QUALITY HIGH LIMIT
		ALERT 173	RUN HOURS EXCEED SERVICE/MAINT LIMIT
		ALERT 174	IAQ EXCEEDS SETPOINT FOR 10 MINUTES
3 MODES		MODES	CURRENT OPERATING MODES
		MODE 21	OPERATING MODE IS SPACE TEMP RESET
		MODE 22	OPERATING MODE IS DEMAND LIMIT
		MODE 23	OPERATING MODE IS UNOCCUPIED HEAT
		MODE 24	OPERATING MODE IS UNOCCUPIED COOL
		MODE 25	OPERATING MODE IS STANDBY
		MODE 26	OPERATING MODE IS OPTIMAL START
		MODE 27	OPERATING MODE IS UNOCCUPIED
		MODE 28	OPERATING MODE IS IAQ PURGE
		MODE 29	OPERATING MODE IS OPTIMAL STOP
		MODE 30	OPERATING MODE IS OCCUPIED HEAT
		MODE 31	OPERATING MODE IS OCCUPIED COOL
		MODE 32	OPERATING MODE IS OCCUPIED
		MODE 33	OPERATING MODE IS NIGHT TIME FREE COOL
		MODE 34	OPERATING MODE IS PRESSURIZATION
		MODE 35	OPERATING MODE IS EVACUATION
		MODE 36	OPERATING MODE IS SMOKE PURGE
		MODE 37	OPERATING MODE IS FIRE SHUTDOWN
		MODE 38	OPERATING MODE IS TIMED OVERRIDE
		MODE 39	OPERATING MODE IS DAV CONTROL
		MODE 40	OPERATING MODE IS FACTORY-FIELD TEST
		MODE 41	OPERATING MODE IS HIGH HUMIDITY OVERRIDE

Table 11 – Keypad Directory (cont)

STATUS (cont)			
Subfunction	Keypad Entry	Display	Expansion (Press  key)
4 STAGES	 	STAGES	CURRENT STAGES
		COOL X	COOLING STAGES X
		CPC X	COOLING PERCENT CAPACITY X
		HEAT X	HEATING STAGES X
		HPC X	HEATING PERCENT CAPACITY X
		SMZ X	SUM/Z RATIO X
5 SET POINT	 	SETPOINT	CURRENT OPERATING SETPOINT
		CLSP X	CONTROL SETPOINT X
		CLTP X	CONTROL TEMP X
6 TEMPERATURE	 	TEMPS	SYSTEM TEMPERATURES
		SCTA X	CIRCUIT A SATURATED CONDENSING TEMP X
		STA X	CIRCUIT A SUCTION TEMP X
		SSTA X	CIRCUIT A SATURATED SUCTION TEMP X
		SHA X	CIRCUIT A SUCTION SUPERHEAT
		SCTB X	CIRCUIT B SATURATED CONDENSING TEMP X
		STB X	CIRCUIT B SUCTION TEMP X
		SSTB X	CIRCUIT B SATURATED SUCTION TEMP X
		SHB X	CIRCUIT B SUCTION SUPERHEAT
		SAT X	SUPPLY AIR TEMP X
		RAT X	RETURN AIR TEMP X
		SPT X	SPACE TEMP X
		OAT X	OUTSIDE AIR TEMP X
		OAT X	OUTSIDE AIR TEMP X (–40 F to 245 F)
	X  *		
7 PRESSURE	 	PRESSURE	SYSTEM PRESSURES
		DPA X	CIRCUIT A DISCHARGE PRESSURE SENSOR X
		SPA X	CIRCUIT A SUCTION PRESSURE SENSOR X
		LPA X	CIRCUIT A LOW PRESSURE SWITCH X
		DPB X	CIRCUIT B DISCHARGE PRESSURE SENSOR X
		SPB X	CIRCUIT B SUCTION PRESSURE SENSOR X
		LPB X	CIRCUIT B LOW PRESSURE SWITCH X
		BP X	BUILDING PRESSURE X
		SP X	STATIC PRESSURE X

*An "X"  in the Keypad Entry column indicates that the reading can be forced by entering a value and then pressing . The valid force ranges are listed in the Expansion column.

†See page 49-50 for details on correct operation of these tests

**The supply-air fan is energized at this point and remains on for the duration of the compressor/heat test functions

††Compressors are energized for 10 seconds

||Controls set point for economizer

LEGEND

AOSS – Adaptive Optimal Start/Stop
CONT – Continuous
CV – Constant Volume
DAV – Digital Air Volume
DD – Day
DTCC – Discrete Time Clock Control
DUR – Duration

EXH – Exhaust
HH – Hour
IAQ – Indoor-Air Quality
MAINT – Maintenance
MIN – Minimum
MM – Month
MOD – Modulating

MPD – Modulating Power Dampers
NTFC – Nighttime Free Cooling
OVRD – Override
RTN – Return
STAT – Status
TEMP – Temperature
VAV – Variable-Air Volume
YY – Year

NOTES:

- 1 Alarm no. will only be displayed if ALARM is present
2. Alert no. will only be displayed if ALERT is present
- 3 If unit is not configured for a certain subfunction, that subfunction will not show up when scrolling through values

Table 11 – Keypad Directory (cont)

STATUS (cont)			
Subfunction	Keypad Entry	Display	Expansion (Press  key)
8 INPUTS	 	INPUTS	SYSTEM INPUTS
		CSA1 X	COMPRESSOR A1 STATUS X
		CSB1 X	COMPRESSOR B1 STATUS X
		CFA1 X	COMPRESSOR A1 SAFETY X
		CFB1 X	COMPRESSOR B1 SAFETY X
		OAC X	OUTSIDE AIR CFM X
		IAQ X	INDOOR AIR QUALITY X
		SFS X	SUPPLY FAN STATUS X
		ENT X	ENTHALPY SWITCH X
	X  *	ENT X	ENTHALPY SWITCH X (0 = High, 1 = Low)
		RH X	RELATIVE HUMIDITY X
	X  *	RH X	RELATIVE HUMIDITY X (0 to 100%)
		FRZ X	FREEZE STAT X
		OARH X	OUTSIDE AIR RELATIVE HUMIDITY X
	X  *	OARH X	OUTSIDE AIR RELATIVE HUMIDITY X (0 to 100%)
		FLTS X	FILTER STATUS X
	X  *	FLTS X	FILTER STATUS X (0 = Clean, 1 = Dirty)
		STO X	SPACE TEMP OFFSET X
		EVAC X	EVACUATION X
		PRES X	PRESSURIZATION X
		PURG X	SMOKE PURGE X
		FSD X	FIRE SHUTDOWN X
9 ANALOG	 	ANALOG	ANALOG OUTPUTS
		IGV X	INLET GUIDE VANES X
		ECON X	ECONOMIZER X
		HCV X	HEATING COIL VALVE X
	X  *	HCV X	HEATING COIL VALVE X (0 to 100%)
		PERD X	POWER EXHAUST/RETURN DAMPER X
	X  *	HUM X	HUMIDIFIER 4-20 X
		HUM X	HUMIDIFIER 4-20 X (0 to 100%)

Table 11 – Keypad Directory (cont)

STATUS (cont)			
Subfunction	Keypad Entry	Display	Expansion (Press  key)
10 OUTPUTS		OUTPUTS	DISCRETE OUTPUTS
		SF X	SUPPLY FAN X
	X  *	SF X	SUPPLY FAN X (0=On, 1=Off)
		EC2P X	ECONOMIZER 2 POSITION X
	X  *	EC2P X	ECONOMIZER 2 POSITION X (0=Open, 1 = Closed)
		MM X	MOTOR MASTER/FAN STAGE 1 X
		FR2 X	OUTDOOR FAN 2 X
		FR3 X	OUTDOOR FAN 3 X
		SF2S X	2 SPEED SUPPLY FAN X
		EFRF X	EXHAUST/RETURN FAN X
		CPA1 X	COMPRESSOR A1 X
		CPB1 X	COMPRESSOR B1 X
		ULA1 X	UNLOADER A1 X
		ULB1 X	UNLOADER B1 X
		ULA2 X	UNLOADER A2 X
		ULB2 X	UNLOADER B2 X
		HS1 X	HEAT STAGE 1 X
		HS2 X	HEAT STAGE 2 X
		HS3 X	HEAT STAGE 3 X
		HS4 X	HEAT STAGE 4 X
		HS5 X	HEAT STAGE 5 X
		HIR X	HEAT INTERLOCK RELAY
		HUM1 X	HUMIDIFIER 1ST STAGE X
	X  *	HUM1 X	HUMIDIFIER 1ST STAGE X (0=On, 1=Off)
		HUM2 X	HUMIDIFIER 2ND STAGE X
	X  *	HUM2 X	HUMIDIFIER 2ND STAGE X (0=On, 1=Off)
		DTCC X	DISCRETE TIME CLOCK CONTROL X
	X  *	DTCC X	DISCRETE TIME CLOCK CONTROL X (0=On, 1=Off)
		PERD X	POWER EXHAUST/RETURN DAMPER X
11 STANDBY		STANDBY	STANDBY/RUN MODE (0=Run, 1=Standby)
		STBY X	UNIT IN STANDBY X

*An "X"  in the Keypad Entry column indicates that the reading can be forced by entering a value and then pressing . The valid force ranges are listed in the Expansion column.

†See page 49-50 for details on correct operation of these tests

**The supply-air fan is energized at this point and remains on for the duration of the compressor/heat test functions

††Compressors are energized for 10 seconds.

||Controls set point for economizer

LEGEND

AOSS — Adaptive Optimal Start/Stop
CONT — Continuous
CV — Constant Volume
DAV — Digital Air Volume
DD — Day
DTCC — Discrete Time Clock Control
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EXH — Exhaust
HH — Hour
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MAINT — Maintenance
MIN — Minimum
MM — Month
MOD — Modulating

MPD — Modulating Power Dampers
NTFC — Nighttime Free Cooling
OVRD — Override
RTN — Return
STAT — Status
TEMP — Temperature
VAV — Variable-Air Volume
YY — Year

NOTES:

- 1 Alarm no. will only be displayed if ALARM is present
- 2 Alert no. will only be displayed if ALERT is present
- 3 If unit is not configured for a certain subfunction, that subfunction will not show up when scrolling through values.

Table 11 – Keypad Directory (cont)

Subfunction	Keypad Entry	TEST	
		Display	Expansion (Press  key)
1 INPUTS		INPUTS	FACTORY/FIELD TEST OF INPUTS
			
		CSA1 X	COMPRESSOR A1 STATUS X
		CSB1 X	COMPRESSOR B1 STATUS X
		CFA1 X	COMPRESSOR A1 SAFETY X
		CFB1 X	COMPRESSOR B1 SAFETY X
		IAQ X	INDOOR AIR QUALITY X
		OAC X	OUTSIDE AIR CFM X
		SFS X	SUPPLY FAN STATUS X
		ENT X	ENTHALPY SWITCH X
		RH X	RELATIVE HUMIDITY X
		FRZ X	FREEZE STAT X
		OARH X	OUTSIDE AIR RELATIVE HUMIDITY X
		FLTS X	FILTER STATUS X
		EVAC X	EVACUATION X
		PRES X	PRESSURIZATION X
		PURG X	SMOKE PURGE X
		FSD X	FIRE SHUTDOWN X
		SCTA X	CIRCUIT A SATURATED CONDENSING TEMP X
		STA X	CIRCUIT A SUCTION TEMP X
		SSTA X	CIRCUIT A SATURATED SUCTION TEMP X
		SHA X	CIRCUIT A SUCTION SUPERHEAT
		SCTB X	CIRCUIT B SATURATED CONDENSING TEMP X
		STB X	CIRCUIT B SUCTION TEMP X
		SSTB X	CIRCUIT B SATURATED SUCTION TEMP X
		SHB X	CIRCUIT B SUCTION SUPERHEAT
		SAT X	SUPPLY AIR TEMP X
		RAT X	RETURN AIR TEMP X
		SPT X	SPACE TEMP X
		OAT X	OUTSIDE AIR TEMP X
		CEWT X	CONDENSER ENT WATER TEMP X
		DPA X	CIRCUIT A DISCHARGE PRESSURE SENSOR X
		SPA X	CIRCUIT A SUCTION PRESSURE SENSOR X
		LPA X	CIRCUIT A LOW PRESSURE SWITCH X
		DPB X	CIRCUIT B DISCHARGE PRESSURE SENSOR X
		SPB X	CIRCUIT B SUCTION PRESSURE SENSOR X
		LPB X	CIRCUIT B LOW PRESSURE SWITCH X
		BP X	BUILDING PRESSURE X
		SP X	STATIC PRESSURE X

*An "X"  in the Keypad Entry column indicates that the reading can be forced by entering a value and then pressing . The valid force ranges are listed in the Expansion column.

†See page 49-50 for details on correct operation of these tests.

**The supply-air fan is energized at this point and remains on for the duration of the compressor/heat test functions.

††Compressors are energized for 10 seconds.

||Controls set point for economizer.

Table 11 – Keypad Directory (cont)

TEST (cont)			
Subfunction	Keypad Entry	Display	Expansion (Press  key)
2 ANALOG OUTPUTS		ANLGOUT	FACTORY/FIELD TEST OF ANALOG OUTPUTS
		IGV	INLET GUIDE VANES TEST
		IGV TST	TESTING INLET GUIDE VANES
		ECON	ECONOMIZER TEST
		ECON TST	TESTING ECONOMIZER
		HCV	HEATING COIL VALVE TEST
		HCV TST	TESTING HEATING COIL VALVE
		PERD	POWER EXHAUST/RETURN DAMPER TEST
		PERD TST	TESTING EXHAUST/RETURN DAMPER
		HUM	HUMIDIFIER 4-20 TEST
		HUM TST	TESTING HUMIDIFIER 4-20
3 DISCRETE OUTPUTS		DISCOUT	FACTORY/FIELD TEST OF DISCRETE OUTPUTS
		SF	SUPPLY FAN
		SF TEST	TESTING SUPPLY FAN
		EC2P	ECONOMIZER 2 POSITION TEST
		EC2P TEST	TESTING ECONOMIZER 2 POSITION
		MM	MOTOR MASTER TESTS
		MM TEST	TESTING MOTOR MASTER
		FR2	OUTDOOR FAN 2 TEST
		FR2 TEST	TESTING OUTDOOR FAN 2
		FR3	OUTDOOR FAN 3 TEST
		FR3 TEST	TESTING OUTDOOR FAN 3
		SF2S	2 SPEED SUPPLY FAN TEST
		SF2S TST	TESTING 2 SPEED SUPPLY FAN
		EFRF	EXHAUST/RETURN FAN TEST
		EFRF TST	TESTING EXHAUST/RETURN FAN
		ULA1	UNLOADER A1 TEST
		ULA1 TST	TESTING UNLOADER A1
		ULB1	UNLOADER B1 TEST
		ULB1 TST	TESTING UNLOADER B1
		ULA2	UNLOADER A2 TEST
		ULA2 TST	TESTING UNLOADER A2
		ULB2	UNLOADER B2 TEST
		ULB2 TST	TESTING UNLOADER B2
		HUM1	HUMIDIFIER 1ST STAGE TEST
		HUM1 TST	TESTING HUMIDIFIER 1ST STAGE
		HUM2	HUMIDIFIER 2ND STAGE TEST
		HUM2 TST	TESTING HUMIDIFIER 2ND STAGE
		DTCC	DISCRETE TIME CLOCK CONTROL TEST
		DTCC TST	TESTING DISCRETE TIME CLOCK CONTROL
		PERD	POWER EXHAUST/RETURN DAMPER TEST
		PERD TST	TESTING EXHAUST/RETURN DAMPER

Table 11 – Keypad Directory (cont)

TEST (cont)			
Subfunction	Keypad Entry	Display	Expansion (Press  key)
4 COMPRESSOR TESTS	 	COMPRSR	FACTORY/FIELD TEST OF COMPRESSOR
		CPA1**	COMPRESSOR A1 TEST
		CPA1 TST	TESTING COMPRESSOR A1††
		CPB1	COMPRESSOR B1
		CPB1 TST	TESTING COMPRESSOR B1††
5 HEAT STAGES	 	HEAT	FACTORY/FIELD TEST OF HEAT
		HS1**	STAGE 1 TEST
		STG1 TST	TESTING HEAT STAGE 1
		HS2	STAGE 2 TEST
		STG2 TST	TESTING HEAT STAGE 2
		HS3	STAGE 3 TEST
		STG3 TST	TESTING HEAT STAGE 3
		HS4	STAGE 4 TEST
		STG4 TST	TESTING HEAT STAGE 4
		HS5	STAGE 5 TEST
		STG5 TST	TESTING HEAT STAGE 5
6 EXIT TEST	 	EXIT TST	EXIT FACTORY/FIELD TEST
		TST CMPL	TEST COMPLETE

Table 11 – Keypad Directory (cont)

HISTORY			
Subfunction	Keypad Entry	Display	Comment
1 ALARM HISTORY	 	ALRMHIST	Alarm history
		ALARM X	Latest alarm expansion
		ALARM X	Previous alarm expansion
		ALARM X	Previous alarm expansion
		ALARM X	Previous alarm expansion
		ALARM X	Previous alarm expansion
		ALARM X	Previous alarm expansion
		ALARM X	Previous alarm expansion
		ALARM X	Previous alarm expansion
		ALARM X	Previous alarm expansion
2 MAINTENANCE HISTORY	 	MTN/HIS	Maintenance history
		mm dd yy	Latest service date

*An "X"  in the Keypad Entry column indicates that the reading can be forced by entering a value and then pressing . The valid force ranges are listed in the Expansion column.

†See page 49-50 for details on correct operation of these tests

**The supply-air fan is energized at this point and remains on for the duration of the compressor/heat test functions.

††Compressors are energized for 10 seconds.

‡Controls set point for economizer

LEGEND

AOSS — Adaptive Optimal Start/Stop
CONT — Continuous
CV — Constant Volume
DAV — Digital Air Volume
DD — Day
DTCC — Discrete Time Clock Control
DUR — Duration

EXH — Exhaust
HH — Hour
IAQ — Indoor-Air Quality
MAINT — Maintenance
MIN — Minimum
MM — Month
MOD — Modulating

MPD — Modulating Power Dampers
NTFC — Nighttime Free Cooling
OVRD — Override
RTN — Return
STAT — Status
TEMP — Temperature
VAV — Variable-Air Volume
YY — Year

NOTES:

1. Alarm no. will only be displayed if ALARM is present
2. Alert no. will only be displayed if ALERT is present
3. If unit is not configured for a certain subfunction, that subfunction will not show up when scrolling through values

Table 11 – Keypad Directory (cont)

SET POINT			
Subfunction	Keypad Entry	Display	Comment
1 SET POINTS	1 SET	SET POINT	System set points
	↓	OHSP X	Occupied heat set point X
	↓	OCSP X	Occupied cool set point X
	↓	UHSP X	Unoccupied heat set point X
	↓	UCSP X	Unoccupied cool set point X
	↓	SPSP X	Static pressure set point X
	↓	SASP X	Supply air set point X
	↓	HUSP X	Humidity set point X
2 DEMAND SET POINTS	2 SET	DEMAND	Demand limit set points
	↓	LSP X	Loadshed set point X
3 DATE AND TIME	3 SET	TIME	Current time
	↓	dow hh mm	Day of Week and Time
	↓	mm dd yy	Month, Day and Year
4 DAYLIGHT SAVINGS TIME	4 SET	DAYLIGHT	Daylight savings time
	↓	ENM X	Daylight enter month X
	↓	END X	Daylight enter day X
	↓	ENT hh mm	Daylight enter time X
	↓	LVM X	Daylight leave month X
	↓	LVD X	Daylight leave day X
	↓	LVT hh mm	Daylight leave time X
5 HOLIDAY TIMES	5 SET	HOLIDAY	Holiday configuration
	↓	mm dd.dur	Holiday mm dd dur days long
	↓	mm dd.dur	Holiday mm dd dur days long
	↓	mm.dd dur	Holiday mm.dd.dur days long
	↓	mm dd.dur	Holiday mm dd dur days long
	↓	mm dd dur	Holiday mm dd dur days long
	↓	mm dd dur	Holiday mm dd dur days long
	↓	mm dd dur	Holiday mm.dd.dur days long
	↓	mm.dd dur	Holiday mm dd dur days long
	↓	mm dd.dur	Holiday mm dd.dur days long
	↓	mm dd dur	Holiday mm.dd.dur days long
	↓	mm dd dur	Holiday mm dd.dur days long
	↓	mm dd dur	Holiday mm dd.dur days long
	↓	mm dd dur	Holiday mm.dd.dur days long
	↓	mm dd dur	Holiday mm dd dur days long
	↓	mm dd dur	Holiday mm.dd.dur days long
	↓	mm.dd.dur	Holiday mm dd dur days long
	↓	mm.dd.dur	Holiday mm dd dur days long
	↓	mm dd.dur	Holiday mm dd.dur days long
	↓	mm dd.dur	Holiday mm.dd.dur days long

Table 11 – Keypad Directory (cont)

SERVICE			
Subfunction	Keypad Entry	Display	Description
1 LOG ON/OFF	1 SRVC	LOG ON	Enter password followed by ENTR
	1 1 1 1 ENTR	LOGGED ON	Logged on ok
	↓ ENTR	LOG OFF	Press ENTR to log off
		LOGD OFF	Logged off ok
2 SOFTWARE VERSION	2 SRVC	VERSION	Software version
	↓	500054-XX	Software version number
3 FACTORY CONFIGURATION	3 SRVC	FACT CFG	Factory configuration
	↓	TYPE X	Unit type (0 = CV, 1 = VAV)
	↓	AWTP X	Air/water type (0 = Air, 1 = Water)
	↓	SIZE X	Unit size (024-030)
	↓	ULOP X	Number of unloaders 2/3/4
	↓	HPSP X	Head pressure set point (F)
	↓	HEAT X	Heat type (0 = None, 1 = Water/Steam, 2 = Elec, 3 = Gas)
	↓	HTSG X	Number of heat stages (0 to 5)
	↓	TRNS X	Transducer options (0 = No, 1 = Yes)
	↓	SF2S X	Two-speed supply-air fan (0 = No, 1 = Yes)
	↓	ECON X	Economizer (0 = None, 1 = Air, 2 = Hydronic, 3 = Two-Pos)
	↓	FANT X	Fan Type (0 = None, 1 = Exh, 2 = Mod Exh, 3 = Mod Rtn)
	↓	HUEN X	Humidifier control (0 = None, 1 = Analog, 2 = Discrete)
	↓	DTRS X	Data reset (0 = No, 1 = Yes) (Required to save edits)
	↓	DPA CALB	Calibrate discharge A pressure sensor
	↓	DPB CALB	Calibrate discharge B pressure sensor
	↓	SPA CALB	Calibrate suction A pressure sensor
	↓	SPB CALB	Calibrate suction B pressure sensor
4 ELEMENT BUS ADDRESS	4 SRVC	BUS ADDR	Element bus address
	↓	BUS X	Bus number (factory default = 0)
	↓	ADR X	Element address (factory default = 1)
5 UNITS	5 SRVC	UNITS X	English/metric system (0 = English, 1 = Metric)
6 USER CONFIGURATION	6 SRVC	USER CFG	User configuration
	↓	HUSN X	Humidity sensors (0 = None, 1 = Differential [2 Sensors], 2 = Space Override [1 Sensor])
	↓	SUSN X	Suction sensors (0 = No, 1 = Yes)
	↓	VENT X	Ventilation control (0 = MDP, 1 = IAQ, 2 = CFM, 3 = All)
	↓	MMAS X	Motormaster (0 = No, 1 = Yes)
	↓	PURG X	Indoor-air quality (0 = Disable, 1 = Enable)
	↓	NTEN X	Nighttime free cool (0 = Disable, 1 = Enable)

*An "X" in the Keypad Entry column indicates that the reading can be forced by entering a value and then pressing . The valid force ranges are listed in the Expansion column.

†See page 49-50 for details on correct operation of these tests.

**The supply-air fan is energized at this point and remains on for the duration of the compressor/heat test functions.

††Compressors are energized for 10 seconds.

‡Controls set point for economizer.

LEGEND

AOSS — Adaptive Optimal Start/Stop
CONT — Continuous
CV — Constant Volume
DAV — Digital Air Volume
DD — Day
DTCC — Discrete Time Clock Control
DUR — Duration

EXH — Exhaust
HH — Hour
IAQ — Indoor-Air Quality
MAINT — Maintenance
MIN — Minimum
MM — Month
MOD — Modulating

MPD — Modulating Power Dampers
NTFC — Nighttime Free Cooling
OVRD — Override
Rtn — Return
STAT — Status
TEMP — Temperature
VAV — Variable-Air Volume
YY — Year

NOTES:

1. Alarm no. will only be displayed if ALARM is present

2. Alert no. will only be displayed if ALERT is present

3. If unit is not configured for a certain subfunction, that subfunction will not show up when scrolling through values.

Table 11 – Keypad Directory (cont)

SERVICE (cont)			
Subfunction	Keypad Entry	Display	Description
6 USER CONFIGURATION (cont)	↓	OSEN X	Adaptive optimal start/stop (0 = Disable, 1 = Enable)
	↓	DLEN X	Demand limit (0 = Disable, 1 = Enable)
	↓	OHEN X	Occupied heating (0 = Disable, 1 = Enable)
	↓	RSEN X	Space temperature reset (0 = Disable, 1 = Enable)
	↓	DPEN X	Duct pressure control (0 = Disable, 1 = Enable)
	↓	FANM X	Fan mode auto/cont (0 = Auto, 1 = Cont)
	↓	TSCH X	Timed override schedules (1 = Unit, 2 = DTCC, 3 = Both)
	↓	TOVR X	Timed override value (0 to 4 hours)
	↓	LLAG X	Lead/Lag option (0 = Disable, 1 = Enable)
7 HEATING COIL	7 SRVC	HEATCOIL	Configure heating coil
	↓	MLG X	Master loop gain value
	↓	SMG X	Submaster gain value
	↓	SCV X	Submaster center value
	↓	FOV X	Fan off value (F)
	↓	SMR X	Submaster reference value
	X ENTR *	SMR X	Submaster reference value forced (35 to 140 F)
8 COOLING	8 SRVC	COOLING	Configure cooling parameters
	↓	MLG X	Master loop gain value
	↓	HHL X	High humidity limit (0 to 99%)
9 DUCT PRESSURE	9 SRVC	DUCTPRES	Configure duct pressure control
	↓	MLG X	Master loop gain value
	↓	SMG X	Submaster gain value
	↓	SCV X	Submaster center value
	↓	SMR X	Submaster reference value
	X ENTR *	SMR X	Submaster reference value forced (0.0 to 5.0 in wg)
10 ECONOMIZER	10 SRVC	ECONMIZR	Configure economizer
	↓	MLG X	Master loop gain value
	↓	SMG X	Submaster gain value
	↓	SCV X	Submaster center value
	↓	MDP X	Minimum damper position (percent open)
	↓	SMR X	Submaster reference value
	X ENTR *	SMR X	Submaster reference value forced (40 to 120)
	↓	DPSP X	Damper set point (F)
	X ENTR *	DPSP X	Damper set point forced (45 to 80 F)
	↓	OAE X	Outdoor air enthalpy value
	↓	RAE X	Return air enthalpy value
11 HEAT	11 SRVC	HEAT	Configure staged heat
	↓	MLG X	Master loop gain value
	↓	SMG X	Submaster gain value
	X ENTR *	SMR X	Submaster reference value forced (35 to 140)
12 NTFC	12 SRVC	NTFC	Configure nighttime free cool (NTFC)
	↓	NTLO X	NTFC lockout temp (min OAT to operate NTFC F)

Table 11 – Keypad Directory (cont)

SERVICE (cont)			
Subfunction	Keypad Entry	Display	Description
13 AOSS	13 SRVC ↓ ↓ ↓ ↓	AOSS	Configure adaptive optimal start/stop
		BLDF X	Building factor value (1 to 100; default = 10)
		UOCF X	24-hour unoccupied factor (0 to 99; default = 15)
		SETB X	Set point bias (0 to 10; default = 2)
		OSMT X	Maximum allowable stop time (10 to 120; default = 60)
14 SPACE TEMPERATURE RESET	14 SRVC ↓ ↓	SPCRESET	Configure space temperature reset
		RTIO X	Reset ratio (0 to 10; default = 3)
		LIMIT X	Reset limit (0 to 20; default = 10)
15 LOADSHED	15 SRVC ↓	LOADSHED	Configure loadshed
		LSGP X	Loadshed group number (1 to 16; default = 1)
16 IAQ	16 SRVC ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	IAQ	Configure indoor-air quality
		PRTY X	IAQ priority level
		IAQS X	IAQ Set point
		IAQG X	IAQ gain (–2 to 2)
		OCS X	Outdoor air cfm set point
		OACG X	Outdoor air cfm gain (1 to 20)
		IVL X	IAQ voltage low point
		IRL X	IAQ reference low point
		IVH X	IAQ voltage high point
		IRH X	IAQ reference high point
17 HUMIDITY	17 SRVC ↓ ↓ ↓ ↓ X ENTR ★	HUMIDITY	Configure humidity
		MLG X	Master loop gain value
		SMG X	Submaster gain value
		SCV X	Submaster center value
		SMR X	Submaster reference value
		SMR X	Submaster reference value forced (0 to 90)
18 BUILDING PRESSURE	18 SRVC ↓ ↓ ↓ ↓ X ENTR ★ ↓	BLD PRES	Configure building pressure
		MLG X	Master loop gain value
		SMG X	Submaster gain value
		SCV X	Submaster center value
		SMR X	Submaster reference value
		SMR X	Submaster reference value forced (0.0 to 0.5)
		BPS X	Building pressure set point

*An "X"  in the Keypad Entry column indicates that the reading can be forced by entering a value and then pressing . The valid force ranges are listed in the Expansion column.

†See page 49-50 for details on correct operation of these tests

**The supply-air fan is energized at this point and remains on for the duration of the compressor/heat test functions

††Compressors are energized for 10 seconds.

|| Controls set point for economizer

LEGEND

AOSS — Adaptive Optimal Start/Stop
CONT — Continuous
CV — Constant Volume
DAV — Digital Air Volume
DD — Day
DTCC — Discrete Time Clock Control
DUR — Duration

EXH — Exhaust
HH — Hour
IAQ — Indoor-Air Quality
MAINT — Maintenance
MIN — Minimum
MM — Month
MOD — Modulating

MPD — Modulating Power Dampers
NTFC — Nighttime Free Cooling
OVRD — Override
RTN — Return
STAT — Status
TEMP — Temperature
VAV — Variable-Air Volume
YY — Year

NOTES:

1. Alarm no. will only be displayed if ALARM is present

2. Alert no. will only be displayed if ALERT is present

3. If unit is not configured for a certain subfunction, that subfunction will not show up when scrolling through values

Table 11 – Keypad Directory (cont)

SERVICE (cont)			
Subfunction	Keypad Entry	Display	Description
19 ALERT LIMITS	19 SRVC	ALRTLMT	Configure alert limits
	↓	SPLO X	Space temp low alert limit/occupied X
	↓	SPHO X	Space temp high alert limit/occupied X
	↓	SPLU X	Space temp low alert limit/unoccupied X
	↓	SPHU X	Space temp high alert limit/unoccupied X
	↓	SALO X	Supply air temp low alert limit/occupied X
	↓	SAHO X	Supply air temp high alert limit/occupied X
	↓	SALU X	Supply air temp low alert limit/unoccupied X
	↓	SAHU X	Supply air temp high alert limit/unoccupied X
	↓	RALO X	Return air temp low alert limit/occupied X
	↓	RAHO X	Return air temp high alert limit/occupied X
	↓	RALU X	Return air temp low alert limit/unoccupied X
	↓	RAHU X	Return air temp high alert limit/unoccupied X
	↓	OATL X	Outdoor air temp low alert limit X
	↓	OATH X	Outdoor air temp high alert limit X
	↓	RHL X	Relative humidity low alert limit X
	↓	RHH X	Relative humidity high alert limit X
	↓	ORHL X	Outdoor air relative humidity low alert limit X
	↓	ORHH X	Outdoor air relative humidity high alert limit X
	↓	SPL X	Static pressure low alert limit X
	↓	SPH X	Static pressure high alert limit X
	↓	BPL X	Building pressure low alert limit X
	↓	BPH X	Building pressure high alert limit X
	↓	OACL X	Outdoor air cfm low alert limit X
	↓	OACH X	Outdoor air cfm high alert limit X
	↓	IAQL X	Indoor-air quality low alert limit X
	↓	IAQH X	Indoor-air quality high alert limit X
	↓	CWLO X	Condenser water low alert limit X
	↓	CWLH X	Condenser water high alert limit X
20 SERVICE HISTORY	20 SRVC	SERVHIST	Service history
	↓	CAT X	Circuit A run time
	↓	CBT X	Circuit B run time
	↓	SFT X	Supply-air fan run time
	↓	CYC X	Cycles stage 0 to stage 1
21 SERVICE MAINTENANCE	21 SRVC	SRV/MTN	Service maintenance alert
	↓	SMAL X	Service/maintenance alert limit (X hrs x 1000)
	↓	SMEH X	Service maintenance elapsed hours (X.X x 1000)
22 TIMED OVERRIDE HISTORY	22 SRVC	OVRDHIST	History of timed overrides
	↓	OHR X	Hours of timed overrides

Table 11 — Keypad Directory (cont)

SCHEDULE			
Subfunction	Keypad Entry	Display	Comments
1 OVERRIDE		OVRD xHR	Number of Override Hours (0 to 4 Hours); Schedule I
2 PERIOD 1		PERIOD 1	Period 1; Time Schedule I
		OCC HH MM	Occupied Time
		UNO HH MM	Unoccupied Time
		MON X	Monday Flag
		TUE X	Tuesday Flag
		WED X	Wednesday Flag
		THU X	Thursday Flag
		FRI X	Friday Flag
		SAT X	Saturday Flag
		SUN X	Sunday Flag
		HOL X	Holiday Flag
3 PERIOD 2		PERIOD 2	Period 2; Time Schedule I
4 PERIOD 3		PERIOD 3	Period 3; Time Schedule I
			Same as Period 1 Subfunction
5 PERIOD 4		PERIOD 4	Period 4; Time Schedule I
			Same as Period 1 Subfunction
6 PERIOD 5		PERIOD 5	Period 5; Time Schedule I
			Same as Period 1 Subfunction
7 PERIOD 6		PERIOD 6	Period 6; Time Schedule I
			Same as Period 1 Subfunction
8 PERIOD 7		PERIOD 7	Period 7; Time Schedule I
			Same as Period 1 Subfunction
9 PERIOD 8		PERIOD 8	Period 8; Time Schedule I
			Same as Period 1 Subfunction
10 OVERRIDE		OVRD XHR	Number of Override Hours (0 to 4 Hours); Schedule II
11 through 18 PERIOD 1 through PERIOD 8	 —	PERIOD 1 — PERIOD 8	Period 1 through Period 8; Time Schedule II
			Configure same as Period 1 subfunction, Time Schedule I

*An "X"  in the Keypad Entry column indicates that the reading can be forced by entering a value and then pressing . The valid force ranges are listed in the Expansion column.

†See page 49-50 for details on correct operation of these tests.

**The supply-air fan is energized at this point and remains on for the duration of the compressor/heat test functions.

††Compressors are energized for 10 seconds.

|| Controls set point for economizer.

LEGEND

AOSS — Adaptive Optimal Start/Stop	EXH — Exhaust	MPD — Modulating Power Dampers
CONT — Continuous	HH — Hour	NTFC — Nighttime Free Cooling
CV — Constant Volume	IAQ — Indoor-Air Quality	OVRD — Override
DAV — Digital Air Volume	MAINT — Maintenance	RTN — Return
DD — Day	MIN — Minimum	STAT — Status
DTCC — Discrete Time Clock Control	MM — Month	TEMP — Temperature
DUR — Duration	MOD — Modulating	VAV — Variable-Air Volume
		YY — Year

NOTES:

1. Alarm no. will only be displayed if ALARM is present.
2. Alert no. will only be displayed if ALERT is present.
3. If unit is not configured for a certain subfunction, that subfunction will not show up when scrolling through values.

UNIT START-UP CHECKLIST

MODEL NO.: _____

SERIAL NO.: _____

DATE: _____

TECHNICIAN: _____

PRE-START-UP:

- ☐ VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT
- ☐ REMOVE ALL SHIPPING HOLDDOWN BOLTS AND BRACKETS
- ☐ VERIFY THAT CONDENSATE CONNECTIONS ARE INSTALLED
- ☐ CHECK ALL ELECTRICAL CONNECTIONS AND TERMINALS FOR TIGHTNESS
- ☐ CHECK GAS PIPING FOR LEAKS (48NP ONLY)
- ☐ CHECK THAT INDOOR AIR FILTERS ARE CLEAN AND IN PLACE
- ☐ VERIFY THAT UNIT IS LEVEL
- ☐ CHECK CONDENSER FAN PROPELLERS FOR LOCATION IN ORIFICE AND TIGHTEN SETSCREWS
- ☐ VERIFY THAT FAN SHEAVES ARE ALIGNED AND BELTS ARE PROPERLY TENSIONED
- ☐ OPEN SUCTION, DISCHARGE, AND LIQUID LINE SERVICE VALVES
- ☐ CHECK OUTDOOR-AIR HOODS FOR PROPER INSTALLATION

START-UP

ELECTRICAL

SUPPLY VOLTAGE L1-L2 _____ L2-L3 _____ L3-L1 _____

- ☐ VERIFY FANS ARE ROTATING IN THE CORRECT DIRECTION

SUPPLY FAN AMPS _____ POWER EXHAUST FAN AMPS _____

MOTOR _____

COMPRESSOR AMPS — COMP NO. 1 L1 _____ L2 _____ L3 _____
— COMP NO. 2 L1 _____ L2 _____ L3 _____

TEMPERATURES

OUTDOOR-AIR TEMPERATURE _____ F DB (Dry Bulb)

RETURN-AIR TEMPERATURE _____ F DB _____ F WB (Wet Bulb)

COOLING SUPPLY AIR _____ F

GAS HEAT SUPPLY AIR (48NP ONLY) _____ F

PRESSURES

GAS INLET PRESSURE (48NP ONLY) _____ IN. WG

GAS MANIFOLD PRESSURE (48NP ONLY) VALVE NO. 1 _____ IN. WG VALVE NO. 2 _____ IN. WG

REFRIGERANT SUCTION CIRCUIT NO. 1 _____ PSIG CIRCUIT NO. 2 _____ PSIG

REFRIGERANT DISCHARGE CIRCUIT NO. 1 _____ PSIG CIRCUIT NO. 2 _____ PSIG

- ☐ VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS ON PAGE 71

CONTROLS START-UP CHECKLIST

CONTROL SETTINGS FOR NON-NETWORKED, FREESTANDING UNIT

PRELIMINARY CHECKLIST ITEMS (DETERMINE BEFORE CONFIGURING CONTROLS)

- ☐ UNIT TO BE OPERATED ON CONSTANT AIR VOLUME (CV) RATHER THAN VARIABLE-AIR VOLUME (VAV)
- ☐ CONFIRM THAT SPACE TEMPERATURE SENSOR (T55) HAS BEEN WIRED TO TB2, TERMINALS 1 AND 2
- ☐ CONFIRM THAT TUBING FOR SPACE AND SUPPLY DUCT PRESSURES HAS BEEN INSTALLED
- ☐ SET ENTHALPY CONTROL SET POINT ON STANDARD ECONOMIZER (IF ITEM F BELOW IS NOT PRESENT)
- ☐ SET SUPPLY FAN AND "CHECK FILTER" STATUS SWITCHES FOR JOB REQUIREMENTS

UNIT OPTION CHECKLIST

ITEM	PRESENT?	
A	☐	ECONOMIZER PRESENT
B	☐	CONSTANT VOLUME POWER EXHAUST (NOT AVAILABLE WITH ITEM C)
C	☐	VARIABLE VOLUME POWER EXHAUST (NOT AVAILABLE WITH ITEM B)
D	☐	VARIABLE INLET GUIDE VANES ON SUPPLY FAN (VAV ONLY)
E	☐	HOT GAS BYPASS
F	☐	OPTIONS MODULE (PSIO2)

(Controls Start-Up Checklist continued on page CL-3.)

CONTROL CONFIGURATION		
KEYBOARD ENTRY	DISPLAY	DESCRIPTION VALUES IN [] INDICATE FACTORY DEFAULTS
1 SRVC	LOG ON	Enter password followed by ENTR
1 1 1 1 1 1 ENTR	LOGGED ON	Logged on okay
3 SRVC ↓ X ENTR	FACT CFG TYPE X TYPE X	Factory configuration Unit type (0 = CV, 1 = VAV) [1 if item D above is present, 0 if not] Verify unit type and change if necessary
6 SRVC ↓ 0 ENTR	FACT CFG LLAG X DISABLE	Factory Configuration Use ↓ to access lead/lag option — disable with HGBP (Item E above) Disable lead/lag (0 = DIS, 1 = ENB) [1]
18 SRVC ↓ X ENTR	BLD PRES BPS .05 BPS X	Configure building pressure control (Item C above) Use ↓ for building pressure set point (range 0 to 5) [.05] Set building pressure set point per job requirements
1 SRVC ↓ ENTR	LOGGED ON LOG OFF LOGD OFF	Access log on/off function Use ↓ to access log off Logged off okay
1 TEST through 6 TEST	INPUTS	Run quick test to verify operation of unit functions (see page 63)
1 SET ↓ ↓ ↓ ↓ ↓ ↓ ↓	SETPOINT OHSP X OCSP X UHSP X UCSP X SPSP X SASP X	Set system set points per job requirements Set occupied heat set point (Range 55-80 F) [68] CV only Set occupied cool set point (Range 55-80 F) [78] CV only Set unoccupied heat set point (Range 40-80 F) [55] Set unoccupied cool set point (Range 75-95 F) [90] Set supply duct pressure set point (Range 0-5 0 in. wg) [1 5] Set supply air set point temperature (Range 45-70 F) [55]
3 SET ↓ ↓	TIME dow.hh mm mm.dd.yy	Current time/date Set day of week and time Set month, day, and year
4 SET	DAYLIGHT	Set daylight savings time begin/end dates. Required if job conditions require adjustment of clock for daylight savings time (see page 56)
5 SET	HOLIDAY	Set holiday dates. Required if job conditions require a different schedule on holidays than other days (see page 57)
2 SCHD through 18 SCHD	PERIOD X	Set occupied/unoccupied schedules. Required if job conditions require unit to enter unoccupied cycle at programmed times of day or days of week (see page 57)

STATUS FUNCTION — This function shows the current status of the alarm and alert codes, operating modes, capacity stages, operating set point, all measured system temperatures and pressures, superheat and saturated condensing temperature values, pressure switch positions, analog inputs, switch inputs, system component status, and unit standby/run (disable/enable) capability.

[1] [STAT] (Alarms) — Alarms are signals sent by the processor that one or more faults have been detected. Each fault is assigned a code number which is reported as an alarm code. Refer to NB,NP Diagnostic Alarm Codes and Possible Causes section on page 75 for specific alarm information. These codes indicate a failure that causes the unit to shut down, terminate an option, or results in the use of a default value as a set point.

Up to 10 alarms can be stored at once. To view them, press **[1] [STAT]** to enter the alarm displays and then press **[↓]** to move to the individual alarm displays. Press **[EXPN]** after a code has been displayed to expand the code into a full definition.

When a diagnostic code is stored in the display and the unit automatically resets, the code is entered into the alarm history. Codes for safeties, which do not automatically reset, are not deleted until the problem is corrected and the machine is switched to STANDBY, and then back to RUN mode.

The controls provide an alarm history of the last 9 alarms generated in the order of their occurrence. The alarm history deletes the first alarm displayed (oldest) once the tenth alarm is generated. This information is available by pressing **[1] [HIST]**.

[2] [STAT] (Alerts) — There are 23 input channels of alerts which are compared against their configured alert limits. If any channel is detected outside of these limits, the corresponding alert number will be displayed after pressing **[2] [STAT]** to determine if any alerts are present. The **[↓]** will display the first alert. Press **[EXPN]** after a code has been displayed to expand the code into a full definition.

Press **[19] [SRVC]** on the keypad to determine a configured alert limit. Then access the **[STAT]** subfunction per Table 12 to determine the actual value being monitored. Table 12 also indicates the acceptable high and low limits (both occupied and unoccupied modes) for the configured alerts and defines the factory preset default values. The alert will return to normal once the alert channel meets the criteria. The criteria for return to normal is the high limit minus a constant or the low limit plus a constant. See Table 13 for the list of constants. Items having no constant return to normal as soon as the unit returns to the acceptable range (between low and high limits).

Table 12 — Sensor Set Point Alert Limits and Default Values

NAME	DESCRIPTION	[STAT] SUBFUNCTION	OCCUPIED SPACE STATUS	ALERT DEFAULT (LOW)	ALERT DEFAULT (HIGH)	LOW LIMIT	HIGH LIMIT
SPT*	Space Temperature	[6] Temps	Occupied	65 F	80 F	-10 F	245 F
			Unoccupied	45 F	100 F	-10 F	245 F
SAT*	Supply-Air Temp	[6] Temps	Occupied	45 F	180 F	-40 F	245 F
			Unoccupied	35 F	180 F	-40 F	245 F
RAT*	Return-Air Temp	[6] Temps	Occupied	60 F	90 F	-40 F	245 F
			Unoccupied	35 F	120 F	-40 F	245 F
OAT	Outdoor-Air Temp	[6] Temps	Occupied/ Unoccupied	-40 F	125 F	-40 F	245 F
SP*	Static Pressure	[7] Pressure	Occupied	0 0 in. wg	5 0 in. wg	0.0 in. wg	5.0 in. wg
BP	Building pressure	[7] Pressure	Occupied	-0 25 in. wg	0.25 in. wg	-0.5 in. wg	0.5 in wg
OAC	Outdoor-Air Cfm	[8] Inputs	Occupied	0 cfm	50,000 cfm	0 cfm	50,000 cfm
RH*	Relative Humidity	[8] Inputs	Occupied	0%	100%	0%	100%
OARH	Outdoor-Air Relative Humidity	[8] Inputs	Occupied/ Unoccupied	0%	100%	0%	100%
IAQ	Indoor-Air Quality	[8] Inputs	Occupied	0 ppm	2000 ppm	0 ppm	2000 ppm

ppm — parts per million

*Once the unit changes from unoccupied to occupied mode, a programmed delay of 30 minutes takes place before any alert will be generated.

Table 13 — Alert Criteria Reset Value for Return to Normal

NAME	DESCRIPTION	CONSTANT VALUE
BP	Building Pressure	None
IAQ	Indoor-Air Quality	None
OAC	Outdoor-Air Cfm	None
OARH	Outdoor-Air Relative Humidity	2%
OAT	Outdoor-Air Temperature	1 F
RAT	Return-Air Temperature	1 F
RH	Relative Humidity	2%
SAT	Supply-Air Temperature	2 F
SP	Static Pressure	0.2 in. wg
SPT	Space Temperature	1 F

Certain analog alerts are only monitored when the unit is in the occupied mode. These alerts are SP (static pressure), RH (relative humidity), and BP (building pressure). Alerts will not be generated when the controls are in the unoccupied mode, even if the sensor value is outside the configured limits.

The OAT (outdoor-air temperature) and OARH (outdoor-air relative humidity) analog alerts are monitored at all times and generate alerts whenever the sensor value exceeds the corresponding alert limits. The SAT (supply-air temperature), SPT (space temperature), RAT (return-air temperature), SP, and RH have alert limits for both the occupied and unoccupied modes (see Table 12). A 30-minute delay is used when changing from unoccupied to occupied mode on these alerts. The SP and RH alerts use the delay period after the occupied mode is entered before determining if an alert condition is present.

3 STAT (Modes)— The operating mode codes are displayed to indicate the operating status of the unit at a given time. To enter the modes subfunction, press **3 STAT** and use the **↓** to determine if more than 1 mode is in effect. See Table 14 for a list of the modes and mode names.

The current operating modes are:

Space Temperature Reset (21) (VAV) only — This mode uses temperature reset to adjust the supply-air set point upward. The unit controls to the modified supply-air temperature set point. The set point is modified based on the space temperature, occupied cooling set point, and user-defined reset ratio and limit.

Demand Limit (22) — Demand limit is only available on units connected to the Carrier Comfort Network (CCN). Initially, the capacity of the unit is limited by the demand limit control redline alert command, and demand limit is in effect. When demand limit is in effect, the unit may not be able to produce the desired leaving-air temperature. A loadshed command is received, and the capacity of the system is reduced to the loadshed set point.

Unoccupied Heating (23) — This mode indicates that the space temperature is below the unoccupied heating set point (or the morning warm-up set point, if applicable) and the heat is on. When the space temperature rises above the set point, the heat stages and the unit are turned off. The economizer will remain closed during unoccupied heating.

Unoccupied Cooling (24) — This mode indicates that the space temperature is above the unoccupied cooling set point

and the unit is on. When the space temperature falls below the set point, the unit is turned off and the economizer will remain closed.

Standby (25) — Standby mode indicates that the unit is being held in an inoperative mode by the user. This is the case when the RUN/STANDBY mode is configured to standby.

Optimal Start (26) — This mode allows cooling or heating to be used to bring space temperature up or down to the occupied set point in time for the occupied period.

NOTE: Morning warm-up will initiate both mode 26 (optimal start) and mode 23 (unoccupied heating).

Unoccupied (27) — This mode indicates the period when the time schedule that has been input has the unit in an unoccupied mode.

IAQ Purge (28) — Purge mode directs the economizer dampers to full open and operates the supply-air fan for a user-configured purge duration starting 2 hours prior to the occupied start time.

NOTE: DO NOT use this feature in conjunction with a hot water or steam coil.

Table 14 — Mode Numbers and Names (**3 STAT)**

MODE NUMBER	MODE NAME
21	Space Temperature Reset (VAV Only)
22	Demand Limit
23	Unoccupied Heating
24	Unoccupied Cooling
25	Standby
26	Optimal Start
27	Unoccupied
28	Indoor-Air Quality Purge
29	Optimal Stop
30	Occupied Heating
31	Occupied Cooling
32	Occupied Fan Only
33	Nighttime Free Cooling
34	Pressurization
35	Evacuation
36	Smoke Purge
37	Fire Shutdown
38	Timed Override
39	Digital Air Volume Control
40	Quick Test
41	High Humidity Override

NOTES

- Optimal start will initiate both mode 26 (optimal start) and mode 23 (unoccupied heating).
- Do not use mode 28 (IAQ purge) in conjunction with a VAV hot water or steam coil.

Optimal Stop (29) — This mode allows space temperature to drift to an expanded occupied set point during the last portion of the current occupied period (constant volume applications only).

Occupied Heating (30) — Occupied heat mode initiates heating stages to provide supply-air temperature required to satisfy heating set point during occupied time period. The economizer is at the minimum position.

Occupied Cooling (31) — Occupied cool mode provides supply-air temperature required to satisfy cooling set point during occupied time period using economizer operation (if the outdoor-air enthalpy is suitable); and then adds stages of cooling as needed.

Occupied (32) — Portion of inputted time schedule when unit is programmed to run and cool and heat modes are not operating according to occupied control set points. This applies to both CV and VAV applications.

Nighttime Free Cooling (33) — This mode starts the supply-air fan and uses the economizer (if outdoor air is satisfactory) to precool space during early morning unoccupied hours (3 to 7 a.m.).

Building Pressurization (34) — The intent of building pressurization is to keep smoke out of a zone. During building pressurization:

- The HIR is on
- the optional economizer dampers open (if equipped)
- the supply-air fan runs (the optional inlet guide vanes are open)
- the optional modulating power exhaust dampers are closed (if installed)
- the optional power exhaust fan is off (if installed)

This allows the space to be overpressurized and smoke will not enter the space. See Table 15 for full details.

Evacuation (35) — This function allows the rooftop unit to remove smoke from the space. During evacuation:

- the HIR is off
- the economizer dampers are open
- the power exhaust fan is running
- the power exhaust dampers are open
- the supply-air fan is off

Note that the optional economizer and modulating power exhaust are required for the evacuation function. See Table 15 for full details.

Smoke Purge (36) — The smoke purge function allows the rooftop unit to remove smoke from the space. During smoke purge:

- HIR is on
- the economizer dampers are open
- the power exhaust fan is running
- the power exhaust dampers are open
- the supply-air fan is on

Note that the optional economizer and modulating power exhaust are required for the smoke purge function. See Table 15 for full details.

Fire Shutdown (37) — During the fire shutdown mode, the unit shuts off and all dampers (except return-air) close. See Table 15 for full details.

Timed Override (38) — The timed override mode provides a one to 4 hour temporary override of the programmed schedule and forces the unit into the occupied mode. Override can be implemented from the HSIO keypad by pressing

1 **SCHD** and entering the override hours desired. Override can also be implemented by pressing the button on the T55 or T56 space temperature sensor(s) (when configured) in the occupied space. The duration of the current override is defined under the **6** **SRVC** timed override value (TOVR). Override expires after each use.

NOTE: Unit must go into an unoccupied mode before another override can begin.

DAV Control (39) — This mode indicates that the unit is being controlled through the CCN network and is connected to a DAV system (VAV terminals with digital controls). Unit occupancy schedule and the space temperature reset are overridden by the DAV system.

Factory/Field Test (40) — This mode indicates that the unit is configured to display all inputs and exercise all output channels.

High Humidity Override (41) — This mode indicates that the humidity is above the high humidity override value and cooling is initiated. This can only be enabled for unit with gas, steam, or hot water heat.

4 **STAT** (Stages) — This subfunction displays the information about the current stage. A capacity stage number, from 0 to 6 for cooling and 0 to 5 for heating is displayed to indicate the number of active stages. See Table 16 for compressor loading sequences. To access the cooling stages

Table 15 — Operating Mode Details

MODE	PRESSURIZATION	EVACUATION	SMOKE PURGE	FIRE SHUTDOWN
DISPLAY CODE (MODE)	34	35	36	37
POWER EXHAUST FAN	Off	On	On	Off
SUPPLY-AIR FAN	On	Off	On	Off
ECONOMIZER DAMPERS	Open	Open	Open	Close
RETURN-AIR DAMPERS	Close	Close	Close	Open
POWER EXHAUST DAMPERS	Close	Open	Open	Close
SUPPLY-AIR FAN INLET GUIDE VANES	Open, Control To Static Pressure Set Point	Close	Open, Control To Static Pressure Set Point	Close
HEAT INTERLOCK RELAY	On	Off	On	Off
ELECTRIC HEAT — ALL STAGES	Off	Off	Off	Off
HUMIDIFIER 1 AND 2	Off	Off	Off	Off

function, press **4** **STAT** and press the **↓** to display the number of cooling stages in operation. Press the **↓** key to display the following:

1. Cooling Percent Capacity — Percent of total unit cooling capacity being utilized.
2. Heating Stages — The number of active heating stages.
3. Heating Percent Capacity — Percent of total unit heating capacity being utilized.
4. Sum/Z Ratio — Load/unload factor is used to determine when compressors and unloaders will be staged. This factor indicates when the addition or subtraction of a step of capacity will occur.

5 **STAT** (Set Point) — This subfunction displays the operating set points that are currently in effect, either occupied or unoccupied. To access the control set point function, press

5 **STAT** and press the **↓** to display the current control set point.

NOTE: If unit is programmed for CV operation, this will be the cooling submaster reference value for cooling and the heating set point for heating. For units programmed for VAV operation, this will be the MSAS (supply-air set point + reset) for cooling and the heating set point for heating.

Press the **↓** to display the control temperature. This display is the actual supply-air temperature leaving the unit.

6 **STAT** (Temperature) — The system temperature subfunction displays the readings at the temperature sensing thermistors. To read a temperature, press **6** **STAT**, then scroll to the desired temperature reading by pressing the **↓** key.

Table 16 — Compressor Loading and Unloading Sequences

48NP/50NB,NP024 UNITS

COOLING STAGE	LEAD CIRCUIT			LAG CIRCUIT		ACTIVE COMP CYLINDERS	PERCENT CYLINDERS ACTIVE
	COMP A1	UL A1	UL A2	COMP B1	UL B1		
0	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	ON	OFF	OFF	2	20
2	ON	ON	OFF	OFF	OFF	4	40
3	ON	OFF	OFF	OFF	OFF	6	60
4	ON	OFF	OFF	ON	ON	8	80
5	ON	OFF	OFF	ON	OFF	10	100

48NP/50NB,NP024 UNITS (cont)

COOLING STAGE	LAG CIRCUIT			LEAD CIRCUIT		ACTIVE COMP CYLINDERS	PERCENT CYLINDERS ACTIVE
	COMP A1	UL A1	UL A2	COMP B1	UL B1		
0	OFF	OFF	OFF	OFF	OFF	0	0
1	OFF	OFF	OFF	ON	ON	2	20
2	OFF	OFF	OFF	ON	OFF	4	40
3	ON	ON	ON	ON	OFF	6	60
4	ON	ON	OFF	ON	OFF	8	80
5	ON	OFF	OFF	ON	OFF	10	100

48NP/50NB,NP028,030 UNITS

COOLING STAGE	LEAD CIRCUIT			LAG CIRCUIT			ACTIVE COMP CYLINDERS	PERCENT CYLINDERS ACTIVE
	COMP A1	UL A1	UL A2	COMP B1	UL B1	UL B2		
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	ON	OFF	OFF	OFF	2	17
2	ON	ON	OFF	OFF	OFF	OFF	4	33
3	ON	OFF	OFF	OFF	OFF	OFF	6	50
4	ON	OFF	OFF	ON	ON	ON	8	66
5	ON	OFF	OFF	ON	ON	OFF	10	83
6	ON	OFF	OFF	ON	OFF	OFF	12	100

COMP — Compressor
UL — Unloader

NOTE: ON means unloaded and OFF means loaded for unloaders.

7 **STAT** (Pressure) — The system pressure subfunction displays suction, discharge, low-pressure switch status, building pressure, and static pressure.

8 **STAT** (Inputs) — This subfunction displays the rest of the system inputs. Press **8** **STAT**, then press the **↓** key. The compressor A1 status is displayed with either ON or OFF based on whether the compressor is running or not. Press the **↓** key to access additional system inputs. Some inputs can be user forced by entering a value to replace the actual value. For example, press the **↓** key until the ENT display appears. The display will show ENT LOW or ENT HGH, indicating that the enthalpy is good (LOW) or bad (HGH). If the display is ENT HGH and the user wants to use outdoor air, pressing **1** **ENTR** will change the display to ENT LOW/FORCE 4; overriding or “forcing” the enthalpy status to be good. This allows economizer operation.

Refer to Table 11 for more information on “forcible” displays. To discontinue a forced command, press the **CLR** key. This removes the forced value and allows the unit to accept input from the controlling device.

The forced values are useful for problem diagnosis, and as a preliminary step before running the test function.

9 **STAT** (Analog Outputs) — This subfunction displays the status of the various analog outputs. Press the **↓** key to access additional analog outputs. Some outputs can be user forced by entering a value for the output. For example, press the **↓** key until the HCV display appears. The display will indicate an output value describing the heating coil valve percent open. If the display reads HEATING COIL VALVE 0 (valve closed) and the user wants to use the heating coil, pressing **100** **ENTR** will change the display to HEATING COIL VALVE 100/FORCE 4; overriding or forcing the heating coil valve to 100% open. This is useful for problem diagnosis and as a preliminary step before running the test function.

10 **STAT** (Outputs) — This subfunction displays the various system discrete outputs. These displays indicate the ability of the component or device to operate. It does not indicate that the component or device is functioning, but that the component or device has been energized by the control. Press the **↓** key to access additional discrete outputs. Some outputs can be user forced.

11 **STAT** (Standby) — The standby/run mode indicates the current capability of the unit. Press the **↓** key to access standby. This displays either a STBY NO (unit is in the run configuration) or STBY YES (unit is in standby and is not capable of operating). To change from STBY YES to STBY NO, either press the **CLR** key or **.** **ENTR**. To change from STBY NO to STBY YES, press **1** **ENTR**. This change to STBY YES will clear any alarms present on the unit.

TEST FUNCTION — The test function operates the “quick test” diagnostic program.

IMPORTANT: Be sure unit is in the standby mode (**11** **STAT**) PRIOR to initiating the test function. The standby/run mode under **11** **STAT** MUST read STBY YES. Test mode will not operate unless unit is in standby.

To operate a test:

1. Enter the desired test subfunction.
2. Press the **↓** to scroll to the desired test.
3. Press **ENTR** to start the test.

Pressing the **↓** key after a test has started advances the system to the next test whether the current test has timed out or not. If the keypad is not used for 10 minutes, the display will return to the rotating default display. You must press **6** **TEST** and **ENTR** to exit quick test. To restart the test procedure, press the **TEST** key.

To terminate the quick test press **6** **TEST**; EXIT TST will be displayed. Press **ENTR** and TST CMPL will be displayed, ending the quick test.

IMPORTANT: You MUST press **6** **TEST** **ENTR** to restore the unit software to automatic control. To return unit to run mode (STBY NO), refer to **11** **STAT** section on this page.

While the unit is in the test function, other functions can be accessed by pressing the appropriate keys. If a component is operating under a test function, it will remain operating when another function (such as temperatures or pressures under the status function) is accessed. The test function must be reentered to shut down that component.

1 **TEST** (Inputs) — The factory/field test of inputs function displays the current sensor input value (analog type) or status (discrete type). During the inputs portion of the quick test, the compressors and fan motors will not operate.

2 **TEST** (Analog Outputs) — The factory/field test of analog outputs causes the analog outputs to be cycled to specific output values. Each output is disabled by selecting the next output (press the **↓** or **↑** key).

To test inlet guide vanes:

1. Press **2** **TEST**. The display will be ANLGOUT.
2. Press the **↓** key once to scroll down. The display will read IGV (inlet guide vanes test).
3. Press the **ENTR** key to start the IGV test. The inlet guide vanes will go from fully closed (default position when unit starts) to 50% open.
4. Press the **ENTR** key again to drive the IGVs from 50% to 100% open.
5. Press the **ENTR** key again to change the IGVs from 100% open to fully closed.
6. Press the **↓** key once to scroll down. The display will read ECON (economizer test).

NOTE: The economizer, heating coil valve, and analog humidifier tests operate in the same manner as the IGV test. The PERD (modulating exhaust/return damper test) operates in a similar manner except that the sequence of operation when pressing the **ENTR** key is zero to 75% open (press **ENTR** once), 75% to 100% open (press **ENTR** again), 100% to 20% open (press **ENTR** again), and 20% to closed (press **ENTR** again).

3 **TEST** (Discrete Outputs) — The factory/field test of discrete outputs enables the discrete outputs. Each output is disabled when the next output is selected by pressing the **↓** or **↑** keys.

4 **TEST** (Compressors) — The factory/field test of compressors enables the supply-air fan and sets the inlet guide vanes to 30% when any compressor is selected. During the compressor test, the compressors will operate for ten seconds after the fan has been enabled.

NOTE: The service valves must be open, and the crankcase heaters should be energized for at least 24 hours before performing the compressor tests.

Once a compressor is operated using the test function, it is not allowed to operate again for 30 seconds. The supply-air fan and inlet guide vanes are not disabled until the compressor test is exited.

5 **TEST** (Heat) — During the factory/field test of heat the supply-air fan is enabled. As the fan starts, the inlet guide vanes are set to 30% open. The heat interlock relay is turned on when any stage of heat is selected. The test delays approximately 11 seconds after the fan is enabled and prior to energizing the first selected heat stage.

NOTE: Any selected heat stage causes that stage to be selected and all other stages will be disabled. The supply-air fan, inlet guide vanes, and heat interlock relay are *NOT* disabled until the heat test is exited.

48NP Units Only (Gas Heat) — Quick test of heat stage no. 1 does not fully test the gas heat. Everything will run, but the gas valve is not fully opened.

Quick test of stage 2 does nothing unless stage 1 is already energized. To fully test the gas heat, place a jumper between HR1-NO and HR2-NO **AFTER** quick testing stage 1. Then perform the quick test for stage 2.

6 **TEST** (Exit Test) — In order to exit the factory/field test mode, press **ENTR**. TST CMPL is displayed, and the expansion of TST CMPL (press **EXPN** key) indicates that the quick test has been terminated.

HISTORY FUNCTION — The history function allows the user to look at unit operational information.

1 **HIST** (Alarm History) — This subfunction allows the user to view the last 9 alarm codes and their descriptions. The oldest alarm is listed first and is replaced when the tenth alarm is generated. The first alarm listed (the oldest) continues to be shifted out as new alarms are generated.

2 **HIST** (Maintenance History) — The maintenance history subfunction displays the latest service date. A service technician can enter a new service date through the HSIO keypad. The entry of a service date shall be password protected. See Service Function section below for more details. The last 2 service dates are displayed at the building supervisor.

SERVICE FUNCTION — The service function allows the user to view and modify the unit configuration files. Factory, field, and service configuration data may be viewed, changed, and/or entered through the keypad and display module.

1 **SRVC** (Log on/Log off) — The service function is password protected by a non-changeable password. To log on, press **1** **SRVC** and the display will read LOG ON. Press **1** **1** **1** **1** **ENTR** and the display will change to LOGGED-ON. At this time, configurations may be viewed or modified. To log out, press **1** **SRVC** **↓** **ENTR** and the display will read LOGD OFF.

2 **SRVC** (Software Version) — This subfunction allows the user to view information about the software, such as the version number and language options.

3 **SRVC** (Factory Configuration) — This subfunction allows for factory configuration of the unit size, type, and options. Under this subfunction, there are a minimum of 7 configuration fields that are configured at the factory.

NOTE: If a processor is replaced in the field, these 7 configuration fields must be entered through the keypad at this subfunction.

To change a configuration:

1. Display present configuration field.
2. Enter the new configuration data.
3. Press the **ENTR** key (See Table 17 for more details).

Table 17 – Factory/Field Configuration Procedure

[illegible]

*Alarm 86, illegal configuration, will result if value is not inputted correctly

- AOSS** — Adaptive Optimal Start/Stop
- CV** — Constant Volume
- DTCC** — Discrete Time Clock Control
- ELEC** — Electric
- IAQ** — Indoor-Air Quality
- MOD** — Modulating
- NTFC** — Nighttime Free Cool
- SPT** — Space Temperature
- VAV** — Variable-Air Volume

NOTES:

- 1 Calibration of the pressure transducers is not required unless problems with the transducers occur or the standard PSIO is replaced To calibrate pressure transducers:
 - a. Disconnect from system
 - b. Hang in the atmosphere

- c. Read pressure Pressures before calibration must be in the range of ± 3 psig (atmosphere)
 - d. Press
 - e. Reattach to system
2. Upon completion of the factory/field configuration step, move to the DTRS (Data Reset) subfunction Press , and all revised inputs will be loaded This procedure takes approximately 40 seconds The display returns to the default rotating display

IMPORTANT: The Data Reset function should be performed any time one or more of the values is configured See Note 2 above for more details

Table 17 – Factory/Field Configuration Procedure (cont)

KEYPAD ENTRY	DISPLAY	COMMENTS
6 SRVC	USER CFG	User configuration
↓	HUSN 0	Humidity sensors; Default = No (0 = No, 1 = Differential [2 sensors], 2 = Space Override [1 sensor])
↓	SUSN 0	Suction sensors (Enter value)
ENTR	SUSN X	0 = No, 1 = Yes
↓	VENT 0	Ventilation control (Enter value)
ENTR	VENT X	0 = SPT, 1 = IAQ, 2 = CFM, 3 = All
↓	MMAS 0	Head pressure control function (Enter value)
ENTR	MMAS X	0 = No, 1 = Yes
↓	PURG DIS	IAQ purge enable; Default = Disable (0 = Disable, 1 = Enable)
↓	NTEN DIS	NTFC enable; Default = Disable (0 = Disable, 1 = Enable)
↓	OSEN DIS	AOSS enable; Default = Disable (0 = Disable, 1 = Enable)
↓	DLEN DIS	Demand limit enable; Default = Disable (0 = Disable, 1 = Enable)
↓	OHEN DIS	Occupied heating enable; Default = Disable (0 = Disable, 1 = Enable)
↓ *	RSEN DIS	Space temperature reset enable; Default = Disable (0 = Disable, 1 = Enable)
↓	DPEN 0	Duct pressure control (Enter value)
ENTR *	DPEN X	0 = Disable, 1 = Enable
↓	FANM 0	Fan Mode (Enter value)
ENTR *	FANM X	0 = Automatic, 1 = Continuous
↓	TSCH 1	Timed Override Schedules (Enter value)
ENTR	TSCH X	1 = Unit, 2 = DTCC, 3 = Both
↓	TOVR 0	Timed Override Hours (Enter value)
ENTR	TOVR X	0, 1, 2, 3, or 4
↓	LLAG	Lead/Lag Option; Enter 0 = No or 1 = Yes

*Alarm 86, illegal configuration, will result if value is not inputted correctly

AOSS – Adaptive Optimal Start/Stop
CV – Constant Volume
DTCC – Discrete Time Clock Control
ELEC – Electric
IAQ – Indoor-Air Quality
MOD – Modulating
NTFC – Nighttime Free Cool
SPT – Space Temperature
VAV – Variable-Air Volume

NOTES:

1 Calibration of the pressure transducers is not required unless problems with the transducers occur or the standard PSIO is replaced To calibrate pressure transducers:

- a Disconnect from system
- b Hang in the atmosphere

c Read pressure. Pressures before calibration must be in the range of ± 3 psig (atmosphere)

d. Press

e Reattach to system.

2. Upon completion of the factory/field configuration step, move to the DTRS (Data Reset) subfunction. Press , and all revised inputs will be loaded This procedure takes approximately 40 seconds The display returns to the default rotating display.

IMPORTANT: The Data Reset function should be performed any time one or more of the values is configured. See Note 2 above for more details.

4 **SRVC** (Element Bus Address) — The element bus address subfunction is used to identify the unit address assignment when using the CCN network. The default bus number is zero and is factory set. When more than one unit is connected to the CCN, the element address must be changed on all but one unit. The element address system default is 1, and element address numbers cannot be repeated. Element address must be changed at the HSIO keypad.

5 **SRVC** (Units of Measure) — Measurements can be displayed in either English or SI Metric units. The default is English. To change units, press **5** **SRVC**. The display will be UNIT 0 (English units). Press **1** **ENTR** and the display will change to UNIT 1 (SI Metric units).

6 **SRVC** (User Configuration) — After logging on, this subfunction allows the user to read or change the factory configuration of user options. Table 17 shows the particular factory and user configurations that are factory set.

The majority of user configuration items are self-explanatory. However, the ventilation control requires the following information:

- 0 = economizer minimum position is controlled by minimum position entered.
- 1 = economizer minimum position is controlled by IAQ set point.
- 2 = economizer minimum position is controlled to maintain a constant outdoor-air cfm set point (with field-installed accessory).
- 3 = economizer will use the largest of the minimum set points as stated in 0, 1, and 2 settings above.

7 **SRVC** (Heating Coil) — This subfunction allows the user to view and modify the factory configuration of the heating coil.

The fan off value is the supply-air temperature that the hydronic heating coil valve will modulate open or closed to maintain during periods when the evaporator fan is off. This is designed to prevent coil freeze-up during off periods. This value can be set anywhere between 35 and 65 F, and the default value is 40 F.

8 **SRVC** (Cooling Coil) — This subfunction is used to read or change the configuration of the cooling coil parameters. The high humidity limit is the set point used when the cooling control will be overridden by the humidity control.

9 **SRVC** (Duct Pressure) — This subfunction is used to read or change the configuration of duct pressure control.

10 **SRVC** (Economizer) — The economizer subfunction is used to read or change the configuration of the economizer.

NOTE: The economizer dampers modulate to maintain a supply-air temperature equal to the damper set point (VAV only).

11 **SRVC** (Heat) — This subfunction is used to read or change the configuration of staged heat.

12 **SRVC** (Nighttime Free Cooling) — This subfunction is used to read or change the configuration of the nighttime free cooling option.

13 **SRVC** (Adaptive Optimal Start/Stop) — This subfunction is used to read or change the configuration of the adaptive optimal start/stop option. Refer to Carrier Comfort Network product literature for more information on configurations.

14 **SRVC** (Space Temperature Reset) — This subfunction is used to read or change the configuration of the space temperature reset. Refer to the Space Temperature Reset sections on pages 28 and 46 for more information.

15 **SRVC** (Loadshed) — This subfunction is used to read or change the configuration of loadshed. Loadshed is used to define the CCN groups for redline and loadshed functions. Groups 1 through 16 are acceptable values.

16 **SRVC** (Indoor-air quality) — This subfunction is used to read or change the configuration of the indoor-air quality option. Refer to the Indoor-Air Quality section on page 65 for more details.

17 **SRVC** (Humidity) — This subfunction is used to read or change the configuration of the humidity option.

18 **SRVC** (Building Pressure) — This subfunction is used to read or change the configuration of the building pressure option.

19 **SRVC** (Alert Limits) — This is used to read or change the configuration of the alert limits.

20 **SRVC** (Service History) — This subfunction is used to read the unit service history.

21 **SRVC** (Service/Maintenance Alert) — This is used to read or change the configuration of the service maintenance alert option.

NOTE: When the number of hours the supply-air fan has been energized reaches the alert limit, alert no. 173 is generated and SMEH 0.0 is displayed, resetting the supply-air fan's run time to 0 hours. The supply-air fan cumulative time energized can also be reset by pressing **2** **HIST** and entering a new service date. This function can be used to monitor standard service practices, such as lubrication of bearings and changing or cleaning filters.

22 **SRVC** (Override History) — This subfunction is used to read the status of the timed override history. This value is cumulative for the current 24-hour period (beginning at midnight).

NOTE: This subfunction is a "read only" option.

SET POINT FUNCTION — The set point function allows the user to view the current values set for the unit. From this function, the user can change the values.

Reading and Changing Set Points — To change the set point of a particular feature, enter the appropriate subfunction and scroll to the variable desired. Once the desired variable has been reached, type in the new value and press the **ENTR** key. The new value will appear in the display.

For example, the occupied cool set point is currently set at the default value of 78 F. To change the occupied set point to 72 F:

1. Press **1** **SET** **↓** **↓** to enter the set point function. The display will read OCSP 78.

2. Press **7** **2** **ENTR** and the display will read OCSP 72.

Set points can be changed by the user provided that the values are within the allowable range for the input. If the input is not within the allowable range, the original value will remain displayed. See Table 18 for allowable ranges and default values.

To change the demand limit set points, the functions must first be enabled in the field configuration subfunction. (See Table 19 for more details on operation modes.)

Table 18 — Set Point Ranges and Defaults

DISPLAY	SET POINT DESCRIPTION	DEFAULT VALUE	ALLOWABLE RANGE
OHSP	Occupied heat set point (F)*	68 F	55 to 80 F
OCSP	Occupied cool set point (F)*	78 F	55 to 80 F
UHSP	Unoccupied heat set point (F)*	55 F	40 to 80 F
UCSP	Unoccupied cool set point (F)*	90 F	75 to 95 F
HUSP	Humidity set point (percent)*	40%	0 to 100%
SPSP	Static pressure set point†	1.5 in wg	0 to 5.0 in wg
BPSP	Building pressure set point	0.05 in wg	0 to 50 in. wg
SASP	Supply air set point (F)	55 F	45 to 70 F
NTLO**	NTFC lockout temperature (F)	50 F	40 to 70 F
RTIO**	Reset ratio (F)	3 F	0 to 10 F
LIMT**	Reset limit (F)	10 F	0 to 20 F
LSP	Loadshed set point (percent)	50%	0 to 100%
MDP**	Minimum damper position (percent)	20%	0 to 100%
PES1**	Power exhaust on-set point 1 (percent)	90%	30 to 100%
PES2**	Power exhaust on-set point 2 (percent)	90%	30 to 100%
OACS**	Outdoor-air cfm set point	1	0 to 50,000 cfm
IAQS**	IAQ set point	1	0 to 2000 ppm
HHOR**	High humidity override (percent)	99	0 to 100%
ECST††	Economizer set point offset	3	1 to 10
USDB††	Unoccupied set point deadband	1	0 to 10

IAQ — Indoor-Air Quality
 NTFC — Nighttime Free Cooling
 PPM — Parts Per Million
 VAV — Variable-Air Volume

*Occupied space
 †Supply duct

**These items are found under the Service function

††These items are found under the Service function, and can only be accessed using either the Building Supervisor or Service Tool

NOTE: For VAV applications, the OHSP is the same as the morning warm-up set point, and the OCSP is the reset set point

Table 19 – Operating Modes

MODE NO.	OPERATING MODE	TO CONFIGURE OPTION		TO ENABLE MODE	
		Press	Display	Press*	Display
21	Space Temperature Reset	[14] [SRVC]	SPCRESET	[6] [SRVC]	RSEN ENB
22	Demand Limit	[15] [SRVC]	LOADSHED	[6] [SRVC]	DLEN ENB
23	Unoccupied Heating	[7] [SRVC]	HEATCOIL	—	—
		[11] [SRVC]	HEAT		
24	Unoccupied Cooling	[8] [SRVC]	COOLING	—	—
		[10] [SRVC]	ECONMIZR		
25	Standby	—	—	[11] [STAT]	STBY YES
26	Optimal Start	[13] [SRVC]	AOSS	[6] [SRVC]	OSEN ENB
27	Unoccupied	[2] [SCHD]	PERIOD 1	—	—
28	IAQ Purge	[16] [SRVC]	IAQ	[6] [SRVC]	PURG ENB
30	Occupied Heating	[7] [SRVC]	HEATCOIL	[6] [SRVC]	OHEN ENB
		[11] [SRVC]	HEAT		
31	Occupied Cooling	[8] [SRVC]	COOLING	—	—
32	Occupied	[2] [SCHD]	PERIOD 1	—	—
33	Nighttime Free Cooling	[12] [SRVC]	NTFC	[6] [SRVC]	NTEN ENB
34	Pressurization	See Table 15 for details			
35	Evacuation				
36	Smoke Purge				
37	Fire Shutdown				
38	Timed Override	From: HSIO or Building Supervisor		[1] [SCHD]	OVRD XHR
		From: T55 or T56		[6] [SRVC]	TSCH v TOVR v
39	DAV Control	—	—	—	—
40	Factory/Field Test	[1] through [6] TEST	—	—	INPUTS through EXIT
41	High Humidity Override	[8] [SRVC] [↓] [↓]	HHL X	[6] [SRVC]	HUSN X

— — Not Applicable

ENB — Enable

*Press the [↓] key until desired display appears once you have accessed the correct function.

1 **SET** (Set Point) — The system set point subfunction displays the occupied and unoccupied heat and cool set points, as well as the static pressure, supply air, and humidity set points.

2 **SET** (Loadshed Set Point) — This subfunction displays the loadshed set point (in percent of unit capacity).

The demand limit/loadshed feature is activated by a redline alert and loadshed commands from the CCN loadshed option. Before any set points can be changed for demand limit, the user must first log into the system. Refer to example below for details on how to log in.

To disable demand limit:

1. Press **6** **SRVC** for the user configuration.
2. Press the **↓** key to scroll down until the display reads DLEN.
3. Press **.** **ENTR** to disable the demand limit option. The display now reads DLEN DSB.

To use demand limit, first enable the demand limit option (see example below), and then enter the loadshed set point.

NOTE: The demand limit function must be enabled in order to function and may be turned off when its operation is not desired.

In the following example, demand limit will be enabled, and the loadshed set point will be set at 60% of available capacity.

1. Press **1** **SRVC**
2. Press **1** **1** **1** **1** **ENTR**. (This is the login command.)
3. Press **6** **SRVC**. The display will read USER CONFIGURATION.
4. Press the **↓** key to scroll down until the display reads DLEN DSB.
5. Press **1** **ENTR** to change the demand limit selection. This will change the display to DLEN ENB; enabling loadshed control.
6. Press **2** **SET** to change to the demand limit set point function.
7. Press the **↓** once to change the display to LSP 50 (the default value).

8. Press **60** **ENTR**, and the display will change to LSP 60. The unit will reduce capacity to 60% when the loadshed command is in effect.

3 **SET** (Time) — The current time is displayed once the subfunction has been accessed. Press the **↓** key to scroll to the next display which will be the day of week and time. The day of the week is entered as a number:

- 1 = Monday
- 2 = Tuesday
- 3 = Wednesday
- 4 = Thursday
- 5 = Friday
- 6 = Saturday
- 7 = Sunday

Time is entered in military time format using a 24-hour clock (9:00 PM = 21:00), with the **.** used as a colon.

Press the **↓** key to scroll to the next display (the current date in month, date, and year format). The month is also entered as a number: 1 = January, 2 = February...12 = December.

In the following example, the day, time, and date will be set. Assume the current date is December 30, 1992, the day is Thursday, and the time is 4:45 p.m.

1. Press **3** **SET** to enter the day, date, and time subfunction. The display will read TIME.
2. Press **↓** to scroll down until the current day of the week and time programmed into the processor is displayed.
3. Press **4** **.** **1** **6** **.** **4** **5** **ENTR** for Thursday at 4:45 p.m. The display should read, THU 16.45.
4. Press **↓** to scroll down until the current date programmed into the processor is displayed.
5. Press **1** **2** **.** **3** **0** **.** **9** **2** for December 30, 1992. The display should read DEC 30 92.

4 **SET** (Daylight Savings Time) — This subfunction reads and displays daylight savings time.

The month is entered as a number: 1 = January, 2 = February, ...12 = December. The day of week and the time of day are entered as explained in **3** **SET** above. Refer to Table 20 on page 57.

Table 20 – Setting Daylight Savings Time

KEYBOARD ENTRY	DISPLAY	COMMENTS
4 SET	DAYLIGHT	Daylight savings time field configuration of set point function
↓	ENM X	Month when daylight savings time begins
4 ENTR	ENM 4	Daylight savings time configured to start month 4 (April)
↓	END X	Day of month when daylight savings time begins
16 ENTR	END 16	Daylight savings time configured to start on the 16th of the month
↓	ENT X	Time of day when daylight savings time begins
2 . 0 0 ENTR	ENT 2.00	Daylight savings time configured to start at 2:00 a.m. on the 16th of April
↓	LVM X	Month when daylight savings time ends
11 ENTR	LVM 11	Daylight savings time configured to end month 11 (November)
↓	LVD X	Day of month when daylight savings time ends
12 ENTR	LVD 12	Daylight savings time configured to end on the 12th of November
↓	LVT X	Time of day when daylight savings time ends
2 . 0 0 ENTR	LVT 2 00	Daylight savings time configured to end at 2:00 a.m. on November 12

(Holiday Periods) — The holiday configuration can set up to 18 Holiday periods for one calendar year. When the calendar year changes, the holidays must be reconfigured for the new year.

IMPORTANT: Because each new year has different holiday and daylight savings time dates, the holiday and daylight savings time periods must be reprogrammed each year.

SCHEDULE FUNCTION — Two schedules are provided with the unit controls. Schedule I provides a means to automatically switch the unit from an occupied mode to an unoccupied mode. Schedule II provides a means to automatically change the optional discrete output (such as outdoor building or parking lot lights) from occupied to unoccupied mode.

Each schedule consists of from 1 to 8 occupied time periods set by the operator. These time periods can be flagged to be in effect or not in effect on each day of the week.

a. To flag a day for operation on that schedule, press

.

b. To change a flag to NO, press .

The day begins at 00.00 and ends at 24.00. The machine is in unoccupied mode unless a scheduled time period is in effect or an override period is in effect.

IMPORTANT: If an occupied mode is to extend past midnight, it must be programmed in the following manner: occupied period must end at 24.00 hours (midnight), and a new occupied period must be programmed to begin at 00.00 hours.

1 **SCHD** (Override) — The time schedule can be overridden to keep the unit in the occupied mode for between 1 and 4 hours on a one-time basis.

To override the unoccupied schedule, press **1** **SCHD** and the display will read OVRD OHR. Press the number of hours of override desired followed by **ENTR**. For example, for 3 hours of override, press **3** **ENTR**; changing the display to OVRD 3HR.

NOTE: Only whole numbers can be used.

To cancel the override, press **.** **ENTR** and the display will change back to the default display (OVRD OHR).

2 **SCHD** through **9** **SCHD** (Occupied and Unoccupied Schedules) — In this subfunction, the occupied and unoccupied times and days are scheduled.

In the following example, the building occupancy is on a set point schedule. There are 5 periods of time that must be programmed.

1. Period 1 is a 3-hour off-peak cool-down period from midnight to 3:00 a.m. following the weekend shutdown.
2. Period 2 is scheduled for Monday and Tuesday from 7:00 a.m. to 6:00 p.m.
3. Period 3 is scheduled for Wednesday, 7:00 a.m. to 9:30 p.m.
4. Period 4 is scheduled for Thursday and Friday from 7:00 a.m. to 5:00 p.m.
5. Period 5 is scheduled for Saturday from 7:00 a.m. to 12:00 p.m.

To program this schedule:

NOTE: This is an example of a schedule. Each application will require its own schedule that should be determined by the building load.

To Program Period 1:

1. Press **2** **SCHD** to enter the period 1 subfunction. The display will read PERIOD 1.
2. Press **↓** to scroll down to OCC (occupied time).
3. Press **0** **0** **.** **0** **0** **ENTR** for midnight.
4. Press **↓** to scroll down to UNO (unoccupied time).
5. Press **3** **.** **0** **0** **ENTR** for 3:00 a.m.

Next are the flags for each day.

6. Press the **↓** key to move to MON (Monday). Suppose that the display reads MON NO. To change the flag so that this period will be in effect, press **1** **ENTR**, and the display will change from MON NO to MON YES.
7. Scroll through the rest of the days (pressing the **↓** key) to be sure that no other days have been flagged. Suppose, for this example, Tuesday was flagged for this period. To change this period from YES to NO, press **.** **ENTR**, and the display will change to TUE NO.

To Program Period 2:

1. Press **3** **SCHD** to enter the period 2 subfunction. The display will read PERIOD 2.
2. Press the **↓** key to scroll down to OCC.
3. Press **7** **.** **0** **0** **ENTR** for 7:00 a.m.
4. Press the **↓** key to scroll down to UNO.
5. Press **1** **8** **.** **0** **0** **ENTR** for 6:00 p.m.

Next are the flags for each day.

6. Press the **↓** key to move to MON. Suppose that the display reads MON NO. To change the flag so that this period will be in effect, press **1** **ENTR**, and the display will change to MON YES.
7. Scroll through the rest of the days to flag Tuesday for this schedule and be sure that no other days have been flagged.

To Program Period 3:

1. Press **4** **SCHD** to enter the period 3 subfunction. The display will read PERIOD 3.
2. Press **↓** to scroll down to OCC.
3. Press **7** **.** **0** **0** **ENTR** for 7:00 a.m.
4. Press **↓** to scroll down to UNO.
5. Press **2** **1** **.** **3** **0** **ENTR** for 9:30 p.m.

Next are the flags for each day.

6. Press the **↓** key to move to MON. Suppose the display reads MON YES. To change the flag so that this period will not be in effect, press **.** **ENTR**, and the display will change to MON NO. Do the same for Tuesday. Scroll through the rest of the days to flag Wednesday for this schedule and be sure that no other days have been flagged.

To Program Periods 4 and 5: These can be programmed in the same manner as above, flagging Thursday and Friday yes for period 4 and Saturday yes for period 5.

To Program Periods 6, 7, and 8: Since these schedules are not used in this example, they should be programmed for OCC 00.00 and UNO 00.00.

NOTE: When a day is flagged yes for 2 overlapping periods, occupied time will take precedence over the unoccupied time. Occupied times can overlap in the schedule with no consequence.

The same scheduling procedures can be used to set optional discrete output schedule II. Subfunctions **2** **SCHD** through **9** **SCHD** define the schedule of the rooftop unit (schedule I). Subfunction **10** **SCHD** provides the override for schedule II. Subfunctions **11** **SCHD** through **18** **SCHD** define schedule of optional discrete output (schedule II).

NOTE: If the unit is connected to a DAV system, the unit time schedule is ignored. The time schedule should still be entered into the unit in case communications are lost with the network.

PRE-START-UP

Unit Preparation — Check to see that unit has been installed in accordance with these Installation Instructions and all applicable codes.

Compressor Mounting — Loosen compressor hold-down bolts until sidewise movement of the washer under each hold-down bolt head can be obtained. Do not loosen completely, as bolts are self-locking and will maintain adjustment.

Internal Wiring — Check all electrical connections in the unit control box; tighten as required.

Refrigerant Service Valves — All units have a Schrader-type service port on both suction lines. Be sure that caps on the ports are tight. All units have a discharge service valve on each compressor and a service valve on each liquid line. Be sure the valves are open before starting unit.

Crankcase Heaters — The crankcase heaters must be firmly attached inside the compressors. The crankcase heaters are energized when there is power to the unit. *Crankcase heaters must be energized with discharge service valve open for at least 24 hours prior to unit start-up in order to remove liquid refrigerant from the compressor crankcase.*

Compressor Oil — Check that compressor oil is visible in the sight glass of the compressor. All units are factory charged with oil. See Table 21. Observe oil level closely at start-up. If oil level is below the sight glass and cannot be seen, add oil until the level is approximately ¼ of sight glass. See Carrier Standard Service Techniques, Refrigerants, for procedures to add or remove oil.

If oil charge is above sight glass, do not remove any oil until the compressor crankcase heater has been on for at least 24 hours. When additional oil or a complete charge is needed, use only Carrier-approved compressor oil.

Approved oils:

Petroleum Specialties, Inc . . . Cyrol 150 (factory charge)
Texaco, Inc. Capella WF-32
Witco Co. Suniso 3GS

Do not use drained oil and do not use any oil that has been exposed to the atmosphere.

Table 21 — Oil Charge

UNIT 48NP/50NB,NP	OIL CHARGE (PTS)
024	18 (8 for 06D818 and 10 for 06D328)
028,030	20 (10 per compressor)

Unit Voltage — Be sure power source agrees with the unit nameplate rating.

Leak Test and Dehydration — Be sure there are no refrigerant leaks. All units are shipped with a complete operating charge of R-22 (Tables 1 and 2) and should be under sufficient pressure for leak testing after installation. If there is no system pressure, add refrigerant until a pressure is observed and then check for leaks. After leaks are repaired, dehydrate the system. For leak testing and dehydration procedures, see Carrier Standard Service Techniques, Refrigerants, Sections 6 and 7. Do not use the system compressors to evacuate the system.

Evaporator-Fan Belts, Pulleys, and Sheaves —

Belts, pulleys, and sheaves are factory installed. All pulleys are nonadjustable. Pulley A is installed in the unit. Pulley B is shipped in the unit and attached to the evaporator-fan motor bracket. See Tables 1 and 2.

See Tables 22A and 22B for complete listing of factory and field-supplied pulleys and belt connections. See Table 23 for air quantity limits.

Check the lubrication of fan and motor bearings. Bearings are shipped full of grease for corrosion protection and may run warm temporarily on start-up until the excess grease has discharged. Check bearing setscrews for tightness. Also check the tightness of the setscrews on the fan wheel and on the fan and motor sheaves. Check fan shaft bearing mountings for tightness.

Recheck sheave alignment and belt tension. See Adjustments section on page 68 for instructions.

Hand-turn the fan to make sure the fan wheel does not rub on the fan housing. The fan shaft and motor shaft must be freewheeling before power is applied to the unit.

Following the necessary electrical checks, check for fan bration. If excessive vibration occurs, check:

- drive misalignment
- mismatched belts
- wheels or sheaves loose on shaft
- loose bearings
- loose mounting bolts
- motor out of balance
- wheel out of balance (replace if necessary)

Check rotation of wheel with arrow on the fan housing. Check fan speed with a strobe-type tachometer, or use this formula:

$$\text{Fan Rpm} = \frac{\text{motor rpm} \times \text{motor sheave pitch diameter (in.)}}{\text{fan sheave pitch diameter (in.)}}$$

(Obtain motor rpm from the fan motor nameplate and read sheave pitch diameters marked on the fan and motor sheaves.)

Example:

Nameplate motor rpm 1750
Motor sheave pitch diameter (in.) 6.4
Fan sheave pitch diameter (in.) 12.4

$$\text{Fan Rpm} = \frac{1750 \times 6.4}{12.4} = 903 \text{ Rpm}$$

The maximum allowable rpm is 1200. Excessive fan speed may result in condensate carryover from the evaporator coil, fan motor overload, or wheel failure. See Table 23 for air quantity limits.

Table 22A – Evaporator-Fan Pulley Data – Standard Units

UNIT	FAN RPM	MOTOR PULLEY	BLOWER PULLEY	BELTS
		No. Grooves – Type – in.	No. Grooves – Type – in.	No. – Type – Size
48/50NP024	780*	2 – 3V – 4.75	2 – 3V – 10.6	2 – 3V – 560
	875*	2 – 3V – 5.30	2 – 3V – 10.6	2 – 3V – 560
	900*	2 – 3V – 4.12	2 – 3V – 8.0	2 – 3V – 500
	980*	2 – 3V – 4.50	2 – 3V – 8.0	2 – 3V – 500
	1090	3 – 3V – 5.00	3 – 3V – 8.0	3 – 3V – 500
	1160	3 – 3V – 5.30	3 – 3V – 8.0	3 – 3V – 500
50NB024	780*	2 – 3V – 4.75	2 – 3V – 10.6	2 – 3V – 850
	875*	2 – 3V – 5.30	2 – 3V – 10.6	2 – 3V – 850
	900*	2 – 3V – 4.12	2 – 3V – 8.0	2 – 3V – 800
	980*	2 – 3V – 4.50	2 – 3V – 8.0	2 – 3V – 800
	1090	3 – 3V – 5.00	3 – 3V – 8.0	3 – 3V – 800
	1160	3 – 3V – 5.30	3 – 3V – 8.0	3 – 3V – 800
48/50NP028	680	2 – 3V – 4.12	2 – 3V – 10.6	2 – 3V – 560
	825	2 – 3V – 5.00	2 – 3V – 10.6	2 – 3V – 560
	900*	2 – 3V – 4.12	2 – 3V – 8.0	2 – 3V – 500
	980*	2 – 3V – 4.50	2 – 3V – 8.0	2 – 3V – 500
	1090*	3 – 3V – 5.00	3 – 3V – 8.0	3 – 3V – 500
	1160	3 – 3V – 5.30	3 – 3V – 8.0	3 – 3V – 500
50NB028	680	2 – 3V – 4.12	2 – 3V – 10.6	2 – 3V – 850
	825	2 – 3V – 5.00	2 – 3V – 10.6	2 – 3V – 850
	900*	2 – 3V – 4.12	2 – 3V – 8.0	2 – 3V – 850
	980*	2 – 3V – 4.50	2 – 3V – 8.0	2 – 3V – 850
	1090*	3 – 3V – 5.00	3 – 3V – 8.0	3 – 3V – 850
	1160	3 – 3V – 5.30	3 – 3V – 8.0	3 – 3V – 850
48/50NP030	680	2 – 3V – 4.12	2 – 3V – 10.6	2 – 3V – 560
	825	2 – 3V – 5.00	2 – 3V – 10.6	2 – 3V – 560
	900	2 – 3V – 4.12	2 – 3V – 8.0	2 – 3V – 500
	980*	2 – 3V – 4.50	2 – 3V – 8.0	2 – 3V – 500
	1090*	3 – 3V – 5.00	3 – 3V – 8.0	3 – 3V – 500
	1160*	3 – 3V – 5.30	3 – 3V – 8.0	3 – 3V – 500
50NB030	680	2 – 3V – 4.12	2 – 3V – 10.6	2 – 3V – 850
	825	2 – 3V – 5.00	2 – 3V – 10.6	2 – 3V – 850
	900	2 – 3V – 4.12	2 – 3V – 8.0	2 – 3V – 850
	980*	2 – 3V – 4.50	2 – 3V – 8.0	2 – 3V – 850
	1090*	3 – 3V – 5.00	3 – 3V – 8.0	3 – 3V – 850
	1160*	3 – 3V – 5.30	3 – 3V – 8.0	3 – 3V – 850

*Indicates standard or optional pulley combinations available as shown in Physical Data tables. All other combinations are field supplied.

NOTE: 50NB, NP units with the high electric heat option cannot be run at this blower speed. The minimum speed with high electric heat option is 780 rpm.

Table 22B — Evaporator-Fan Pulley Data — Units with Inlet Guide Vane and Static Pressure Control Option

UNIT	FAN RPM	MOTOR PULLEY	BLOWER PULLEY	BELTS
		No. Grooves — Type — in.	No. Grooves — Type — in.	No. — Type — Size
48/50NP024	680	2 — 3V — 4.12	2 — 3V — 10.6	2 — 3VX — 510
	785*	2 — 3V — 4.75	2 — 3V — 10.6	2 — 3VX — 530
	875*	2 — 3V — 5.30	2 — 3V — 10.6	2 — 3VX — 530
	900*	2 — 3V — 4.12	2 — 3V — 8.0	2 — 3VX — 450
	985*	2 — 3V — 4.50	2 — 3V — 8.0	2 — 3VX — 450
	990	2 — 3V — 6.00	2 — 3V — 10.6	2 — 3VX — 530
	1075	2 — 3V — 6.50	2 — 3V — 10.6	2 — 3VX — 530
	1095	3 — 3V — 5.00	3 — 3V — 8.0	3 — 3VX — 475
	1160	3 — 3V — 5.30	3 — 3V — 8.0	3 — 3VX — 475
50NB024	680	2 — 3V — 4.12	2 — 3V — 10.6	2 — 3VX — 950
	785*	2 — 3V — 4.75	2 — 3V — 10.6	2 — 3VX — 950
	875*	2 — 3V — 5.30	2 — 3V — 10.6	2 — 3VX — 950
	900*	2 — 3V — 4.12	2 — 3V — 8.0	2 — 3VX — 900
	985*	2 — 3V — 4.50	2 — 3V — 8.0	2 — 3VX — 900
	990	2 — 3V — 6.00	2 — 3V — 10.6	2 — 3VX — 1000
	1075	2 — 3V — 6.50	2 — 3V — 10.6	2 — 3VX — 1000
	1095	3 — 3V — 5.00	3 — 3V — 8.0	3 — 3VX — 950
	1160	3 — 3V — 5.30	3 — 3V — 8.0	3 — 3VX — 950
48/50NP028	680	2 — 3V — 4.12	2 — 3V — 10.6	2 — 3VX — 500
	785	2 — 3V — 4.75	2 — 3V — 10.6	2 — 3VX — 500
	875	2 — 3V — 5.30	2 — 3V — 10.6	2 — 3VX — 500
	900*	2 — 3V — 4.12	2 — 3V — 8.0	2 — 3VX — 450
	985*	2 — 3V — 4.50	2 — 3V — 8.0	2 — 3VX — 450
	990*	2 — 3V — 6.00	2 — 3V — 10.6	2 — 3VX — 530
	1075*	2 — 3V — 6.50	2 — 3V — 10.6	2 — 3VX — 530
	1095	3 — 3V — 5.00	3 — 3V — 8.0	3 — 3VX — 475
	1160	3 — 3V — 5.30	3 — 3V — 8.0	3 — 3VX — 475
50NB028	680	2 — 3V — 4.12	2 — 3V — 10.6	2 — 3VX — 950
	785	2 — 3V — 4.75	2 — 3V — 10.6	2 — 3VX — 950
	875	2 — 3V — 5.30	2 — 3V — 10.6	2 — 3VX — 950
	900*	2 — 3V — 4.12	2 — 3V — 8.0	2 — 3VX — 900
	985*	2 — 3V — 4.50	2 — 3V — 8.0	2 — 3VX — 900
	990*	2 — 3V — 6.00	2 — 3V — 10.6	2 — 3VX — 1000
	1075*	2 — 3V — 6.50	2 — 3V — 10.6	2 — 3VX — 1000
	1095	3 — 3V — 5.00	3 — 3V — 8.0	3 — 3VX — 950
	1160	3 — 3V — 5.30	3 — 3V — 8.0	3 — 3VX — 950
48/50NP030	680	2 — 3V — 4.12	2 — 3V — 10.6	2 — 3VX — 500
	785	2 — 3V — 4.75	2 — 3V — 10.6	2 — 3VX — 500
	875	2 — 3V — 5.30	2 — 3V — 10.6	2 — 3VX — 500
	900	2 — 3V — 4.12	2 — 3V — 8.0	2 — 3VX — 450
	985	2 — 3V — 4.50	2 — 3V — 8.0	2 — 3VX — 450
	990*	2 — 3V — 6.00	2 — 3V — 10.6	2 — 3VX — 530
	1075*	2 — 3V — 6.50	2 — 3V — 10.6	2 — 3VX — 530
	1095*	3 — 3V — 5.00	3 — 3V — 8.0	3 — 3VX — 450
	1160*	3 — 3V — 5.30	3 — 3V — 8.0	3 — 3VX — 450
50NB030	680	2 — 3V — 4.12	2 — 3V — 10.6	2 — 3VX — 950
	785	2 — 3V — 4.75	2 — 3V — 10.6	2 — 3VX — 950
	875	2 — 3V — 5.30	2 — 3V — 10.6	2 — 3VX — 950
	900	2 — 3V — 4.12	2 — 3V — 8.0	2 — 3VX — 900
	985	2 — 3V — 4.50	2 — 3V — 8.0	2 — 3VX — 900
	990*	2 — 3V — 6.00	2 — 3V — 10.6	2 — 3VX — 1000
	1075*	2 — 3V — 6.50	2 — 3V — 10.6	2 — 3VX — 1000
	1095*	3 — 3V — 5.00	3 — 3V — 8.0	3 — 3VX — 950
	1160*	3 — 3V — 5.30	3 — 3V — 8.0	3 — 3VX — 950

*Indicates standard or optional pulley combinations available as shown in Physical Data tables. All other combinations are field supplied.

Table 23 — Air Quantity Limits (cfm)

UNIT		MINIMUM	MAXIMUM
48NPD	024	4409*	10,000
	028	5000	12,500
	030	5400	12,500
48NPE	024	5757*	10,000
	028	5757*	12,500
	030	5757*	12,500
50NP (Except units with high heat)	024	4000	10,000
	028	5000	12,500
	030	5400	12,500
50NP (Units with high heat)	024	6000*	10,000
	028	7000*	12,500
	030	8100*	12,500
50NB	024	4000	10,000
	028	5000	12,500
	030	5400	12,500

*Due to heating.

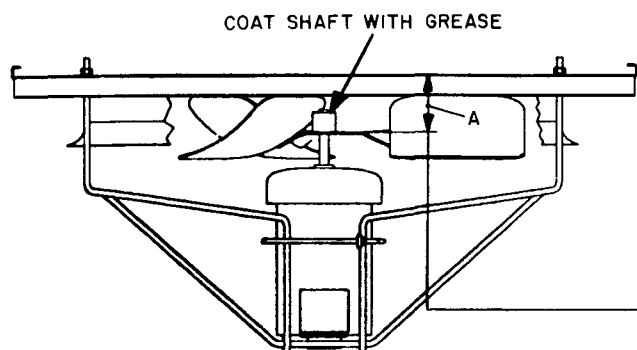
Condenser Fans and Motors — Each unit has 2 condenser fans and motors; these are factory set. See Fig. 20 for correct location of fan in orifice. Check that fan propeller rotation is correct; it should be counterclockwise when facing the fans.

Return-Air Filters — Check that the correct filters are installed in the filter rack. See Tables 1 and 2 for quantities and sizes. Access is through the door marked FILTER SECTION. Do not operate the unit without return-air filters.

Economizer Inlet Screens — Check that they are in place before operating the unit.

Economizer Dampers — With no power to the unit, the economizer outdoor air dampers should be fully closed. Check by opening the access door marked FILTER SECTION. On units with economizer, be sure economizer minimum positions are set at the desired settings. Be sure hoods are installed properly.

25% Outdoor-Air Damper (If Applicable) — On units without economizer, be sure accessory 25% outdoor-air damper is set at the desired position. Also, be sure hood is installed properly.



UNIT 48NP/50NB,NP	A DIMENSION (In.)
024	3.31
028	3.56
030	3.81

Fig. 20 — Condenser-Fan Adjustment

Initial Check

IMPORTANT: Do not attempt to start unit, even momentarily, until all items on the Start-Up Checklist and the following steps have been completed.

1. Verify unit has been installed per the Installation section of this literature.
2. Verify that all auxiliary components (sensors, controls, etc.) have been installed and wired to the NB,NP control boxes per these instructions and the unit wiring label diagrams.
3. Verify that pressure hoses (static, duct, etc.) are properly attached, routed, and free from pinches or crimps that may affect proper control operation.
4. Set any control configurations that are required (field-installed accessories, etc). The unit is factory configured for all appropriate factory-installed options with the applicable controls programmed to the default values. See Table 18 for configuration values.
5. Enter unit set points. The unit is shipped with the set point default values shown in Table 18. If a different set point is required, change per the example shown under Set Point Function section on page 54.
6. Configure schedule subfunctions: occupied, unoccupied, and holiday periods. See Schedule Function section on page 57 for details on setting periods.
7. Verify that control time periods programmed meet current requirements.
8. Check tightness of all electrical connections.
9. Perform quick test (see Quick Test section below).

Quick Test — The test function provides a check on control inputs and outputs, and can only be conducted when the unit is in the standby mode. To put the unit into the standby mode, press **11** **STAT**, then **↓**, then **1** **ENTR**.

The test function and associated subfunctions should be run to check all unit inputs and outputs prior to unit start-up. Refer to Test Function section on page 49 and Table 11 for full details on the test function and performing quick tests.

START-UP

General

1. Put the ON/OFF switch in the ON position. Close the control circuit breaker (CCB), which will energize the control circuit and the crankcase heaters.
2. Using the HSIO keypad or building supervisor, verify that no alarms have been detected.
3. Ensure that quick test has been performed to make sure controls are operating properly. Refer to Pre-Start-Up section on page 59 for instructions on quick test.
4. Using the HSIO keypad, put unit into the run mode:
 - a. Press **11** **STAT**.
 - b. Press **↓**.
 - c. Press **CLR**. This will put unit in "RUN" mode.
 - d. Press **3** **STAT** and the unit changes status from mode 25 (standby) to mode 32 (occupied) or mode 27 (unoccupied), depending on the programmed time schedule. When the unit receives a call for cooling or heating (either from the internal control or the CCN Network command), the unit will initiate activity to meet the respective set point value.

Operating Sequence

ADAPTIVE OPTIMAL START — Optimal start is used to heat up or cool down the space prior to occupancy. The purpose is to have the space temperature approach and then achieve the occupied set point by the time of occupancy. The control utilizes outdoor-air temperature, space temperature, occupied set point, and a "K" factor. The "K" factor is expressed in minutes per degree, and calculates a start time offset, which is the time in minutes that the system shall be started in advance of the occupied time. The control monitors its results and adjusts the "K" factor to ensure that the occupied set point is achieved at time of occupancy rather than too early or too late.

ADAPTIVE OPTIMAL STOP (CV Applications Only) — Optimal stop is used to allow space temperature to drift to an expanded occupied set point during the last portion of an occupied period. The control calculates a stop time offset, (the time in minutes prior to the scheduled unoccupied time) during which expanded heating and cooling set points can be used. Adaptive optimal stop utilizes space temperature, an expanded occupied set point, and a "K" factor to calculate stop time offset. The amount (F) to expand the occupied set point is user configurable. Like adaptive optimal start, the control corrects itself for optimal operation by adjusting the "K" factor as required.

COOLING

NOTE: The cooling algorithms used in the NB,NP units will only run when the supply-air fan is on.

Units With Economizer — The economizer will modulate to satisfy the supply-air set point if the outdoor-air enthalpy is suitable. If the economizer cannot satisfy the leaving-air set point, the economizer will remain at 100% open, and mechanical cooling will be initiated. If the outdoor-air enthalpy is not suitable, economizer will remain at minimum position during mechanical cooling.

CV Operation — The controls will compare the occupied space temperature to the occupied cooling set point. If the occupied space temperature is above the set point, the unit will commence cooling. The supply-air temperature set point that has been determined by the NB,NP software is compared to the actual supply-air temperature to determine when to add or remove stages of capacity to satisfy the load.

VAV Operation — The controls will compare the supply-air temperature to the modified supply-air set point. The modified supply-air temperature set point is compared to the actual supply-air temperature to determine when to add or remove stages of capacity to satisfy the load.

All Units — The controls try to control the supply-air temperature (SAT) to the value specified by the supply-air temperature set point by cycling the compressor and the unloader(s). Both the supply- and return-air temperature sensors are used to adjust the cycling deadband to match the actual load. The control system provides cooling capacity control of up to 6 stages, using 2 compressors and up to 4 unloaders, to maintain supply-air temperature (VAV) or space temperature (CV) to an occupied or unoccupied set point. Automatic lead-lag circuit switching occurs (if configured) to equalize run times per compressor for improved compressor reliability. The compressor to start first is changed every time stage equals zero.

NOTE: Automatic lead/lag should be disabled if optional hot gas bypass is employed because the unit only contains hot gas bypass on one circuit.

The CV control system sequence reads the space sensor and performs a calculation to determine the supply-air temperature required (a cooling coil submaster reference [CCSR] value) to satisfy conditions and outputs this value to the submaster loop.

The VAV control system sequence uses the modified supply-air set point ($MSAT = \text{supply-air set point} + \text{reset value}$) as the supply-air temperature required to satisfy conditions (submaster reference value) and outputs this value to the submaster loop.

The submaster loop uses the modified supply-air set point compared to the actual supply-air temperature to determine the required number of capacity stages to satisfy the load. The logic for determining when to add or subtract a stage is a time-based integration of the deviation from the set point plus the rate of change of the supply-air temperature.

If the supply-air temperature is above the set point and the supply-air temperature is increasing, SMZ (the capacity ratio) will increase.

- a. If the next capacity stage is a compressor, when $SMZ = 100\%$ a stage of capacity is added and SMZ is set to zero.
- b. If the next capacity stage is an unloader, a stage of capacity is added when $SMZ = 60\%$ and SMZ is set to zero.

If the supply-air temperature is below the set point and the rate of change is less than or equal to zero, then SMZ will decrease. If the next capacity stage is a compressor, when $SMZ = -100\%$ a stage is removed and SMZ is set to zero. If the next capacity stage is an unloader, when $SMZ = -60\%$ a stage is removed and SMZ is set to zero. SMZ is updated every 30 seconds.

First Stage and Slow Change Override — The first stage override reduces cycling on the first stage of capacity, and the slow change override prevents the addition or subtraction of another stage of capacity if the SAT is close to the set point and gradually moving towards the set point.

Low Temperature Override — Low temperature override protects against rapid load decreases by removing a stage every 30 seconds when required based on temperature and the temperature rate of change.

High Temperature Override — High temperature override protects against rapid load increases by adding a stage once every 60 seconds as required.

Time Delay — A time delay feature sets SMZ to zero for 90 seconds after each capacity change. This prevents the compressors from rapid cycling and permits oil to return to the compressors when there are short compressor cycles (excluding overrides).

The first compressor starts 1½ to 3 minutes after the call for cooling. During the initial start-up of a circuit, the low pressure input shall be ignored for 2 minutes. If shutdown occurs due to a compressor safety, the circuit is locked out and the appropriate fault code is displayed. If the low pressure alarm is generated, it may reset a maximum of 3 times automatically if low pressure alarm resets within 5 minutes after alarm is tripped (after initial 2 minute delay).

Automatic lead-lag circuit switching (if configured) occurs to equalize run times per compressor. The compressor to start first is changed each time the stage is equal to zero.

Space Temperature Reset — If optional space temperature reset (VAV only) is being used, the unit controls to a higher supply-air set point as the building load reduces to prevent overcooling. The supply-air temperature set point is reset upward as the space temperature falls below the occupied cooling set point (space set point) as a function of the reset ratio.

The reset ratio is used to raise the supply-air set point upward by X° F equal to the reset ratio times the number of ° F that the space temperature is below the occupied cooling set point. The new set point is called the modified supply-air set point (MSAT). The equation is:

$$\text{MSAT} = \text{supply air set point} + (\text{occupied cooling set point} - \text{space temperature}) \times \text{the reset ratio}$$

A reset limit should be configured which will limit the number of ° F that the supply-air set point may be raised. The modified set point (displayed as the control set point) is recalculated every 2 minutes. Both the reset ratio and the reset limit are user defined. For DAV systems, the average occupied zone temperature (AOZT) replaces space temperature in the MSAT calculation.

Demand Limit — If demand limit is in effect, the mode will be displayed on the HSIO display. If demand limit is being used (available on units connected to the CCN only), the unit may temporarily be unable to maintain the desired supply-air temperature because of imposed power limitations (loadshed set point). The demand limit option must be enabled before the control can receive and accept redline alert and loadshed commands from the network loadshed option.

When the redline alert is received, the control sets the current stage of capacity as the maximum stage of capacity. The redline alert can only be in effect for 1 hour. The redline alert will be cleared when the loadshed sends a command to clear the redline for the unit. Once the loadshed command is received, the unit reduces its present maximum stage of capacity by the user-defined percentage in the loadshed set point. This reduced capacity will be in effect for a maximum of 1 hour or until the loadshed is cleared by the loadshed option. If the 1 hour expires before the loadshed is

cleared by the loadshed option, the control will clear the loadshed command itself and return to normal control.

Units With Power Exhaust — On units configured with modulating power exhaust, the power exhaust fan will be energized when the building pressure set point is exceeded, and the damper will modulate to maintain the building pressure set point.

Head Pressure Control — The microprocessor controls the condenser fans to maintain the lowest condensing temperature and the highest operating efficiency possible. The condenser fan stages are configured to react to either saturated condensing temperatures (SCT) or refrigerant pressure sensors, or can be controlled by the lead compressor.

A low ambient head pressure control option is also included standard on all NB,NP units as an additional feature to allow fan cycling on the first stage. The first stage of head pressure control is cycled in the same manner as the Motormaster® II control. See Table 24.

The highest SCT is used to control the condenser (outdoor) fan motor(s) (OFM) controlled by the head pressure control relay (MMR). See Table 25 for fan control points. If FR2 is energized in addition to MMR, then MMR will always be energized.

The other stage of head pressure control is controlled by the SCT on standard units, or the SCT and suction transducers on units equipped with suction pressure transducers and suction sensors. Table 25 shows the fan configuration and lists the on and off points for FR2.

Table 25 also describes the fan sequence of operation and defines the particular fans controlled by stage. The OFM no. 1 is always the condenser fan on the right when viewing the unit from the condenser end.

HEATING

NOTE: The heating algorithms on the NB,NP units will only run when the supply-air fan is on. Two-stage factory-installed gas heat is standard on the 48NP units (but only the first stage is used on VAV applications).

When the unit is in the heating mode, room terminals must be fully open. The room terminals should be controlled by the heat interlock relay (HIR) on VAV applications.

NOTE: HIR not applicable on units using DAV applications.

During heating, the economizer dampers (if so equipped) will be at the minimum damper position during occupied heating mode, and will be fully closed during unoccupied heating.

Occupied CV Operation — The heater is staged to prevent the occupied space temperature from falling below the desired set point. The control reads the space temperature and computes the supply-air temperature necessary to heat the space to the heating set point. The NB,NP controls will compare the calculated supply-air temperature set point to the actual supply-air temperature to compute the number of stages required to satisfy the conditions.

Occupied VAV Operation — Heating is primarily used for morning warm-up or occupied space heating with the heater being staged to maintain desired return-air temperature. If the unit is in morning warm-up, the return-air temperature is read and compared to the occupied heating set point. The NB,NP controls will compare the calculated supply-air temperature set point to the actual supply-air temperature to compute the number of stages required to satisfy the conditions. Once morning warm-up is completed and the unit is in occupied mode, heat will not be activated again unless the occupied heating mode has been selected.

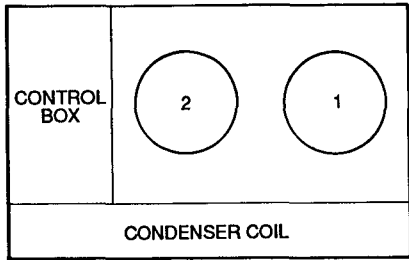
NOTE: Morning warm-up begins only before the time clock designated occupied time.

Table 24 – Fan Relay Operation

FAN RELAY (FR) OUTPUT (FAN STAGE NO.)	CONFIGURATION	OFM ON POINT	OFM OFF POINT
MM (Head Pressure Control Function)	Standard Fan Control (MMAS=NO)	Mechanical Cooling On	Mechanical Cooling Off
	Head Pressure Control w/SCT Sensors (MMAS=YES; Pressure Transducers=NO)	SCT > Head Pressure Set Point - 15 F	SCT < Head Pressure Set Point - 37 F For 90 Seconds
	Head Pressure Control w/Pressure Transducers (MMAS=YES; Pressure Transducers=YES)	SCT > 138 F OR Head Pressure > 330 psig	
FR2	Unit with either SCT OR Pressure Transducers (MMAS=YES; Pressure Transducers=NO)	SCT > Head Pressure Set Point	SCT < Head Pressure Set Point - 35 F for 2 Minutes
	Optional Suction Transducers AND Sensors Installed (MMAS=YES; Pressure Transducers=YES)		SCT < Head Pressure Set Point and Superheat > 30 F For 2 Minutes

FR – Fan Relay
OFM – Outdoor (Condenser) Fan Motor
SCT – Saturated Condensing Temperature

Table 25 – Fan Sequence of Operation

CONDENSER FAN CONFIGURATION			
Fan Arrangement	Fan Relay Output (Fan Stage No.)	Load Controlled	Fan ON
024-030 Units 	1 (MM)	MMC	OFM1
	FR2	OFC1	OFM2

LEGEND

FR – Fan Relay
MM – Head Pressure Control Function
MMC – Head Pressure Control Function Contactor
OFC – Outdoor (Condenser) Fan Contactor
OFM – Outdoor (Condenser) Fan Motor

Morning Warm-Up (VAV Only) – Morning warm-up occurs when the adaptive optimal start (AOS) algorithms start the unit before the occupied start time, and the unit has a heating demand. The morning warm-up control uses the occupied heating set point for controlling heat stages. Once the return air reaches the set point, heating will be shut off.

When the heating demand is satisfied, the warm-up condition will terminate. The unit may reenter morning warm-up if there is another call for heat before the start of the occupied period. Morning warm-up can continue into the occupied period as long as there is a need for heat, even if occupied heating is disabled.

NOTE: On units equipped with optional economizer, the dampers will be fully closed during morning warm-up, except when morning warm-up continues into the occupied period. If morning warm-up continues into the occupied period, the dampers will open to the minimum position to provide ventilation air.

Room terminals should go to the fully open position when the unit enters the heating mode. The terminals should be

controlled by the HIR, located in the unit control box. When the unit goes into heating mode, the HIR is energized and opens the room terminals.

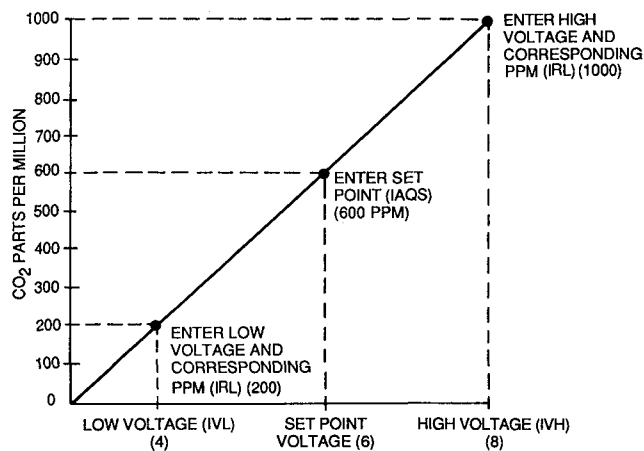
NOTE: Morning warm-up is initiated before the time clock designated occupied time.

Economizer Minimum Position – The control has the capability of maintaining the minimum economizer position based on 3 inputs when the optional PSIO module and economizer are installed. The 3 inputs are selected minimum position, outdoor-air cfm, and IAQ set points. The 6 SRVC VENT function is used to configure the control for the minimum position of the economizer.

Indoor-Air Quality (IAQ) – If the unit is configured to control the occupied space indoor-air quality by maintaining a constant cfm of outdoor air and/or an allowable level of undesirable gases or vapors (CO₂, CO, formaldehyde, etc.), it must be equipped with an economizer. The economizer dampers will modulate to maintain the user-defined set points.

If the gas or vapor level control is configured (VENT = 1), the IAQ priority should be set to either low or high. A low priority will cause an alarm to occur when the set point is exceeded, but will not attempt to correct the problem. A high priority will allow economizer damper modulation when the set point has been exceeded. An alert will be generated after 10 minutes if the air quality level has not been reduced below the set point. In the Service function, the high and low voltage readings for the sensor being used and the corresponding reference levels (in parts per million) for the voltages must be entered for proper operation. See Fig. 21 for example. For gas or vapor level, constant cfm (VENT = 2), or both (VENT = 3), a controlling set point must be entered.

NOTE: Consult the latest updated issue of ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) Standard 62 when determining required set points for indoor-air quality (ASHRAE 62, Ventilation for Acceptable Indoor-Air Quality section).



NOTE: Voltage range is 0 to 10

Fig. 21 – Sensor Use Example

SERVICE

Service Access — All unit components can be reached through clearly labelled hinged access doors. These doors are not equipped with tiebacks, so if heavy duty servicing is needed, either remove them or prop them open to prevent accidental closure.

Each door is held closed with 3 latches. The latches are secured to the unit with a single ¼-in. — 20 x ½-in. long bolt. See Fig. 22.

To open, loosen the latch bolt using a 7/16-in. wrench. Pivot the latch so it is not in contact with the door. Open the door. To shut, reverse the above procedure.

NOTE: Disassembly of the top cover may be required under special service circumstances. It is very important that the orientation and position of the top cover be marked on the unit prior to disassembly. This will allow proper replacement of the top cover onto the unit and prevent rain-water from leaking into the unit.

IMPORTANT: After servicing is completed, make sure door is closed and relatched properly, and that the latches are tight. Failure to do so can result in water leakage into the evaporator section of the unit.

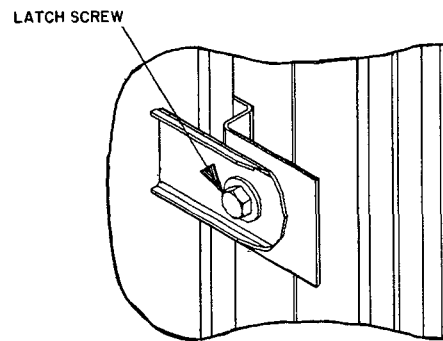


Fig. 22 – Door Latch

COMPRESSORS — Access to the compressors is through the door on the right side of the unit (when facing the condenser coil). This door also provides access to the discharge and liquid line service valves, the crankcase heaters, the filter driers, the sight glasses, and the high and low-pressure switches. Compressor no. 1 is compressor closest to the condenser coil.

EVAPORATOR-FAN MOTORS, PULLEYS, AND BELTS — Access to these components is through the 2 doors labelled FAN SECTION on the left side of the unit (when facing condenser coil).

UNIT CONTROL BOX — Access to this component is through the door marked ELECTRICAL SECTION on the left side of the unit (when facing condenser coil).

GAS HEAT SECTION (48NP Units Only) — Access to the gas section is through the door labelled HEAT SECTION on the left side of the unit (when facing condenser coil). See Fig 23 and 24.

All gas system components are in the gas section, except the limit switch(es). Find the limit switch(es) in the upper right side of the compressor section, behind the suction bell of the right compressor. Limit switch(es) is covered by a rainshield and held in place by 2 screws.

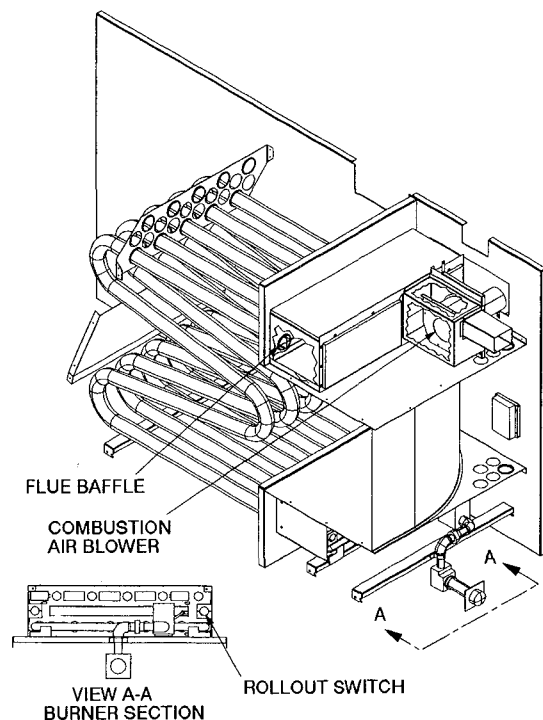


Fig. 23 – Gas Section Detail 48NPD (Low Heat)

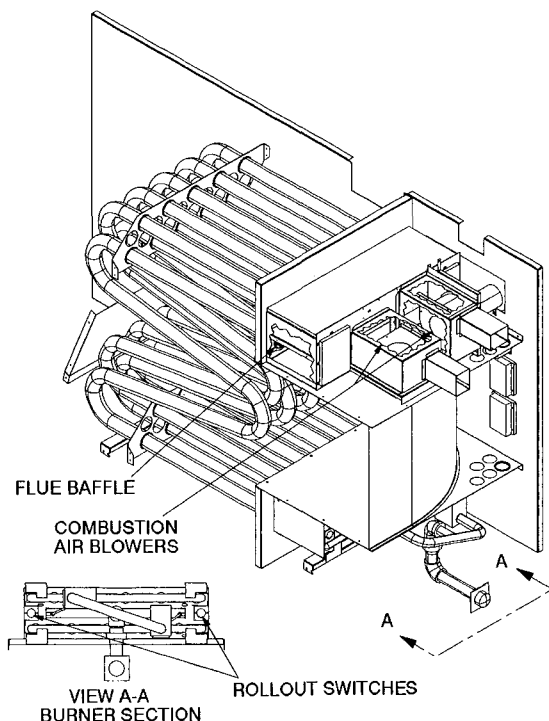


Fig. 24 — Gas Section Detail, 48NPE (High Heat)

MAIN AND PILOT BURNERS (48NP Units Only) — At the beginning of each heating season, inspect for deterioration due to corrosion or other causes. Observe the pilot and main burner flames through the viewport, contained in the condenser section, and adjust if necessary. See Automatic Pilot Adjustment or Main Burner Adjustment Sections on page 70.

FLUE GAS PASSAGEWAYS (48NP Units Only) — The flue collector box and heat exchanger cells may be inspected by removing the combustion-air blower(s), flue box cover, and main burner assembly. See Fig. 23 and 24 for proper removal sequence. If cleaning is required, remove heat exchanger baffles through the flue box and clean all parts with a wire brush. When replacing heat exchanger baffles, be sure to replace screw through clamp on baffle retaining rod into the vestibule plate.

COMBUSTION AIR BLOWER (48NP Units Only) — Clean periodically to assure proper airflow and heating efficiency. Inspect every blower wheel every fall and periodically during the heating season. For first heating season, inspect blower wheel bimonthly to determine proper cleaning frequency. Inspect wheel by shining a flashlight into the opening. If cleaning is required, remove blower assembly from unit and then disassemble as shown in Fig. 25.

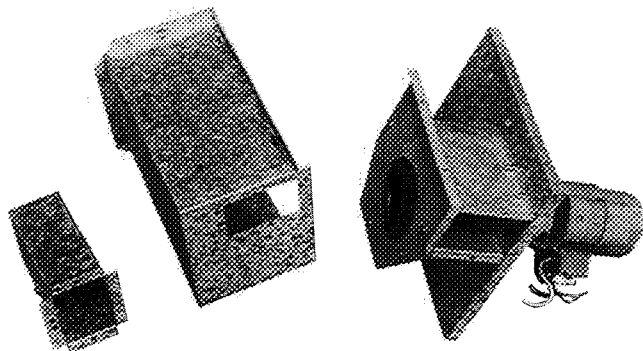


Fig. 25 — Combustion Blower Removal

ELECTRIC HEAT CONTROL BOX (50NB,NP Units Only)

Model 50NP — On these units, access to the electric heat control box is through the door marked **FAN SECTION** on the back end of the unit. (End opposite condenser coil.) Be sure to use the correct door, as there are 3 doors labelled **FAN SECTION**.

Model 50NB — On these units, access to the electric heat control box is through the door marked **HEAT SECTION**.

All Units — Electric heat control box contains (see Fig. 26):

- power terminal block HTB (high-heat units only)
- fuse blocks, FB1, FB2, etc.
- fuses FU (3 per fuse block)
- heater contactors HC1, HC2, etc.

HEATER BOX (50NB,NP Units Only)

Model 50NP — Access to the heater box on these units is through the last door on the left side of the unit (when facing condenser coil). Door is marked **FAN SECTION**. Box is mounted directly under evaporator fan.

Model 50NB — Access to the heater box on these units is through the door marked **HEAT SECTION**.

All Units — Heater box contains:

- heater limit switches LS1, LS2, etc.
- heater elements HTR1, HTR2, etc.

NOTE: Only the heater element connectors are located in the heater box. The heater elements themselves are in the airstream.

ECONOMIZER DAMPER MOTOR — On units so equipped, the economizer motor is located on a bracket in the return air section. Access to it is through the door labelled **FILTER SECTION** on the far end of the unit (when facing condenser coil).

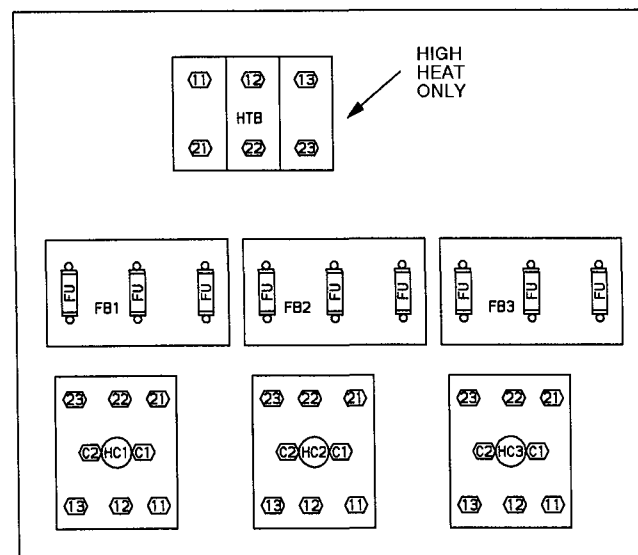


Fig. 26 — Typical Electric Heat Control Box Component Arrangement

25% OUTDOOR-AIR DAMPER — Access to adjust the 25% outdoor-air damper is through the door marked **FILTER SECTION**. To adjust the far side linkage arm, climb into the unit.

POWER EXHAUST MOTOR — Remove the power exhaust hood to gain access to motor.

MODULATING POWER EXHAUST DAMPER MOTOR (Units With Modulating Power Exhaust Option) — The modulating power exhaust damper motor is located in the power exhaust hood assembly. Access to the motor is through the lower right-hand hood side plate (right-hand side when facing the hood). To reach the motor, remove the channel clip between economizer hoods and power exhaust fan deck and remove the 8 screws in the hood side plate.

RETURN-AIR FILTERS — Access to these filters is through the door marked **FILTER SECTION**.

CONDENSER FANS AND FAN MOTORS — Remove the wire fan guard on top of the unit to gain access to the condenser fans and motors.

INLET GUIDE VANE MOTOR (Units With Inlet Guide Vane and Static Pressure Control Option) — The inlet guide vane motor is located next to the evaporator fan. Access is the same as for evaporator fan motor, pulleys, and belts, as described in Service Access section on page 66. Figure 27 shows the location of the inlet guide vane damper motor.

MODULATING POWER EXHAUST DIFFERENTIAL PRESSURE TRANSDUCER — The differential pressure transducer is located in the small control box mounted in the corner next to the access door labelled **FILTER SECTION**. See Fig. 27. To gain access to this box, remove the control box cover. When replacing cover, be sure to properly secure it in order to prevent water from being drawn into the unit.

INLET GUIDE VANE DIFFERENTIAL PRESSURE TRANSDUCER (Units With Inlet Guide Vane and Static Pressure Control) — The inlet guide vane motor differential pressure transducer is located in the small control box mounted in the corner next to the access door labeled **FILTER SECTION**. To gain access to this box, remove the control box cover. See Fig. 27.

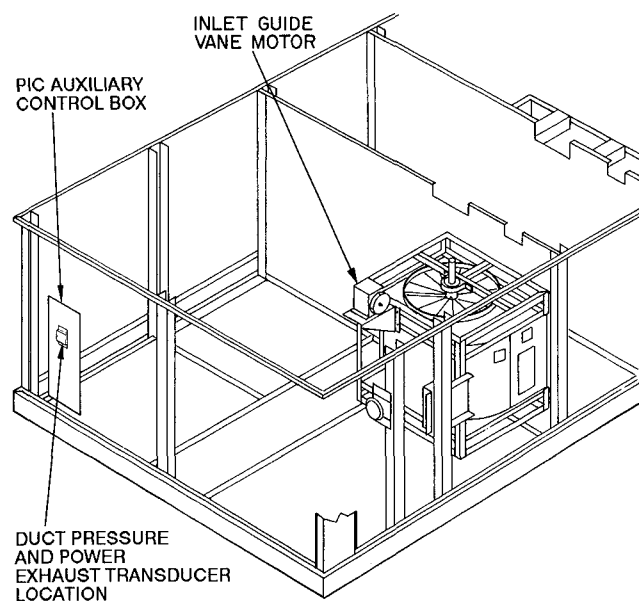


Fig. 27 — Location of Differential Pressure and Modulating Power Exhaust Transducers and Inlet Guide Vane Motor

Cleaning — Inspect unit at the beginning of each heating and cooling season and during each season as operating conditions may require.

Clean condenser coil with a vacuum cleaner, fresh water, compressed air, or a bristle brush (not wire). Coil cleaning should be a part of the planned maintenance program. Clean evaporator coil with a stiff bristle brush (not wire), vacuum cleaner, or compressed air.

Check and clean condensate drain annually at the start of the cooling season. In winter, keep drain and traps dry or protect against freeze-up.

Replace return-air filters at the start of each heating and cooling season and as often as necessary during each season, depending on operating conditions. See Tables 1 and 2 for filter types, quantities, and sizes.

Remove economizer outdoor-air filters from the hoods by removing the filter retainers. Clean filters with steam or hot water and mild detergent. Reinstall in hoods after cleaning. Never replace cleanable filters with throwaway filters.

Lubrication

COMPRESSORS — Each compressor is correctly charged at the factory. Refer to 06D Compressor Service Manual if additional information regarding compressor lubrication system is required. Also see Compressor Oil section on page 59.

FAN SHAFT BEARINGS — Lubricate fan shaft bearings at least once a year with suitable bearing grease. Typical lubricants are given below:

MANUFACTURER	LUBRICANT
Texaco	Regal AFB-2*
Mobil	Mobilplex EP No. 1
Sunoco	Prestige 42
Texaco	Multifak 2

*Preferred lubricant because it contains rust and oxidation inhibitors

INLET GUIDE VANE BEARINGS — These bearings are oil impregnated. Annually lubricate with a few drops of non-detergent SAE 20 oil.

FAN MOTOR BEARINGS — The condenser-fan motors and the evaporator-fan motor(s) have sealed bearings so no field lubrication is required.

DOOR HINGES — All door hinges should be lubricated at least once a year.

Adjustments

EVAPORATOR-FAN MOTOR PLATE — Adjust using a $\frac{15}{16}$ -in. wrench on the bolts shown in Fig. 28. Turn the bolts counterclockwise to move the motor mounting plate toward the fan and loosen the belts; turn clockwise to move the plate away from the wheel and tighten the belts. Make the same number of turns to each bolt.

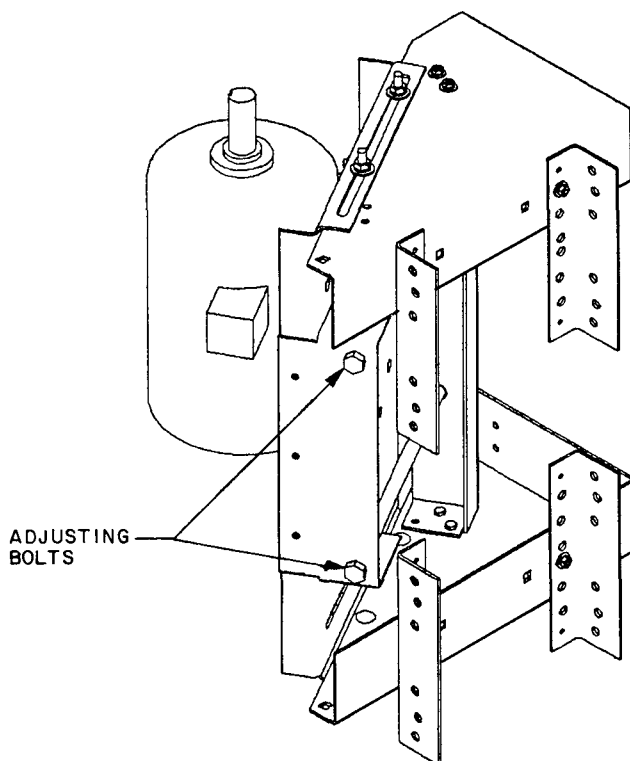


Fig. 28 — Evaporator-Fan Motor Adjustment

BELT INSTALLATION AND TENSIONING

NOTE: When installing or replacing belts, always use a complete set of new, matched belts. Mixing belts often results in premature breakage of the new belts.

1. Turn off unit power.
2. Adjust motor plate so belt can be installed without stretching over the grooves of the pulley. (Forcing the belts can result in uneven belt stretching and a mismatched set of belts.)
3. Before tensioning the belts, equalize belt slack so that it is on the same side of the belt for all belts. Failure to do so may result in uneven belt stretching.
4. Tighten belts using the motor plate adjusting bolts.
5. Adjust until proper belt tension ($\frac{1}{2}$ -in. deflection with one finger) is obtained. Be sure to adjust both adjusting bolts the same numbers of turns.

NOTE: Check the tension at least twice during the first day of operation as there is normally a rapid decrease in tension until the belts have run in. Check tension periodically thereafter and keep it at the recommended tension.

With the correct belt tension, belts may slip and squeal momentarily on start-up. This slippage is normal and disappears after wheel reaches operating speed. Excessive belt tension shortens belt life and may cause bearing and shaft damage.

PULLEY ALIGNMENT — For proper belt life, the motor and fan pulleys must be properly aligned. To check, first turn off unit power. See Fig. 29. Place a straight edge against the motor and fan pulleys. If the pulleys are properly aligned, the straight edge should be parallel to the belts.

If they are not parallel, check that the motor shaft and fan shaft are parallel. If they are not, adjust the motor plate adjusting bolts until they are.

After verifying that the shafts are parallel, loosen the setscrews on the motor pulley. Move pulley on the shaft until the pulleys are parallel. To move the sheave on the shaft, loosen the belts. If necessary, blower sheave can also be moved on the shaft.

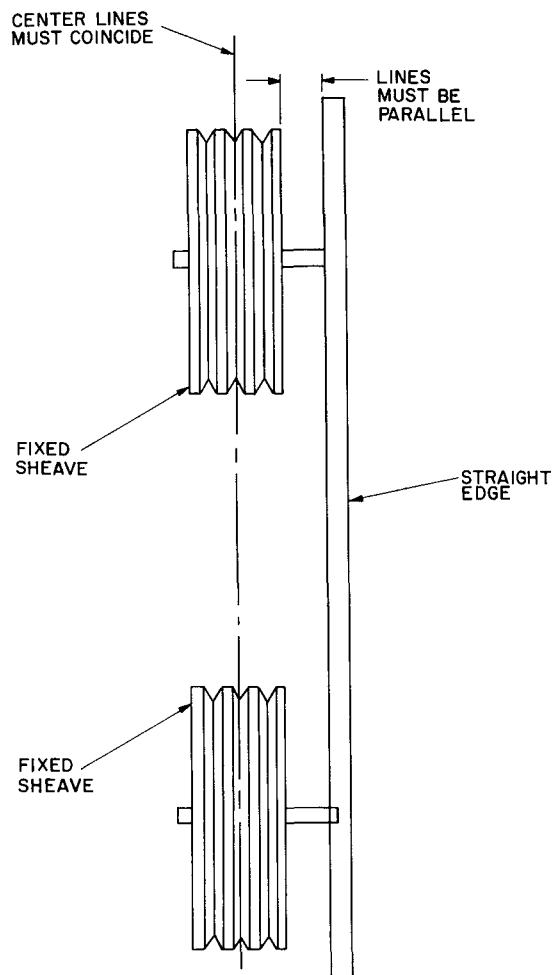


Fig. 29 — Pulley Alignment

INSTALLING ALTERNATE MOTOR PULLEY — On all units, the alternate motor pulley is shipped secured to the motor plate brackets. See Pulley B, Tables 1 and 2. To install the alternate pulley:

1. Turn off unit power.
2. Loosen belts using motor adjusting bolts until belts can be removed without stretching them over the grooves of the pulley.
3. Remove belts.
4. Loosen setscrews on motor pulley.
5. Slide pulley off motor shaft. Make sure setscrews on new pulley are loose.
6. Slide new pulley onto fan shaft and align it with the fan pulley as described in Pulley Alignment section above.
7. Tighten setscrews.
8. Install belts and tension properly as described in Belt Installation and Tensioning section above.

CONDENSER FAN — Before adjusting condenser fans, turn off unit power.

1. Remove fan guard and loosen fan hub setscrew.
2. See Fig. 20 and adjust fan height using a straight edge laid across the fan deck.
3. Tighten setscrew and replace rubber hubcap to prevent hub from rusting to the motor shaft.
4. Fill hub recess with Permagum if hub has no rubber hubcap.
5. Replace fan guard.

PILOT LIGHT OFF (48NP Units Only) — If pilots do not light as described in Heating section on page 64, be sure that pilot orifice is unobstructed, then check for spark ignitor malfunctions as follows:

1. Turn off the control circuit breaker (CCB) to shut off control supply power to ignitor control pack (ICP).
2. Check that spark gap is $\frac{3}{8}$ in. $\pm$ $\frac{1}{32}$ inch.
3. Check that ICP is securely grounded.
4. Check that the high-voltage lead is securely connected between the ICP and the electrode body.
5. Turn on CCB to restore power to ICP. Check that 24 v is supplied to terminal TH of the ICP.
6. Check unit label diagram for correct terminal usage if any wires are removed.

AUTOMATIC PILOT ADJUSTMENT (48NP Units Only):

1. Turn off CCB to shut off unit.
2. Remove screw cap cover on pilot gas valve to expose adjusting screw.
3. Turn gas valve(s) to PILOT position to ensure that main burners do not ignite.
4. Turn on CCB to restore power to unit.
5. Configure unit for occupied heat operation and set occupied heat set point to 80 F. See Set Point Function section on page 54 for more details.

NOTE: If occupied temperature $\geq$ 80 F, turn off CCB. Locate heat relays HR1 and HR2. Remove wires from the NO (normally open) contact and attach them at the NC (normally closed) contact. This will enable heat operation. Turn on CCB. Heating will be initiated, and the pilot will ignite.

6. With a small screwdriver, turn adjustment screw until flame fully engulfs sensor.
7. Replace cap on pilot gas valve. Turn off power to CCB. Replace valve(s) to original position.
8. Check for proper burner operation by cycling the burners. Wait 30 seconds between burner cycles.

NOTE: If HR1 and HR2 are mechanically jumpered according to Step 5, both stages of heat will be in operation. To verify proper burner operation, cycle unit on and off by supplying and removing power to the CCB.

9. Reattach HR1 and HR2 wires to NO contact if removed in Step 5 above.
10. Check that all doors are closed securely before leaving the unit.

GAS VALVE ADJUSTMENT (48NP Units Only) — The gas valve opens and closes in response to the heating demand or limit control. When power is supplied to valve terminal no. 3, the main valve opens to its preset position.

The regulator factory setting is stamped on the valve body (2.9 in. wg). Gas manifold should always be checked at unit start-up.

To adjust regulator:

1. Configure unit for occupied heat operation, and set occupied heat set point to 55 F. See Set Point Function section on page 54 for more details.

NOTE: If the occupied temperature is $\geq$ 55 F, turn off the CCB, and locate terminals HR1 and HR2. Remove wires from the NO contact to prevent heating operation.

2. Turn main gas valve to OFF position.

3. Remove $\frac{1}{8}$ in. pipe plug from manifold or gas valve pressure tap connection. Install a suitable pressure-measuring device.
4. Set main gas valve to ON position.
5. Turn off CCB. Restore wires from terminals HR1 and HR2 to the NO contact.
6. Configure unit for occupied heat operation and set occupied heat set point to 80 F. See Set Point Function section on page 54 for more details.

NOTE: If occupied temperature is $\geq$ 80 F, turn off CCB. Locate terminals HR1 and HR2. Remove wires from the NO contact and attach them to the NC contact. This will enable heat operation due to maximum heat set point of 80 F. Turn on CCB. Heating will be initiated, and the pilot will ignite.

7. Remove screw cap plastic cover covering the regulator adjustment screw.
8. Turn adjustment screw clockwise to increase pressure or counterclockwise to decrease pressure.
9. Once desired pressure is established, remove pressure-measuring device and replace the $\frac{1}{8}$ -in. pipe plug and screw cap.
10. Reattach HR1 and HR2 wires to NO contact if removed in Step 1 or 6 above.

MAIN BURNER ADJUSTMENT (48NP Units Only) — Main burners are factory set and should require no adjustment. However, if burner adjustment is necessary:

1. Perform automatic pilot adjustment following instructions in Automatic Pilot Adjustment section above.
2. Turn gas valve to ON position. Allow unit to operate at least 15 minutes with heat section access door closed.
3. Open heat section access door.
4. Loosen primary air shutter and adjust to a minimum opening of $\frac{5}{8}$ inch.
5. Retighten primary air shutter and close access door.

To check ignition of main burners and fan switch operation, configure unit for occupied heat operation and set occupied heat set point to 80 F. See Set Point Function section on page 54 for more details.

NOTE: If occupied temperature $\geq$ 80 F, turn off CCB. Locate heat relays HR1 and HR2. Remove wires from the NO contact and attach them to the NC contact. This will enable heat operation due to maximum heat set point of 80 F. Turn on CCB. Heating will be initiated, and the pilot will ignite.

IMPORTANT: Be sure to return wiring to the starting location after adjustments are made.

MAIN BURNER REMOVAL (48NP Units Only) — See Fig. 23-25.

1. Shut off main gas valve.
2. Shut off power to unit.
3. Unplug all plug assemblies required for burner removal and all sensor and ignitor wires.
4. Disconnect gas connection(s) from between gas valve(s) and field-supplied piping.
5. Remove 2 screws securing burner assembly to unit.
6. Slide burner assembly from unit.

NOTE: For high-heat units (48NPE), the door frame must be removed before the burner assembly can be removed.

25% OUTDOOR-AIR DAMPER — See Outdoor-Air Inlet Adjustments section, page 8, for adjustment details.

REFRIGERANT CHARGE — All units are shipped with a complete operating charge of R-22. See unit nameplate and Tables 1 and 2 for amount of charge. When adding a complete charge, evacuate system using standard evacuating procedures and weigh in the specified amount of charge. All units have charging charts for each refrigerant circuit. See Fig. 30-35.

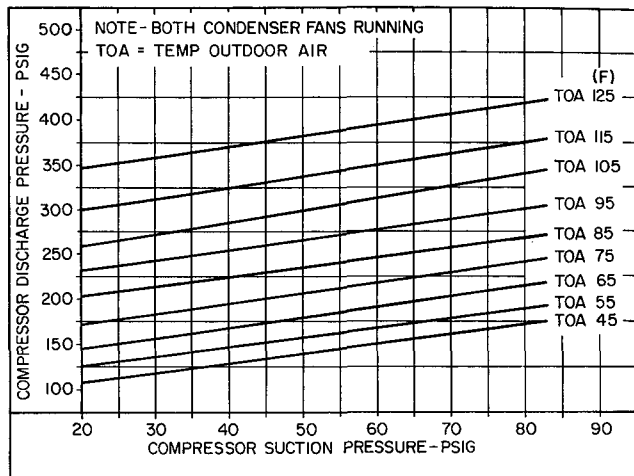


Fig. 30 — Charging Chart; 48NP/50NB, NP024 System 1

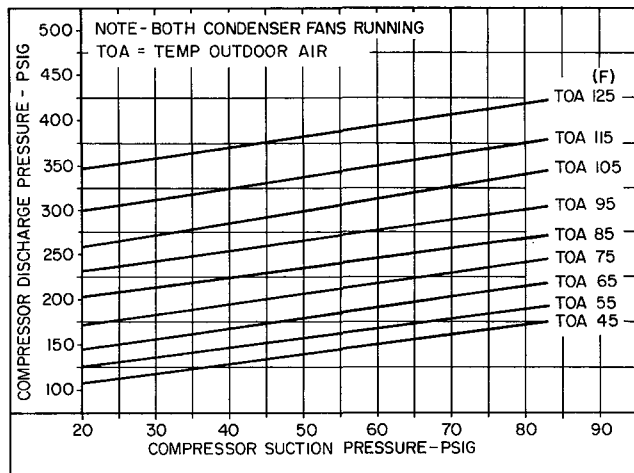


Fig. 31 — Charging Chart; 48NP/50NB, NP024 System 2

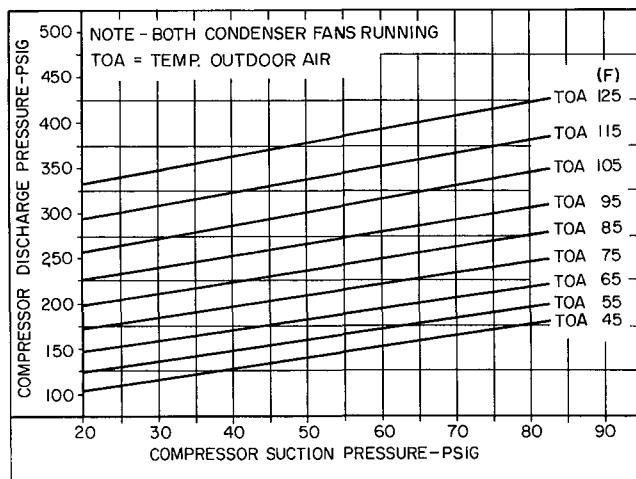


Fig. 32 — Charging Chart; 48NP/50NB, NP028 System 1

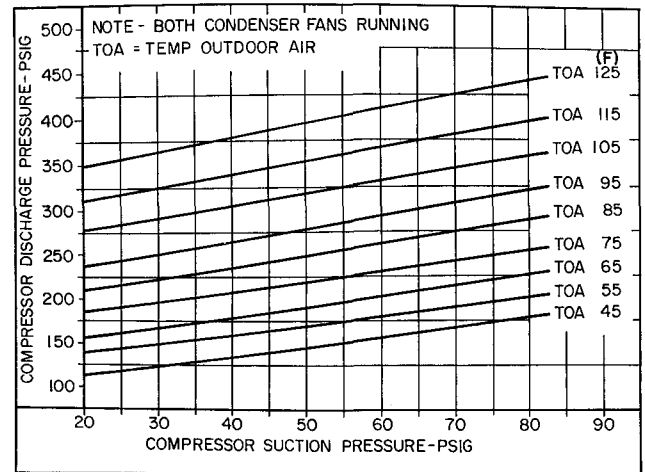


Fig. 33 — Charging Chart; 48NP/50NB, NP028 System 2

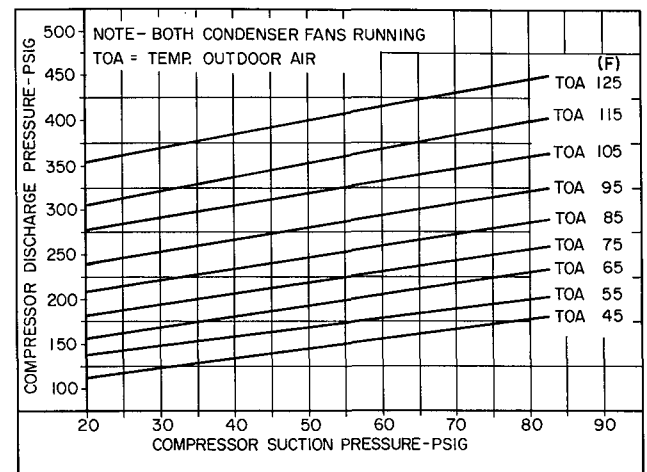


Fig. 34 — Charging Chart; 48NP/50NB, NP030 System 1

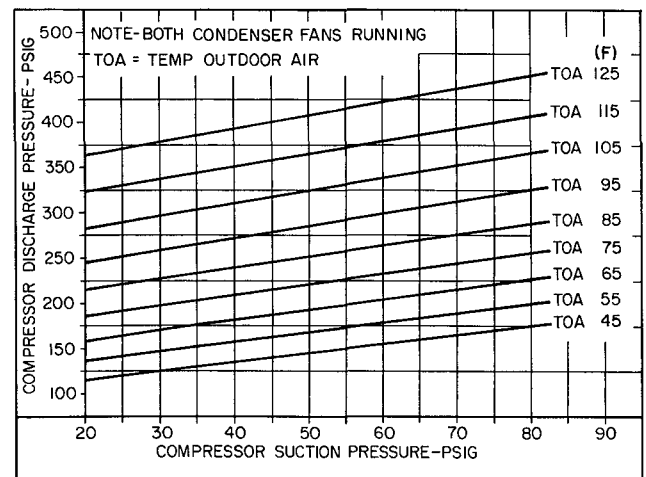


Fig. 35 — Charging Chart; 48NP/50NB, NP030 System 2

Refrigerant Feed Components — Each refrigerant circuit (2 per unit) has all the necessary refrigerant controls:

Thermostatic Expansion Valve (TXV) — Each circuit has one. It is nonadjustable and is factory set to maintain 10 to 13 F superheat leaving the evaporator coil. The TXV controls flow of liquid refrigerant to the evaporator coils.

Moisture/Liquid Indicator — A clear flow of liquid refrigerant indicates sufficient charge in the system. Bubbles indicate undercharged system or the presence of non-condensables. Moisture in the system measured in parts per million (ppm) changes the color of the indicator:

- Green — moisture below 45 ppm
- Chartreuse — 45 to 130 ppm (caution!)
- Yellow — moisture above 130 ppm (wet)

Change filter driers at the first sign of moisture in the system.

IMPORTANT: Unit must be in operation at least 12 hours before moisture indicator can give an accurate reading. With unit running, indicating element must be in contact with refrigerant to give a true reading.

Filter Drier — Replace whenever the moisture/liquid indicator shows moisture in the system.

Liquid Line Service Valve — Located immediately ahead of the filter drier, this valve has a 1/4-in., flare connection for field charging. In combination with the compressor discharge service valve, each circuit can be pumped down into the high side.

Compressor Discharge Service Valve — Each compressor has one.

Protective Devices

COMPRESSOR PROTECTION

Overcurrent — Each compressor has one manual reset, calibrated trip, magnetic circuit breaker. Do not bypass connections or increase the size of the circuit breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

Overtemperature — Each 06D compressor has an internal thermostat to protect it against excessively high discharge gas temperatures.

Crankcase Heater — Each compressor has a 125-watt crankcase heater to prevent absorption of liquid refrigerant by oil in the crankcase when the compressor is idle. Since 115-v power for the crankcase heaters is drawn from the unit control circuit, main unit power must be on for the heaters to be energized.

IMPORTANT: After a prolonged shutdown or service job, energize the crankcase heaters for 24 hours before starting the compressor.

Compressor Lockout — Each compressor has a compressor lockout. It is used to monitor the status of the compressor and send a signal to the PSIO. To reset, interrupt control power.

EVAPORATOR-FAN MOTOR PROTECTION — A manual reset, calibrated trip, magnetic circuit breaker protects against overcurrent. Do not bypass connections or increase the size of the breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

CONDENSER-FAN MOTOR PROTECTION — Each condenser fan motor is internally protected against overtemperature. They are also protected against a severe overcurrent condition by manual reset, calibrated trip, magnetic circuit breakers on a common circuit. As with the circuit breakers, do not bypass connection or increase breaker size to correct trouble. Determine the cause and correct it before resetting the breaker.

HIGH- AND LOW-PRESSURE SWITCHES — See Fig. 36 for compressor mounting locations. Settings for these switches are shown in Table 26. If either switch trips, that refrigerant circuit will be automatically locked out by the controls. To reset, manually interrupt control power.

Table 26 — Pressure Switch Settings (psig)

SWITCH	CUTOUT	CUT-IN
High	426±7	320±20
Low	27±4	67± 7

NOTE: When a pressure transducer is used, the low-pressure trip point is the same as the low-pressure switch.

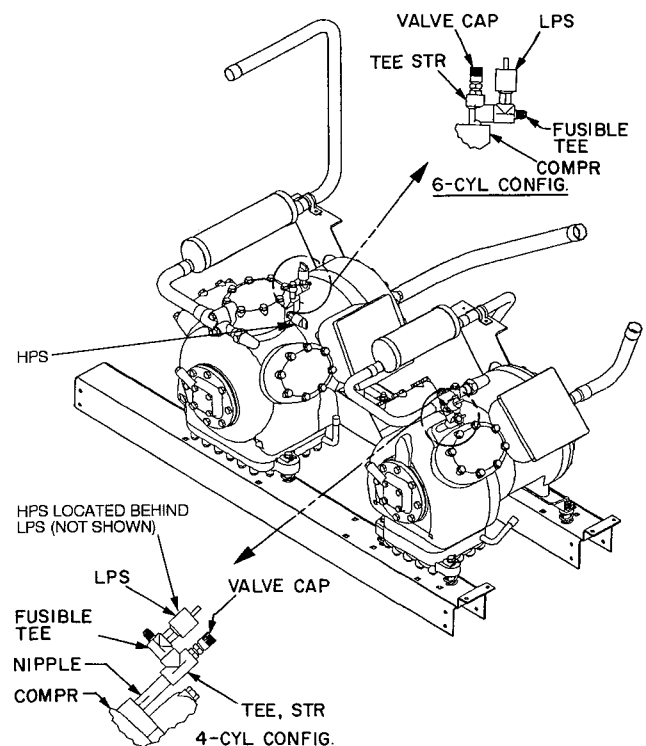


Fig. 36 — High- and Low-Pressure Switch Locations

Relief Devices — All units have relief devices to protect against damage from excessive pressures (i.e., fire). These devices protect the high and low side.

Control Circuit, 115 V — This control circuit (TRAN1 secondary) is protected against overcurrent by a 5-amp circuit breaker (CB3). Breaker can be reset. If it trips, determine cause of trouble before resetting.

Control Circuit, 24 V — This control circuit (TRAN2 secondary) is protected against overcurrent by a 3.2-amp circuit breaker (CB4). Breaker can be reset. If it trips, determine cause of trouble before resetting.

Control Circuit, 21 V — These control circuits (TRAN4 and TRAN5 secondary) are protected by 3.2 amp fuses (FU1 and FU2, respectively). Determine cause of trouble before replacing fuse(s).

Gas Heat (48NP Only)

LIMIT SWITCHES — The maximum supply-air temperature is controlled by a limit switch located in the gas section. The limit switch is designed to trip at 100° F above the maximum temperature rise shown in Table 1.

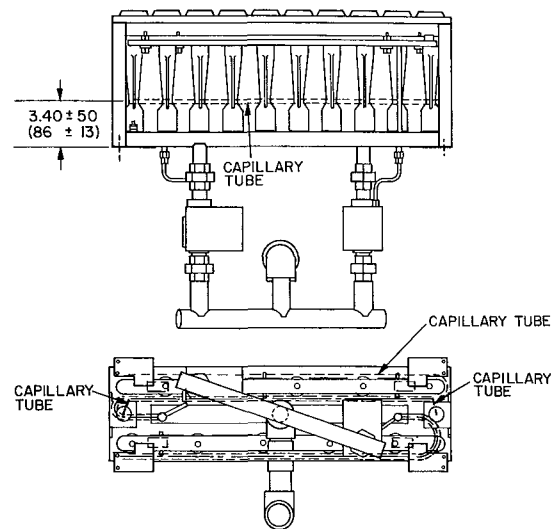
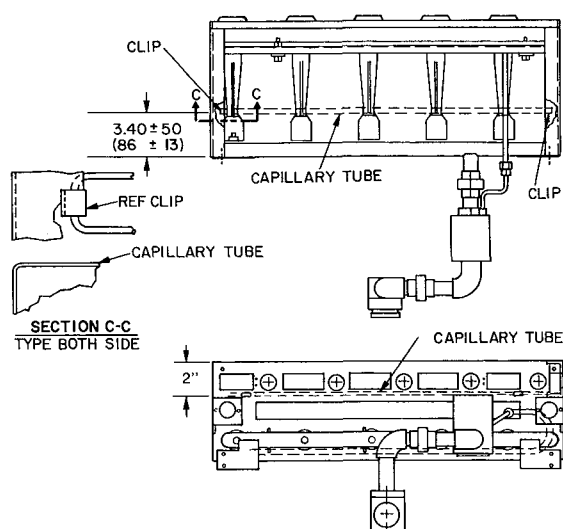


Fig. 37 — Location of Rollout Switch Capillary Tube

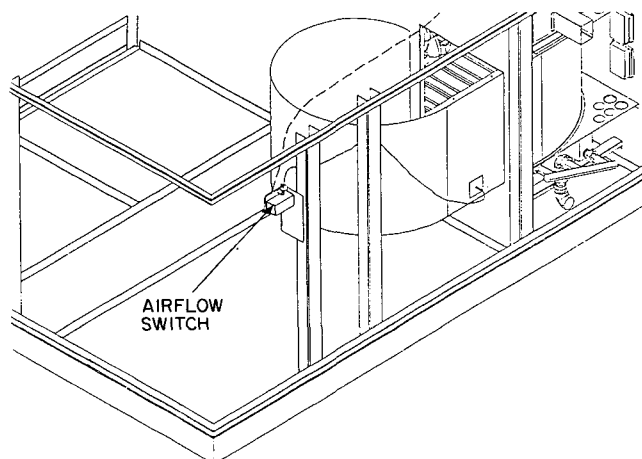


Fig. 38 — Airflow Switch Location (48NPE Units Only)

When the limit switch trips, the gas valve is deenergized and the combustion-air blower(s) and evaporator fan are held on until the unit is cooled to its reset temperature. Once the unit cools, the gas valve is reenergized.

ROLLOUT SWITCH — This switch senses any flame or excessive heat in the main burners and deenergizes the gas valve. If this occurs, the gas heating system is locked out until the rollout switch is reset manually. Reset by pressing the button on the rollout switch. See Fig. 23 and 24.

When the rollout switch trips, it likely indicates a flue blockage. Inspect the unit for any obstructions in the flue system, for holes on the flue box, or for a defective centrifugal switch or loose combustion blower. See Fig. 37 for proper location of the rollout capillary.

AIRFLOW SWITCH, 48NPE (HIGH HEAT) UNITS ONLY

— Shuts off the gas heat in the event there is a loss of air over the gas cells. The airflow switch is located in the fan section (see Fig. 38). The switch will automatically reset when airflow is sufficient.

Electric Heat (50NB, NP Only)

OVERCURRENT — Heaters are protected by fuses in the power circuit, located in the heater control box. As with circuit breakers, determine the cause of fuses tripping before replacing them. Do not replace with larger fuses. All fuses are 60 amp, except for the 18 kW, 460-v heater, which uses 35-amp fuses.

OVERTEMPERATURE — Heaters are protected by limit switches mounted in the heater box. They reset automatically once they cool.

TROUBLESHOOTING

Control Loop Checkout

⚠ CAUTION

The checkout and adjustment of control loops should only be done by certified Carrier Comfort Network (CCN) technicians. The following checkout procedure is offered as a guide and presumes the user has obtained basic knowledge of controls through CCN training.

TO CHECK OPERATION OF ANALOG OUTPUTS —

The control algorithms of the unit controls utilize the master/submaster loop concept. The master loop monitors the master sensor (the sensor which tries to maintain the desired set point), and calculates the submaster reference required to do so. The submaster loop monitors the submaster sensor and controls the actual output to the controlled device.

These algorithms require the adjustment of a number of gain values to function properly. The NB,NP units come with preset default values. However, it may be necessary to adjust several of these values to achieve stable control. These values are submaster loop gain (SMG), submaster loop center value (SCV), and master loop proportional gain (MPG). In addition, proportional, integral, and derivative multiplier values can be accessed through the building supervisor software.

To verify or adjust submaster default values, perform the following for each controlled device (control loop):

1. Verify that the system is in the occupied mode and the supply-air fan is running.
2. Verify that the supply-air fan status indicates ON. If the fan status is OFF, the unit control algorithms will disable all routines.
3. Verify that all forced values have been removed.
4. Table 27 indicates recommended starting values for MPG and SMG for NB,NP units. Verify that these values have been entered by checking the service function.
5. Verify/adjust the SMG. If the SMG is too large, the loop will tend to oscillate (hunt). If it is too small, the loop will react too slowly.

Verify or adjust the SMG as follows:

- a. Using the HSIO keypad, force the submaster reference of the control loop to a value above or below the actual sensor reading. Verify that the actuator responds correctly. If the actuator drives in the wrong direction, go to the submaster gain (SMG) for the control loop and reverse the sign of the gain.
For example: If the submaster loop gain is 5.0, change it to -5.0.
- b. Observe the operation of the controlled device for a few minutes. If the device oscillates every few seconds around the forced value, then lower the SMG by small amounts until the output steadies. If the output to the device responds to a change in the temperature in small increments, then increase the SMG in small amounts until the output steadies.

NOTE: Do not be alarmed if the submaster sensor stabilizes at a value greater or less than the forced value. This is called the submaster droop offset and is normal.

6. It is not necessary to adjust the submaster loop center value, as the master loop will adjust the submaster reference as required to satisfy its set point. However, it

may be desirable to keep the submaster droop to a minimum. This is most often required for economizer loops.

If the submaster droop is too large, adjust the SCV as follows:

If the submaster droop is positive (actual value greater than reference value), the SCV should be decreased for HCV (heating coil) and IGV (inlet guide vane) loops and increased for CC (constant volume) and ECON (economizer) loops.

If the submaster droop is negative (actual value less than reference value), the SCV should be increased for HCV and IGV loops and decreased for CC and ECON loops.

7. Once the submaster loop is adjusted, remove all forced values and proceed with verification and adjustment of master loop.
8. To check the master loop:
 - a. Create an error in the master loop. For example: Force the actual space temperature to a value less than the heating set point or greater than the cooling set point.
 - b. Observe system (loop) response for 10 to 20 minutes to verify stable control. After 10 minutes, if the output continues to swing from full open to full closed, lower the MPG and observe again.
 - c. Do this until the loop operation is stable. After 10 minutes, if the loop does not seem to respond (little change in submaster reference), increase the MPG and observe again. Do this until stable operation is achieved.
9. Once satisfied with loop operation, remove all forced values which may have been initiated during this procedure.
10. Repeat Steps 1-9 until all loops have been checked.

NOTE: For better tuning, the building supervisor or service tool should be used to adjust the proportional and integral terms. Contact your Carrier representative for more details.

IAQ Control Loop Adjustment — The IAQ control loop is different from the other control loops. It has one gain value that can be adjusted in the service subfunction (**16** **SRVC**) under IAQG (indoor-air quality gain). This gain

is used to speed up or slow down the response of the economizer dampers to the difference between the IAQ set point and the IAQ sensor. If the economizer is moving too slowly, then the gain needs to be increased. If the economizer moves too rapidly and overshoots the set point, then the gain should be reduced.

Base Unit Controls — The NB,NP unit controls have many features to aid service personnel in troubleshooting. By using the keypad and display module and the status function, actual operating conditions of the system are displayed while the unit is running. The test function allows proper operation of the compressors, compressor unloaders, fans, and other components to be checked while the unit is stopped. The service function displays how configurable items are currently configured. If an operating fault is detected, an alarm is generated and an alarm code(s) is displayed under the subfunction **1** **STAT** along with an explanation of the fault. All current alarms are stored in this subfunction.

Table 27 — 48NP/50NB,NP MPG and SMG Recommended Starting Values

GAIN	SERVICE SUBFUNCTION	GAIN VALUE	
		CV Application	VAV Application
Heating Coil MPG	7	8.0	8.0
Heating Coil SMG	7	7.5	7.5
Constant Volume MPG	8	8.0	8.0
Economizer MPG	10	8.0	1.1
Economizer SMG	10	-7.5	-7.5
Inlet Guide Vanes MPG	9	—	0.5
Inlet Guide Vanes SMG*	9	—	5.0
Staged Heat MPG	11	8.0	8.0
Staged Heat SMG	11	5.0	5.0
Building Pressure MPG	18	0.5	0.5
Building Pressure SMG	18	5.0	5.0
Humidifier MPG	17	2.0	2.0
Humidifier SMG	17	7.5	7.5

MPG — Master Loop Proportional Gain

SMG — Submaster Loop Gain

*This value will show as duct pressure if accessed from the HSIO keypad instead of the building supervisor

To determine how a machine is operating, check the diagnostic information available (**6** **STAT** through **10** **STAT**) and the operating mode displays (**3** **STAT**). If no display appears, follow the Troubleshooting section for the control modules on page 83. If the display is working:

1. Note all alarm codes displayed under **1** **STAT** .
2. Note all operating mode codes displayed under **3** **STAT** .
3. Note the modified supply-air set point in effect and the current supply-air temperature under **5** **STAT** .
 - a. If reset is in effect, the modified set point may be different from the supply-air set point because the space temperature is below the reset set point.
 - b. If demand limit is in effect, the machine may be incapable of producing the desired supply-air set point due to the decreased capacity of the machine.
 - c. Check the programming of the schedule function to see if occupied or unoccupied set point should be in effect.

NOTE: To disable unit operation, press **11** **STAT** and put the unit in standby mode.

If the unit is off, there are several conditions that can cause this situation to occur:

1. Cooling load satisfied.
2. Programmed schedule.
3. General power failure.
4. Blown fuse in the control power feed.
5. Open control circuit fuse.
6. Unit ON/OFF switch moved to OFF.
7. Loss of communications between the processor module and other control modules.
8. Operation of the unit blocked by the demand limit function.
9. Unit is in standby mode.
10. Unit is turned off through the CCN network
11. Unit supply-air temperature thermistor (SAT) failure.
12. Supply-air fan is not operating.
13. High duct static pressure.

If a single circuit stops, there are several potential causes:

1. Open contacts in the compressor discharge gas thermostat.

2. Open contacts in the compressor high-pressure switch.
3. Low refrigerant pressure.
4. Thermistor failure.
5. Transducer failure.
6. High suction superheat.
7. Low suction superheat.
8. Unit supply-air temperature thermistor (SAT) failure.
9. Compressor circuit breaker trip.
10. Operation of the circuit blocked by the demand limit function.
11. Loss of communications between the processor module and DSIO module.

Before attempting to restart the machine, check the alarms and alerts subfunctions to determine the cause of the shutdown. If the unit, circuit, or compressor stops more than once as a result of a safety device, determine and correct the cause before attempting to start the unit again.

After the cause of the shutdown has been corrected, unit restart may be automatic or manual depending upon the fault. A manual reset requires the STANDBY mode be reenabled to STBY NO display. Manual reset conditions may also be cleared through the building supervisor or service tool by selecting modify, controller, configuration and downloading "Unit Reset YES" from the configuration screen. All of the fault conditions are described in the Diagnostic Alarm Codes section below.

NB,NP DIAGNOSTIC ALARM CODES AND POSSIBLE CAUSES (See Table 28):

Alarm Codes 51 and 55 (Compressor Fault) — Alarm code 51 is for a fault on compressor A1, and alarm code 55 is for a fault on compressor B1. If the DSIO1 relay module fails or a compressor safety circuit switch opens during the operation of the compressor, the microprocessor detects this fault, stops the compressor, signals the alarm, and deenergizes the DSIO relay to lock the compressor off. To reset the alarm, use the manual method. The possible causes are:

1. High-pressure switch open (code 51 or 55, then code 76 and/or 77 if pressure transducers are installed). The high-pressure switch is wired in series with the 24-v supply that energizes the load side of the DSIO1 module. If the high-pressure switch opens during compressor operation, the compressor stops, and the stop is detected by the DSIO1, terminal strip J3.
2. Wiring error. A wiring error in the control safety circuit will cause the modules to malfunction, and an error will be indicated.

To check out alarm codes 51 or 55:

1. Scroll through the subfunction **4** **TEST** to the proper compressor number using the **↓** key.
2. Energize the step (press **ENTR**). If the compressor does not start, the cause is most likely related to one of the following: HPS (high-pressure switch) open, tripped compressor circuit breaker, or incorrect wiring in either the safety circuit or compressor contactor coil circuit. To follow the circuit alarm, see the unit wiring diagram.

If the compressor starts, verify that all stages of condenser (outdoor) fans are operational using **3** **TEST** and **ENTR** for MM and FR2.

Return unit to run mode and observe compressor operation to verify that compressor lock-out circuit is working and condenser (outdoor) fans are energized after compressor starts.

NOTE: With head pressure control option enabled (**6** **SRVC**), MMAS = YES), a short delay will occur before the first stage of condenser fan(s) is energized. Check location of SCT on condenser coil or pressure transducer wiring and pressure (if equipped) if condenser fans do not start.

Alarm Codes 53 and 57 (Compressor Status) — If the commanded state of the compressor does not match compressor status for 3 seconds, the corresponding compressor stops and the proper alarm trips. This alarm will detect circuit breaker failures, and failure of the compressor contactor to be energized. If a compressor circuit breaker trips due to compressor overcurrent or a short or ground between the circuit breaker and compressor, an alarm for that compressor will be indicated. This will only affect that circuit; the other circuit will continue to operate. The microprocessor is also programmed to indicate a compressor failure if the CLO (cooling lockout) circuit to the DSIO1, terminal J3, receives a voltage when a compressor is not supposed to be operating. Other possible causes include a failed contactor or DSIO module.

Alarm Code 59 (Supply-Air Thermistor Failure) — If the temperature measured by this thermistor is outside the range of -40 to 245 F (-40 to 118 C), heating, cooling, and economizer use are disabled. Reset of this alarm is automatic once the problem is corrected. Start-up follows the normal sequence. The cause of the alarm is usually a bad thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alarm Code 60 (Return-Air Thermistor Failure) — If the temperature measured by this thermistor is outside the range of -40 to 245 F (-40 to 118 C), the cooling capacity algorithm will use a default of 8° F per stage drop. Heating and economizer will be disabled. Reset of this alarm is automatic once the problem is corrected. Start-up follows the normal sequence. The cause of the alarm is usually a bad thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alarm Code 61 (Outdoor-Air Thermistor Failure) — If the temperature measured by this thermistor is outside the range of -40 to 245 F (-40 to 118 C), the economizer routine will use enthalpy input only. If the unit is equipped with humidity sensors, then the enthalpy will also be considered bad and the economizer will close the dampers. Nighttime free cooling will also be disabled. Reset of this alarm is automatic once the problem is corrected. Start-up follows the normal sequence. The cause of the alarm is usually a bad thermistor, a wiring error, or a loose connection.

Alarm Codes 62 and 63 (Saturated Condensing Thermistor Failure) — If the SCT fails (temperature is out of the range of -40 F to 245 F), the alarm will trip and the appropriate circuit will shut off. Reset of this alarm is automatic once

the problem is corrected. The unit performs a complete re-start when the SCT sensor resets. The cause of the alarm is usually a bad thermistor, a wiring error, or a loose connection.

NOTE: This alarm is only valid when the unit has saturated condensing thermistors.

Alarm Codes 64 and 65 (Suction Thermistor Failure) — If the temperature measured by this thermistor is outside the range of -40 to 245 F (-40 to 118 C), the high and low superheat alarms will be disabled and the head pressure algorithm will operate as if the unit did not have suction sensors. Reset of this alarm is automatic once the problem is corrected. Start-up follows the normal sequence. The cause of the alarm is usually a bad thermistor, a wiring error, or a loose connection.

Alarm Code 66 (Space Thermistor Failure) — This alarm applies to all units. If the temperature measured by this thermistor is outside the range of -10 to 245 F (-23 to 118 C), the temperature reset, nighttime free cooling, and cooling and heating (CV applications only) functions are disabled. Reset of this alarm is automatic once the problem is corrected, and the reset function will be enabled. The cause of the alarm is usually a bad thermistor, a wiring error, or a loose connection.

Alarm Codes 67 through 70 (Transducer Failure) — If the voltage ratio of a transducer is less than 2% or greater than 98% for 3 seconds, the transducer has failed and the affected circuit shuts down.

- Code 67** — Compressor A1 Discharge Pressure Transducer Failure
- Code 68** — Compressor B1 Discharge Pressure Transducer Failure
- Code 69** — Compressor A1 Suction Pressure Transducer Failure
- Code 70** — Compressor B1 Suction Pressure Transducer Failure

The reset of this alarm is automatic if the voltage ratio returns within range. Start-up of this circuit follows a normal sequence. The cause of this error is usually a bad transducer, a bad 5-v power supply, or a wiring error. The failed transducer should be recalibrated by the control using the service function before the transducer is considered bad.

Alarm Code 71 (Loss of Communications With DSIO1) — If communication is lost with the DSIO1 module, all outputs controlled by this module will be turned off. This alarm will reset automatically when the communication is restored. The outputs will turn on normally after the alarm condition has been reset. The probable cause for this condition is a faulty or improperly connected plug, a wiring error, or a faulty module.

Alarm Code 72 (Loss of Communications With DSIO2) — If communication is lost with the DSIO2 module, all outputs controlled by this module will be turned off. This alarm will reset automatically once the communication is restored. The outputs will turn on normally after the alarm condition has been reset. The probable cause for this condition is a faulty or improperly connected plug, a wiring error, or a faulty module.

Alarm Code 73 (Loss of Communications With Option Board No. 1 [PSIO2]) — If communication is lost with the PSIO2 module, all outputs controlled by this module will be turned off. Reset of this alarm is automatic when the communication is restored.

Start-up after this alarm has been remedied follows a normal sequence. The probable cause for this condition is a faulty or improperly connected plug, a wiring error, or a faulty module.

Alarm Codes 74 and 75 (Low Pressure Circuit A or B)

With low-pressure switches installed — If a circuit is on and the low-pressure switch is open (opens at 27 psig $\pm$ 4 psig) for 15 seconds, the compressor in that circuit will stop and the alarm will trip.

NOTE: During initial start-up of a circuit, the low pressure input will be ignored for 2 minutes.

With a suction transducer installed — If a circuit is on and the suction pressure drops below 28 psig for 15 seconds, the compressor in that circuit will stop and the alarm will trip.

Alarm code 74 signals a circuit A failure, and code 75 signals a circuit B failure. The reset for this alarm can be automatic if the pressure reaches 67 $\pm$ 7 psig (switch) or 65 psig (transducer) within 5 minutes after the alarm has tripped. The circuit will not be reset if it trips again after 3 consecutive failures. The possible causes for the alarm are low refrigerant charge, dirty filters, evaporator fan turning backwards, inlet guide vanes not opening properly, plugged filter drier, or faulty transducer.

Alarm Codes 76 and 77 (High Pressure Circuit A or B)

— If a compressor trips on compressor fault alarm 51 or 55 and the discharge pressure for that circuit is greater than 410 psig, then the high pressure alarm will trip. If the discharge pressure ever exceeds 440 psig, then the alarm will trip and the appropriate circuit will be shut off.

Alarm code 76 signals a circuit A failure, and alarm code 77 signals a circuit B failure

Reset of this alarm is manual. The circuit will start normally after the alarm condition has been corrected. Possible causes for this alarm are an overcharged system, high outdoor ambient temperature coupled with a dirty outdoor coil, plugged filter drier, partially closed liquid line service valve, or a faulty transducer.

NOTE: This alarm is only valid when the unit has refrigerant pressure transducers.

Alarm Code 78 (Supply-Air Fan) — If the commanded state and status of the supply-air fan do not match for 60 seconds, the alarm trips (The control circuit does not detect circuit breaker failures due to motor overcurrent, shorts or grounds between the evaporator-fan circuit breaker and motor, circuit breaker trips, or broken belts.) Other possible causes are fan status switch failure, tubing not properly connected, or switch set improperly. All other unit outputs except the supply-air fan are turned off when this alarm is generated. The supply-air fan output remains energized.

Reset of this alarm is automatic once the problem is corrected

Alarm Codes 80 and 81 (Low Saturated Suction Temperature) — If the saturated suction temperature is less than 20 F (-6.7 C) for 5 minutes, the alarm trips and the circuit shuts off.

If the unit is configured for 2-speed fan operation, the fan must be on high speed for this alarm to be generated. If the fan is at low speed, the speed will be set to high and the 5 minute timer will be restarted. The fan will be locked on high speed until the saturated suction temperature exceeds 65 F.

Alarm code 80 signals a circuit A failure, and alarm code 81 signals a circuit B failure. Reset is manual, and start-up of the circuit is normal after the alarm has been cleared. Possible causes of the fault condition are a combination of low entering outdoor-air temperature, low evaporator-fan

cfm, low refrigerant charge, plugged filter drier, partially closed liquid line service valve, or pressure transducer failure.

NOTE: This alarm is valid only when the unit has refrigerant pressure transducers.

Alarm Codes 82 and 83 (High Suction Superheat) — This alarm is valid only when unit is configured for pressure transducers and suction sensors (thermistors), and mechanical cooling is on.

If the suction superheat is greater than 45 F (7 C) for more than five minutes, the alarm trips and the circuit shuts down. Alarm code 82 signals a circuit A failure, and alarm code 83 signals a circuit B failure. Reset of this alarm is manual. The circuit will start normally after the alarm condition has been corrected. Possible causes for this alarm are low refrigerant charge, plugged filter drier, partially closed liquid line service valve, or a faulty thermistor or transducer.

Alarm Codes 84 and 85 (Low Suction Superheat) — This alarm is valid only when the unit is configured for pressure transducers and suction sensors (thermistors), and mechanical cooling is on.

If the suction superheat is less than 3 F (-16 C) for more than five minutes, the alarm trips and the affected circuit shuts down. Alarm code 84 signals a circuit A failure, and alarm code 85 signals a circuit B failure. Reset of this alarm is manual. Start-up of the circuit is normal after the alarm has been corrected. Possible causes of the alarm include a faulty thermostatic expansion valve (TXV), thermistor, or transducer.

Alarm Code 86 (Illegal Configuration) — This fault indicates a configuration code error, and the unit is not allowed to start. Refer to Table 17 and  on pages 51 and 50 for factory configuration values and  on page 53 for user configuration variables. Check all configuration codes and set points and correct any errors.

Alarm Code 87 (Unit Configuration Required) — This fault indicates the factory configuration is missing and the unit is not allowed to start. Refer to Table 17 and  on pages 51 and 50 for factory configuration values and  on page 53 for user configuration variables. Check all configurations and set points and correct any errors.

To enter a new configuration, enter the proper value and press . Use the  key to scroll to the next configuration. The unit should start after the field and factory configuration values are correctly entered. The usual cause for this fault is the replacement of the processor module. Refer to the instructions accompanying the processor module for more details.

Alarm Code 88 (Hydronic Coil Freeze Stat) — The hydronic coil freeze stat alarm requires a field supplied, normally open, temperature actuated switch connected to PSIO2 at plug J7 (bottom). The alarm is activated by a 24-v signal generated by the switch when it closes. The economizer will be set at minimum position, heating coil valve will be fully open, and supply-air fan will be shut off. This may be caused by low temperature outdoor-air used with minimum airflow, during IAQ purge mode with low temperature outdoor air, or because the outdoor-air damper is jammed open.

Reset of this alarm is automatic once the problem is corrected.

Table 28 – Alarm Codes

DISPLAY	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
51	Compressor A1 Failure	Compressor A1 shut down	Manual	High-pressure switch open Wiring error
52	Not Used	—	—	—
53	Compressor A1 Status Failure	Compressor A1 shut down	Manual	Voltage on DSIO1 J3 when compressor off. Failed contactor Failed DSIO module Circuit breaker tripped.
54	Not used	—	—	—
55	Compressor B1 Failure	Compressor B1 shut down	Manual	High-pressure switch open Wiring error
56	Not Used	—	—	—
57	Compressor B1 Status Failure	Compressor B1 shut down	Manual	Voltage on DSIO1 J3 when compressor off Failed contactor Failed DSIO module. Circuit breaker tripped
58	Not Used	—	—	—
59	Supply-Air Thermistor Failure	Heating, cooling, and economizer disabled	Automatic	Bad, shorted, or open thermistor caused by a wiring error or loose connection.
60	Return-Air Thermistor Failure	Heating and economizer disabled	Automatic	Bad, shorted, or open thermistor caused by a wiring error or loose connection
61	Outdoor-Air Thermistor Failure	NTFC disabled and economizer uses enthalpy input only. If unit has humidity sensors, economizer dampers close	Automatic	Bad thermistor, wiring error, or loose connection.
62	Saturated Condensing Thermistor Failure, Circuit A	Circuit A shut down	Automatic	Bad thermistor, wiring error, or loose connection. This alarm is only valid when unit does not have pressure transducers.
63	Saturated Condensing Thermistor Failure, Circuit B	Circuit B shut down	Automatic	Bad thermistor, wiring error, or loose connection. This alarm is only valid when unit does not have pressure transducers
64	Suction Thermistor Failure, Circuit A	Superheat alarms disabled. Unit will operate as if there are no suction sensors	Automatic	Bad thermistor, wiring error, or loose connection. This alarm is only valid when unit is configured for suction sensors.
65	Suction Thermistor Failure, Circuit B	Superheat alarms disabled. Unit will operate as if there are no suction sensors	Automatic	Bad thermistor, wiring error, or loose connection. This alarm is only valid when unit is configured for suction sensors.
66	Space Thermistor Failure	Temperature reset, NTFC, cooling and heating functions disabled (CV applications only).	Automatic	Bad thermistor, wiring error, or loose connection.
67	Compressor A1 Discharge Pressure Transducer Failure	Compressor A1 shuts down	Automatic	Bad transducer, bad 5-v power supply, or a wiring error
68	Compressor B1 Discharge Pressure Transducer Failure	Compressor B1 shuts down	Automatic	Bad transducer, bad 5-v power supply, or a wiring error.
69	Compressor A1 Suction Pressure Transducer Failure	Compressor A1 shuts down	Automatic	Bad transducer, bad 5-v power supply, or a wiring error.
70	Compressor B1 Suction Pressure Transducer Failure	Compressor B1 shuts down	Automatic	Bad transducer, bad 5-v power supply, or a wiring error.
71	Loss of Communications with DSIO1	All DSIO1 outputs turned off	Automatic	Faulty or improperly connected plug, faulty DSIO1 module, or wiring error
72	Loss of Communications with DSIO2	All DSIO2 outputs turned off	Automatic	Faulty or improperly connected plug, faulty DSIO2 module, or wiring error
73	Loss of Communications with PSIO2	All PSIO2 outputs turned off	Automatic	Faulty or improperly connected plug, faulty PSIO2 module, or wiring error.
74	Low Pressure, Circuit A	Circuit A compressor(s) shut down	Automatic or Manual	Low refrigerant charge, dirty filters, evaporator fan turning backwards, inlet guide vanes not opening properly, plugged filter drier, or faulty transducer.
75	Low Pressure, Circuit B	Circuit B compressor(s) shut down	Automatic or Manual	Low refrigerant charge, dirty filters, evaporator fan turning backwards, inlet guide vanes not opening properly, plugged filter drier, or faulty transducer.
76	High Pressure, Circuit A	Circuit A compressor(s) shut down	Manual	An overcharged system, high outdoor ambient temperature coupled with a dirty outdoor coil, plugged filter drier, partially closed liquid line service valve, or a faulty transducer. This alarm is only valid when the unit has refrigerant pressure transducers.

LEGEND

DSIO — High-Voltage Relay Module
IAQ — Indoor-Air Quality
NTFC — Nighttime Free Cool
PSIO — Processor Module
TSM — Terminal System Manager
TXV — Thermostatic Expansion Valve

Table 28 – Alarm Codes (cont)

DISPLAY	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
77	High Pressure, Circuit B	Circuit B compressor(s) shut down	Manual	An overcharged system, high outdoor ambient temperature coupled with a dirty outdoor coil, plugged filter drier, partially closed liquid line service valve, or a faulty transducer. This alarm is only valid when the unit has refrigerant pressure transducers
78	Supply-Air Fan State and Status	All unit outputs (except supply fan) turned off. Supply fan output remains energized.	Automatic	Fan status switch failure, tubing not properly connected, or fan status switch set incorrectly
79	Not used	—	—	—
80	Low Saturated Suction Temperature, Circuit A	Circuit A shut down	Manual	Low entering outdoor-air temperature, low evaporator-fan cfm, low refrigerant charge, plugged filter drier, partially closed liquid line service valve, or pressure transducer failure.
81	Low Saturated Suction Temperature, Circuit B	Circuit B shut down	Manual	Low entering outdoor-air temperature, low evaporator-fan cfm, low refrigerant charge, plugged filter drier, partially closed liquid line service valve, or pressure transducer failure.
82	High Suction Superheat, Circuit A	Circuit A shut down	Manual	Low refrigerant charge, plugged filter drier, partially closed liquid line service valve, or a faulty thermistor or transducer
83	High Suction Superheat, Circuit B	Circuit B shut down	Manual	Low refrigerant charge, plugged filter drier, partially closed liquid line service valve, or a faulty thermistor or transducer.
84	Low Suction Superheat, Circuit A	Circuit A shut down	Manual	Faulty TXV, thermistor, or transducer.
85	Low Suction Superheat, Circuit B	Circuit B shut down	Manual	Faulty TXV, thermistor, or transducer
86	Illegal Configuration	Unit will not start	Manual	Configuration code error.
87	Unit Configuration Required	Unit will not start	Manual	Factory configuration missing
88	Hydronic Coil Freeze Stat	Economizer at minimum position, heating coil valve fully open, supply-air fan shut off	Automatic	Low temperature outdoor-air used with minimum airflow Unit is in IAQ purge mode with low temperature outdoor air. Outdoor-air damper is jammed open.
89	Pressurization	Initializes pressurization mode. See Table 15 for hardware state details.	Automatic	Pressurization alarm tripped. Space being over-pressurized to prevent smoke from entering zones.
90	Evacuation	Initializes evacuation mode. See Table 15 for hardware state details.	Automatic	Smoke alarm tripped. Power exhaust/return-air fans clear smoke from space.
91	Smoke Purge	Initializes smoke purge mode. See Table 15 for hardware state details.	Automatic	Purge alarm tripped. Outdoor air is being supplied and return air is being exhausted
92	Fire Shutdown	Unit shuts down. See Table 15 for hardware state details	Automatic	Fire alarm tripped.
93	Linkage Failure	Unit returns to stand-alone operation	Automatic	Loose connection, a broken wire, or a loss of communication with the TSM
94	Building Pressure	Alarm generated.	Automatic	Power exhaust fan failure in either the 1/4-in. plastic tubing routed to the area to be controlled or the tubing routed to the atmosphere from the building pressure control. This alarm is only valid when the unit is configured for modulating power exhaust or return-air fan
95	Duct Static Pressure	The supply-air fan shuts off for 5 minutes.	Automatic	Inlet guide vane actuator motor failure. A leak or obstruction in the 1/4-in plastic tubing routed from the inlet guide vane duct pressure control to the ductwork connection; All the terminals are closed
96	Not used	—	—	—
97	Indoor-Air Quality Failure	Alarm generated	Automatic	IAQ set point is less than the IAQ low reference generated, or the IAQ priority is configured as low and the IAQ sensor reading exceeds the IAQ set point.

LEGEND

DSIO — High-Voltage Relay Module
IAQ — Indoor-Air Quality
NTFC — Nighttime Free Cool
PSIO — Processor Module
TSM — Terminal System Manager
TXV — Thermostatic Expansion Valve

Alarm Code 89 through 92 (Pressurization, Evacuation, Smoke Purge, and Fire Shutdown, respectively) — When the unit is equipped with an optional smoke control and a fire system is installed, these 4 modes are provided to control smoke within areas serviced by the unit. The unit must be equipped with an economizer and power exhaust fan options, and the control option module to support these modes. The building fire alarm system closes field supplied, normally open, dry contacts connected to PSIO2 at plug J7 (bottom) to activate the alarms.

Reset of this alarm is automatic once the problem is corrected.

Alarm Code 93 (Linkage Failure — DAV System Only) — A linkage failure alarm is generated when the linkage has stopped updating the TSM linkage tables within the last 5 minutes.

NOTE: This alarm can only be generated after linkage has updated the table at least one time since initialization.

The unit controls enter the linkage default mode if the linkage is enabled, but the communications link has been lost. With the controls having reverted back to stand-alone operation, the existing sensors, previously overridden by linkage, will be used. This may be caused by a loose connection or a broken wire.

Reset of this alarm is automatic once the problem is corrected.

Alarm Code 94 (Building Pressure) — If the building pressure is greater than the building pressure set point plus 0.25 in. wg for 30 seconds, the alarm will be generated. This may be caused by a power exhaust fan failure or a leak or obstruction in either the 1/4-in. plastic tubing routed to the area to be controlled or the tubing routed to atmosphere from the building pressure control. This alarm is valid only when the unit is configured for modulating power exhaust or return-air fan.

Reset of this alarm is automatic once the problem is corrected.

Alarm Code 95 (Duct Static Pressure) — If the duct pressure is greater than the static pressure set point plus 1.0 in. wg for 30 seconds, or equal to or greater than 5.0 in. wg for 15 seconds, then the alarm will trip, and the supply-air fan will shut off for 5 minutes. This may be caused by an IGV actuator motor failure or a leak or obstruction in the 1/4-in. plastic tubing routed from the IGV duct pressure control to the ductwork connection, or all the terminals are closed.

Reset of this alarm is automatic once the problem is corrected.

Alarm Mode 97 (Indoor-Air Quality Failure) — This alarm is valid only when the unit is configured with the PSIO2 control option module and the unit is equipped with field-supplied IAQ sensors.

If the IAQ set point (IAQS) is less than the IAQ low reference value or greater than the high reference value, an alarm will be generated. An alarm will also occur when the IAQ priority is configured as low and the IAQ sensor reading exceeds the IAQ set point.

Reset of this alarm is automatic once the problem is corrected.

THERMISTOR TROUBLESHOOTING — The NB,NP control system uses thermistors to measure temperatures of the supply and return air, outdoor air and space temperature, and the saturated condensing and suction temperatures of the refrigerant circuits.

The resistance versus temperature and electrical characteristics for thermistors in the system (except space temperature) are identical. To obtain an accurate reading, a high-impedance meter (such as a digital meter) must be used.

Thermistors in the NB,NP control system have a 5-vdc signal applied across them any time the unit control circuit is energized. The voltage drop across the thermistor is directly proportional to the temperature and resistance of the thermistor.

To determine temperatures at the various thermistor locations:

1. Disconnect the thermistor from the processor board.
2. Measure the resistance across the appropriate thermistor using a high quality digital ohmmeter.
3. Use the resistance reading to determine the thermistor temperature using Tables 29 and 30.

The microprocessor has been programmed to check the operation of the thermistors. If the measured temperature is outside the range of -40 to 245 F (-40 to 118.3 C) and 168,250 to 203.75 ohms (OAT, SAT, SCT, SGT, and RAT only), it will be treated as a sensor failure and a diagnostic code will be displayed. It is also possible to check the operation of the thermistors using the test function.

To check the thermistors:

1. Use the temperature subfunction of the status function (**6** **STAT**) to determine if the thermistors are reading correctly.
2. Check the thermistor calibration at a known temperature by measuring actual resistance and comparing the value measured with the values listed in the thermistor tables (Tables 29 and 30).
3. Make sure that the thermistor leads are connected to the proper pin terminals at the PSIO1 and PSIO2 terminal strip J7 on the processor boards, and that the thermistors are properly located in the refrigerant circuit.

If a thermistor has failed or the wire is damaged, replace the complete assembly. Do not attempt to splice the wires or repair the assembly.

TRANSDUCER TROUBLESHOOTING — The NB,NP control system uses transducers to measure pressures around the system. If a transducer is suspected of being faulty, check the voltage to the transducer. The refrigerant pressure transducer supply voltage should be 5 vdc $\pm$ 0.2 v. These transducers convert the measured refrigerant pressure to a voltage. This voltage is then evaluated as a ratio to the 5 vdc $\pm$ 0.2 v supply voltage. Read the voltage on channel 12. If the check filter switch is open, then 5 v is used for the ratio. All other transducers (BP [building pressure], DP [duct pressure], and CFM) require 24 vac. If the supply voltage is correct, compare the pressure reading displayed on the HSIO keypad and the pressure obtained on a calibrated pressure gage.

NOTE: A 24-vac isolation transformer is required for proper operation of field-installed IAQ and humidity sensors, and one transformer is required for each sensor.

To check the transducers:

1. Use the pressure subfunction of the status function (**7** **STAT**) to determine if the pressure transducers are reading correctly. Connect a calibrated gage to the lead compressor suction or discharge pressure connection to check transducer reading.
2. Make sure that the transducer leads are properly connected in the junction box and to the PSIO. Check the transformer TRAN3 output. Check the transducer supply voltage from PS1. It should be 5 vdc $\pm$ 0.2 v. Check the supply voltage to PSIO channel 12.

**Table 29 – Thermistor Resistance vs Temperature Values for All Thermistors Excluding
Space Temperature Thermistor(s) (5 K at 25 C Resistors)**

TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)
-25	98010	26	19392	77	4976	128	1614	179	570
-24	94707	27	18843	78	4855	129	1582	180	560
-23	91522	28	18311	79	4737	130	1550	181	551
-22	88449	29	17796	80	4622	131	1519	182	542
-21	85485	30	17297	81	4511	132	1489	183	533
-20	82627	31	16814	82	4403	133	1459	184	524
-19	79871	32	16346	83	4298	134	1430	185	516
-18	77212	33	15892	84	4195	135	1401	186	508
-17	74648	34	15453	85	4096	136	1373	187	501
-16	72175	35	15027	86	4000	137	1345	188	494
-15	69790	36	14614	87	3906	138	1318	189	487
-14	67490	37	14214	88	3814	139	1291	190	480
-13	65272	38	13833	89	3726	140	1265	191	473
-12	63133	39	13449	90	3640	141	1239	192	467
-11	61070	40	13084	91	3556	142	1214	193	461
-10	59081	41	12730	92	3474	143	1189	194	456
-9	57162	42	12387	93	3395	144	1165	195	450
-8	55311	43	12053	94	3318	145	1141	196	444
-7	53526	44	11730	95	3243	146	1118	197	439
-6	51804	45	11416	96	3170	147	1095	198	434
-5	50143	46	11111	97	3099	148	1072	199	429
-4	48541	47	10816	98	3031	149	1050	200	424
-3	46996	48	10529	99	2964	150	1028	201	419
-2	45505	49	10250	100	2898	151	1007	202	415
-1	44066	50	9979	101	2835	152	986	203	410
0	42678	51	9717	102	2774	153	965	204	405
1	41339	52	9461	103	2713	154	945	205	401
2	40047	53	9213	104	2655	155	925	206	396
3	38800	54	8973	105	2598	156	906	207	391
4	37596	55	8739	106	2542	157	887	208	386
5	36435	56	8511	107	2488	158	868	209	382
6	35313	57	8291	108	2436	159	850	210	377
7	34231	58	8076	109	2385	160	832	211	372
8	33185	59	7868	110	2335	161	815	212	366
9	32176	60	7665	111	2286	162	798	213	361
10	31201	61	7468	112	2238	163	782	214	356
11	30260	62	7277	113	2192	164	765	215	350
12	29351	63	7091	114	2147	165	749	216	344
13	28472	64	6911	115	2103	166	734	217	338
14	27624	65	6735	116	2060	167	719	218	332
15	26804	66	6564	117	2018	168	705	219	325
16	26011	67	6399	118	1977	169	690	220	318
17	25245	68	6237	119	1937	170	677	221	311
18	24505	69	6081	120	1898	171	663	222	304
19	23789	70	5929	121	1860	172	650	223	297
20	23096	71	5781	122	1822	173	638	224	289
21	22427	72	5637	123	1786	174	626	225	282
22	21779	73	5497	124	1750	175	614		
23	21153	74	5361	125	1715	176	602		
24	20547	75	5229	126	1680	177	591		
25	19960	76	5101	127	1647	178	581		

**Table 30 – Thermistor Resistance vs Temperature Values for
Space Temperature Thermistor(s) (10 K at 25 C Resistors)**

TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)
-30	173631	22	38309	74	10698	126	3603	178	1410
-29	168222	23	37304	75	10459	127	3533	179	1386
-28	162998	24	36329	76	10227	128	3466	180	1363
-27	157954	25	35382	77	10000	129	3400	181	1341
-26	153083	26	34463	78	9779	130	3335	182	1319
-25	148378	27	33571	79	9563	131	3272	183	1297
-24	143833	28	32704	80	9353	132	3210	184	1276
-23	139442	29	31863	81	9148	133	3150	185	1255
-22	135200	30	31046	82	8948	134	3090	186	1234
-21	131101	31	30252	83	8754	135	3033	187	1214
-20	127139	32	29481	84	8563	136	2976	188	1195
-19	123310	33	28732	85	8378	137	2920	189	1175
-18	119609	34	28005	86	8197	138	2866	190	1156
-17	116031	35	27298	87	8021	139	2813	191	1138
-16	112571	36	26611	88	7849	140	2761	192	1119
-15	109226	37	25943	89	7681	141	2710	193	1101
-14	105992	38	25295	90	7517	142	2660	194	1084
-13	108863	39	24664	91	7357	143	2611	195	1066
-12	99837	40	24051	92	7201	144	2564	196	1049
-11	96910	41	23456	93	7049	145	2517	197	1033
-10	94078	42	22877	94	6900	146	2471	198	1017
-9	91339	43	22313	95	6755	147	2426	199	1000
-8	88687	44	21766	96	6613	148	2383	200	985
-7	86122	45	21234	97	6475	149	2340	201	969
-6	83638	46	20716	98	6340	150	2298	202	954
-5	81235	47	20212	99	6209	151	2256	203	939
-4	78908	48	19722	100	6080	152	2216	204	925
-3	76655	49	19246	101	5954	153	2176	205	910
-2	74474	50	18782	102	5832	154	2138	206	896
-1	72362	51	18332	103	5712	155	2100	207	882
0	70317	52	17893	104	5595	156	2063	208	869
1	68336	53	17466	105	5481	157	2026	209	855
2	66417	54	17050	106	5369	158	1991	210	842
3	64558	55	16646	107	5260	159	1956	211	829
4	62757	56	16253	108	5154	160	1922	212	817
5	61012	57	15870	109	5050	161	1888	213	804
6	59321	58	15497	110	4948	162	1855	214	792
7	57682	59	15134	111	4849	163	1823		
8	56094	60	14780	112	4752	164	1791		
9	54555	61	14436	113	4657	165	1760		
10	53062	62	14101	114	4564	166	1730		
11	51616	63	13775	115	4474	167	1700		
12	50213	64	13457	116	4385	168	1671		
13	48853	65	13148	117	4299	169	1643		
14	47534	66	12846	118	4214	170	1615		
15	46255	67	12553	119	4132	171	1587		
16	45014	68	12267	120	4051	172	1560		
17	43810	69	11988	121	3972	173	1534		
18	42643	70	11717	122	3895	174	1508		
19	41510	71	11452	123	3819	175	1483		
20	40411	72	11194	124	3745	176	1458		
21	39344	73	10943	125	3673	177	1434		

CONTROL MODULES — The standard PSIO1 and optional PSIO2 (processor modules) and standard DSIO1 and DSIO2 (high-voltage relay modules) all perform continuous diagnostic evaluations of the hardware condition. Proper operation of these modules is indicated by 2 light-emitting diodes (LED) on the front surface of the DSIO modules and on the top horizontal surface of the PSIO modules.

Red LED — Blinking continuously at a 3 to 5 second rate indicates proper operation. Lit continuously indicates a problem requiring replacement of the module. Off continuously indicates the power supply should be checked. If there is no input power, check the fuses. If a fuse is bad, check for shorted secondary of the transformer or a bad module.

Green LED — On a PSIO module, this is the green light that is closest to the COMM connectors. The other green LED on the module indicates external communications (when used). The green LED should always be blinking when power is on. It indicates that the modules are communicating properly. If the green LED is not blinking, check the red LED. If the red LED is normal, check the module addresses. The proper addresses are:

PSIO1 (Standard Processor Module) — 01

PSIO2 (Optional Processor Module) — 31

DSIO1 (Standard High-Voltage Relay Module) — 19

DSIO2 (Standard High-Voltage Relay Module) — 49

NOTE: If the wrong address is entered for the DSIO1 and 2 and/or PSIO1 and 2, then the wrong input channel will be read and the wrong output channel energized.

If all modules indicate a communication failure, check the COMM plug on the PSIO module for proper seating. If a good connection is made and the condition persists, replace the PSIO module.

If only the DSIO module indicates a communication failure, check the COMM plug on that module for a proper connection. If a good connection is made and the condition persists, replace the DSIO module.

All system operating intelligence resides in the PSIO module. This module monitors conditions through the input and output ports and the DSIO modules.

The machine operator communicates with the microprocessor through the HSIO keypad and display module. Communication between the PSIO and the other modules is accomplished by a 3-wire sensor bus. These 3 wires run in parallel from module to module.

On the sensor bus terminal strips, terminal 1 of the PSIO1 module is connected to Terminal 1 of all of the other modules. Terminals 2 and 3 are connected in the same manner. If any of the wires are crossed, the system will not work.

The NB,NP unit processor modules, the high-voltage relay modules, and the HSIO keypad module are all powered from two 21-vac power sources which connect to terminals 1 and 2 of the power input strip on each module.

PROCESSOR MODULE(S) (PSIO)

Inputs — Each input channel has 3 terminals; 2 are used.

Outputs — Output of the PSIO module is 24 vdc or 4-20 mA dc. There are 3 terminals; 2 are used.

Replacing Defective PSIO Modules — The replacement part number is printed on a label on the front of the PSIO module. The replacement module order is configured as a generic replacement module, which will require configuration in the field.

Before any service work is started, be sure that all electrical disconnects are open and tagged.

Installation

1. Verify the existing PSIO module is defective by using

the procedure described in the Control Modules section on this page.

2. Refer to the Unit and Controls Start-Up Checklists on page CL-1 through CL-3 that should have been completed at start-up. This information is needed later in this procedure. If the checklist does not exist, make a new checklist by filling out the **3** **SRVC** and **6** **SRVC** configurations on paper. Tailor the various options and configurations as needed for this particular installation.
3. Check that all power to the unit is off. Switch off all circuit breakers. Carefully disconnect all wires from the defective module by unplugging the 6 connectors. It is not necessary to remove any of the individual wires from the connectors. Remove the green ground wire.
4. Remove the PSIO module mounting screws and remove the module from the control box. Save the screws.
5. With a small screwdriver, set the address switches S1 and S2 on the new PSIO module to match those on the defective module.
6. Mount the new module in the control box using the screws saved in Step 4.
7. Reinstall all 6 wire connectors and the green ground wire.
8. Check all wire connections before restoring power to the unit.
9. Verify that the unit ON/OFF switch is in the ON position.
10. Restore power to the unit and close the control circuit breaker (CCB). Verify that the red and green LEDs respond as described in the Control Modules section on this page. The HSIO keypad should begin its rotating display.
11. Using the HSIO keypad and display module, press **2** **SRVC** to verify that the software version matches the version number shown on the PSIO label.
12. Press **3** **SRVC** to verify that the factory configuration codes agree with the values listed in Table 17 on page 51.
13. Set other applicable inputs required in **3** **SRVC** and **6** **SRVC** to match the options and accessories installed on the equipment.

Table 17 on page 51 lists the proper values necessary to make any changes. The HSIO keypad display will blank out after pressing the **ENTR** key while displaying data reset (DTRS). The rotating display returns when the data reset has been completed.
14. Press **3** **SRVC** and verify each item is now configured as needed for this particular installation. Refer to the Service Function section on page 50 to verify the factory default settings for both a specified unit and generic control unit.
15. Press **6** **SRVC** to check the remainder of the user configuration values.
16. After completing the configuration steps outlined above, close all remaining circuit breakers and perform a unit test as described in **1** **TEST** through **6** **TEST** subfunctions on pages 49 and 50.
17. Complete this procedure and restore the unit to normal operation by returning the STANDBY/RUN mode to STBY NO.

HIGH-VOLTAGE RELAY MODULES (DSIO1 and DSIO2)

Inputs — Inputs on terminal strip J3 are discrete inputs (on/off). When 24 vac is applied across the 2 terminals in a channel, it reads as an on signal. Zero v is read as an off signal.

Outputs — Terminal strips J4 and J5 are internal relays whose coils are energized by a signal from the microprocessor. The relays switch the circuit to which they are connected. No power is supplied to these connections by the DSIO module.

DSIO Replacement — Before any service work is started, be sure that all electrical disconnects are opened and tagged.

Installation

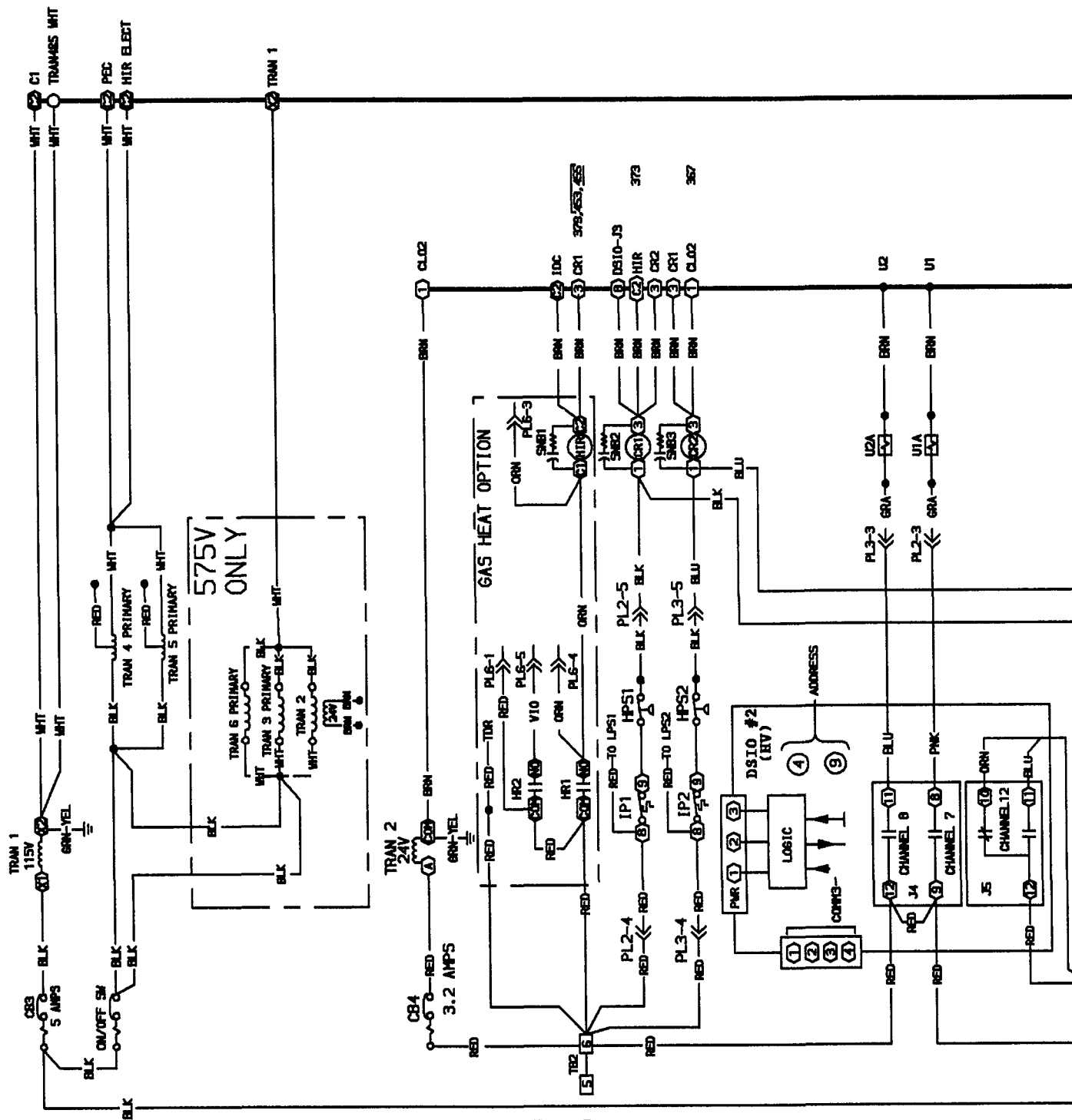
1. Verify the existing DSIO module is defective by using the procedure described in the Control Modules section on page 83.
2. Check that all power to the unit is off. Switch off all circuit breakers. Carefully disconnect all wires from the defective module by unplugging the connectors. It is not necessary to remove any of the individual wires from the connectors. Remove the green ground wire.
3. Remove the DSIO module mounting screws and remove the module from the control box. Save the screws.

4. With a small screwdriver, set the address switches S1 and S2 on the new DSIO module to match those on the defective module.
5. Mount the new module in the control box using the screws saved in Step 3.
6. Reinstall all of the wire connectors and the green ground wire.
7. Carefully check all wire connections before restoring power to the unit.
8. Verify that the unit ON/OFF switch is in the ON position.
9. Restore power to the unit and close the control circuit breaker (CCB). Verify that the red and green LEDs respond as described in the Control Modules section on page 83. The LID (keypad) should begin its rotating display.
10. After completing the configuration steps outlined above, close all remaining circuit breakers and perform a unit test as described in Test Function section on page 49 to determine if the module is operating properly.
11. Complete this procedure and restore the unit to normal operation by returning the STANDBY/RUN mode to STBY NO.

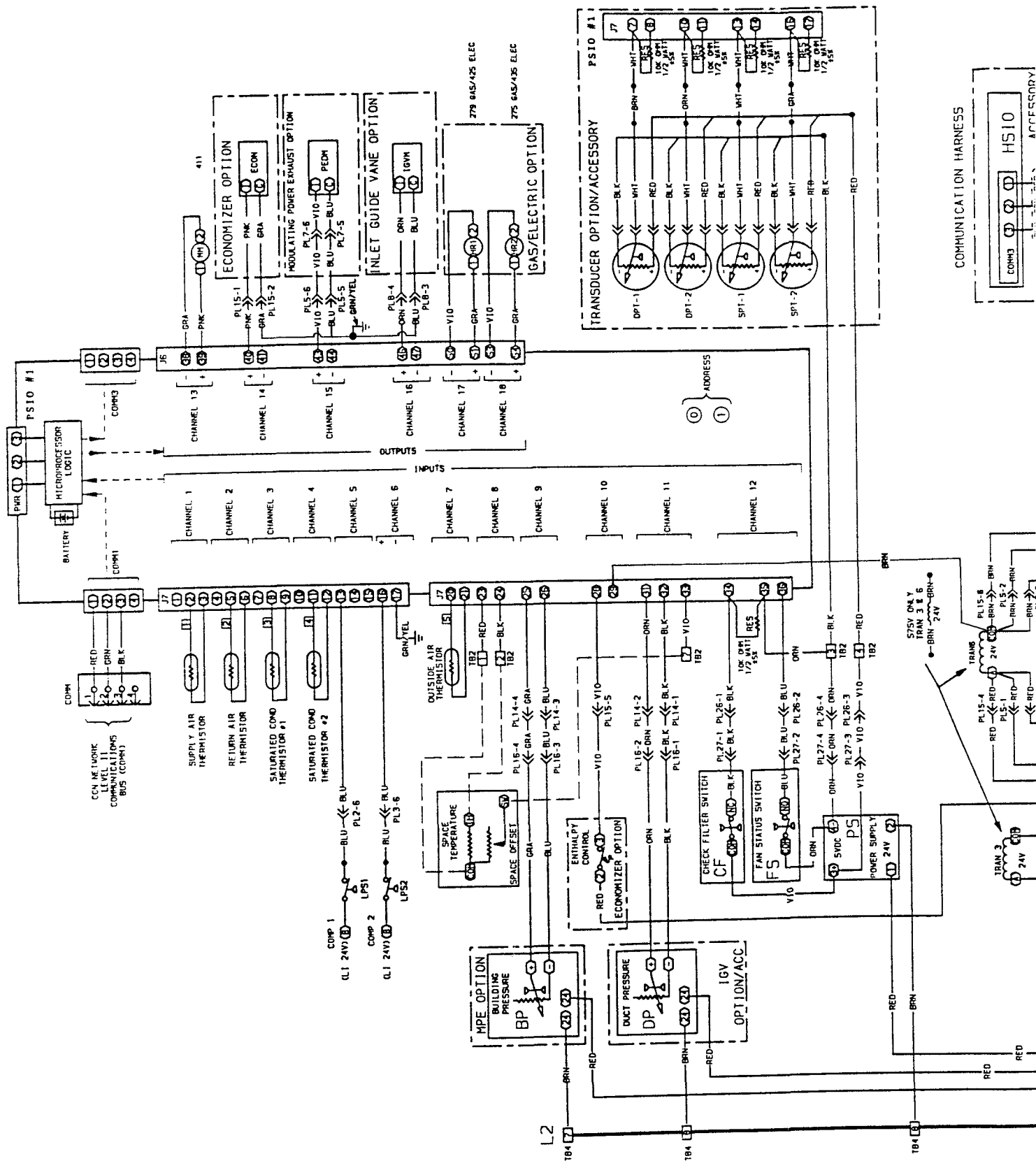
LEGEND FOR FIG. 39

BP	— Building Pressure
C	— Contactor
CB	— Circuit Breaker
CF	— Check Filter Switch
CLO	— Compressor Lockout
COM	— Common
COMM	— Communication Plug
COND	— Condenser
CR	— Control Relay
CS	— Centrifugal Switch
DP	— Duct Pressure
DPT	— Discharge Pressure Transducer
DSIO	— High-Voltage Relay Module
DU	— Dummy
EC	— Enthalpy Control
FS	— Fan Status Switch
FU	— Fuse
GND	— Ground
GR	— Gas Relay
HHR	— Hydronic Humidifier Relay
HIR	— Heat Interlock Relay
HPS	— High-Pressure Switch
HR	— Heater Relay
HSIO	— Keypad and Display Module
HV	— High Voltage
HYD	— Hydronic
ICP	— Ignitor Control Pack
IDC	— Induced Draft Contactor
IFC	— Indoor (Evaporator) Fan Contactor
IGV	— Inlet Guide Vanes
IGVM	— Inlet Guide Vanes Motor

LPS	— Low-Pressure Switch
LS	— Limit Switch
LSR	— Limit Switch Relay
MG	— Main Gas
MGV	— Main Gas Valve
MM	— Head Control Pressure Device
MPER	— Modulating Power Exhaust Relay
MV	— Main Valve
NC	— Normally Closed
NO	— Normally Open
PEC	— Power Exhaust Contactor
PEDM	— Power Exhaust Damper Motor
PG	— Pilot Gas
PL	— Plug
PS	— Power Supply (5 VDC)
PSIO	— Processor Module
PV	— Pilot Valve
PWR	— Power
RES	— Resistor
RS	— Rollout Switch
SEN,SN	— Sensor
SPT	— Suction Pressure Transducer
SW	— Switch
TB	— Terminal Block
TDO	— Timed Discrete Output
TH	— Thermostat
TRAN	— Transformer
VLV	— Valve
----	Field Wiring
———	Factory Wiring



275
278



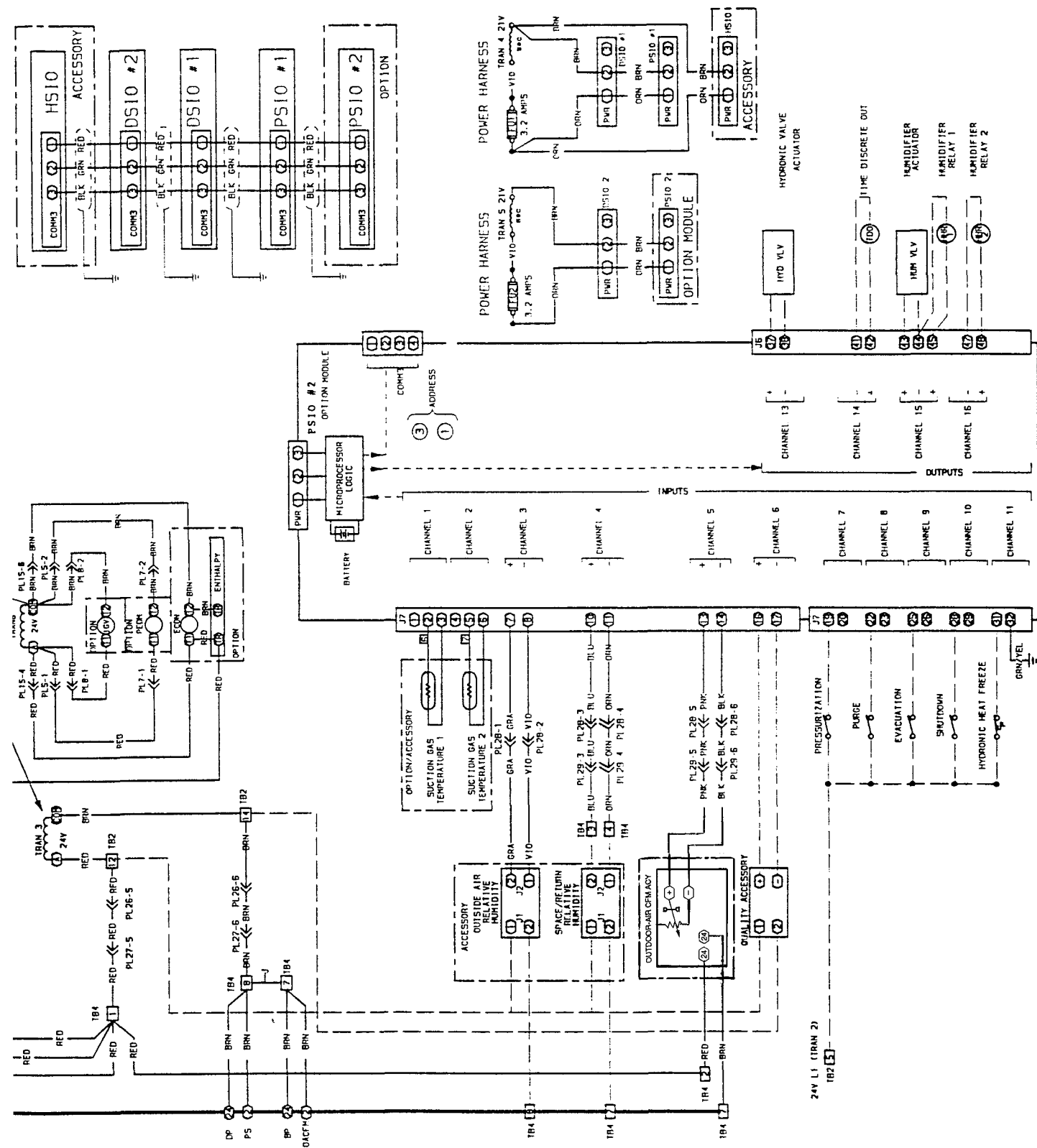


Fig. 39 — Typical Wiring Schematic (cont)

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