



**COBRA™ Energy Recovery Units
48/50HJ004-014 with 62AQ060-300
Single-Package Rooftop Units
and Field-Installed 62AQ060-300
ENERGY\$RECYCLER™ Units**

Application Data

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GENERAL

Carrier's COBRA™ energy recovery units and field-installed 62AQ Energy\$Recycler™ units use Carrier's patented heat pump technology to reclaim energy from building exhaust air. This energy is then used to pre-condition ventilation air for the rooftop unit during winter and summer operation. These units are designed to satisfy higher ventilation requirements and other building codes while minimizing energy costs.

The 62AQ Energy\$Recycler unit can be field-installed or factory-installed. When it is factory-installed on a 48HJ or 50HJ rooftop unit, the combined total package is designated as a COBRA unit. Factory installation of the 62AQ unit provides the benefit of reduced field-installation time, single point power connections, and the assurance of a factory test for the complete COBRA unit. The COBRA unit requires less maintenance than other energy recovery systems and can be serviced by a qualified refrigerant technician. See Fig. 1.

NOTE: The COBRA unit nameplate is located on the opposite end of the rooftop section, on the upper right-hand part of the panel due to the location of the 62AQ Energy\$Recycler section.

For field-installed 62AQ applications, the 62AQ unit must be connected to the base unit in the field. The 62AQ unit attaches directly to the return air opening of the rooftop unit using hardware provided in an accessory mounting kit and support rail. Power and control wiring for the 62AQ unit are also field provided. The rooftop unit must be curb mounted in the vertical supply and return configuration only. Connection to competitive units requires field-supplied mounting arrangements and ductwork.

Additional literature available for 62AQ Energy\$Recycler units or the combined COBRA units include:

- The 62AQ Energy\$Recycler Product Data: applies to COBRA and field-installed 62AQ units.
- The COBRA Energy Recovery Unit Installation, Start-Up and Service Supplement: applies to COBRA units only.
- The 62AQ Energy\$Recycler Installation, Start-Up and Service Instructions applies to field-installed 62AQ units.

Features/Benefits — Carrier's COBRA and field-installed 62AQ units provide all-in-one unitary offerings with energy recovery capability and total latent load control.

DOWNSIZE ROOFTOP UNIT — By pre-conditioning the outdoor air, the evaporator mixed entering air conditions can be reduced, which may allow for use of a smaller tonnage rooftop unit. Units have up to 100% outdoor air (OA) capability for compliance with industry ventilation standards.

COST EFFICIENT OPERATION — Utilizing energy from exhaust air allows for improved indoor air quality (IAQ) and enhanced rooftop unit efficiency at both peak and part load conditions.

ADDITIONAL STAGES — System flexibility allows for the energy recovery device to operate as an additional stage of heating or cooling.

EASE OF INSTALLATION — Available as a factory-installed option on the Weathermaster® 48/50HJ 3 to 12½ ton rooftop product line, COBRA energy recovery units provide expanded capability to the rooftop unit's performance. The factory-installed COBRA energy recovery unit is applicable for vertical-supply, vertical-return configuration units only.

UNIT MOUNTING — The 62AQ Energy\$Recycler unit is designed to mount directly to vertically ducted rooftop units using an accessory mounting kit and support rail. No additional roof curb is required.

FACTORY INSTALLATION BENEFITS — When a 62AQ Energy\$Recycler™ unit is factory-installed on a rooftop unit, it is designated as COBRA™ unit. See Fig. 1 for COBRA configuration. Benefits of factory installation of the energy recovery section include:

- reduced field-installation time
- single point power connections
- pre-configured iso-exhaust option
- less maintenance than other energy recovery systems and serviceable by any qualified refrigeration technician
- single unit nameplate

ROOF CURB APPLICATIONS — COBRA and field-installed 62AQ units both require specific curb designs to support the additional weight of the Energy\$Recycler (E\$R) unit.

COBRA Curb Application — The COBRA unit has two proven mounting options. The preferred method is to use the COBRA full-perimeter roof curb. See Fig. 2, 3A and 3B. Two full perimeter curbs are available: part number CRRFCURB022A00 is used with size 004-007 units, part number CRRFCURB023A00 is used with size 008-014 units. The full perimeter curb complies with NRCA (National Roofing Contractors Association) standards.

The unit may also be mounted on a Carrier standard rooftop unit roof curb in combination with an accessory supplemental equipment support or a field-fabricated and field-installed support for the 62AQ section. The 62AQ section support is required if the Carrier standard rooftop unit roof curb is used. See Fig. 4-7.

Ductwork attaches to the roof curb. DO NOT attach ductwork to the unit.

COBRA Iso-Exhaust, Split Return Duct Application — A COBRA application is capable of utilizing an “iso-exhaust” feature. Developed with indoor air quality in mind, the iso-exhaust option allows the exhaust of poor quality return air directly outside without contaminating supply air. In addition, the energy from the previously unused exhaust air is reclaimed and used to precondition the outdoor air, reducing the load on the evaporator coil and providing better comfort for occupants.

This design is ideal for applications where there is contaminated air (bathroom, photo processing, etc.) that cannot be returned to the conditioned space and, therefore, MUST be exhausted. A split-return-duct arrangement allows two separate return ducts to be attached to the roof curb: “R2,” which contains “contaminated air,” is routed into the E\$R section; “R1” contains normal air that can be recirculated back to the space. This design separates the two return airstreams so that the exhaust air and the rooftop unit return air do not mix. Thus, separate ducting is required for each stream of air, sized according to the openings of the E\$R section and rooftop unit return.

The full perimeter roof curb featuring a “split-return” design is available for this application. Although the position of the “curb splitter bracket” that separates the return air into two openings is adjustable, the COBRA “scoop” that directs the return air into the E\$R section is a fixed dimension. Therefore, the “return support bracket” must be moved to appropriate dimension for the applicable scoop, and the scoop must be sealed (via provided seal-strip) to the roof curb. Additionally, the R1 and R2 field-supplied ductwork must be mated and sealed with the curb.

See Fig. 3A, 3B, 8A and 8B for additional details on COBRA iso-exhaust dimensions.

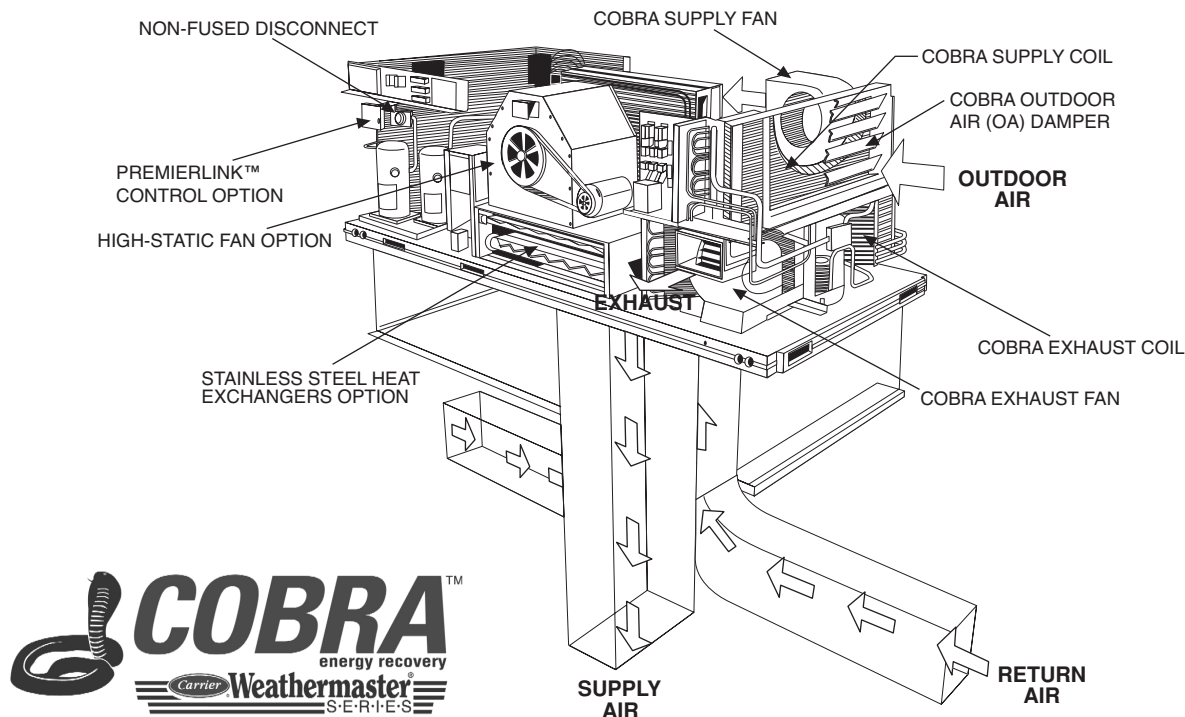


Fig. 1 — COBRA Energy Recovery Unit

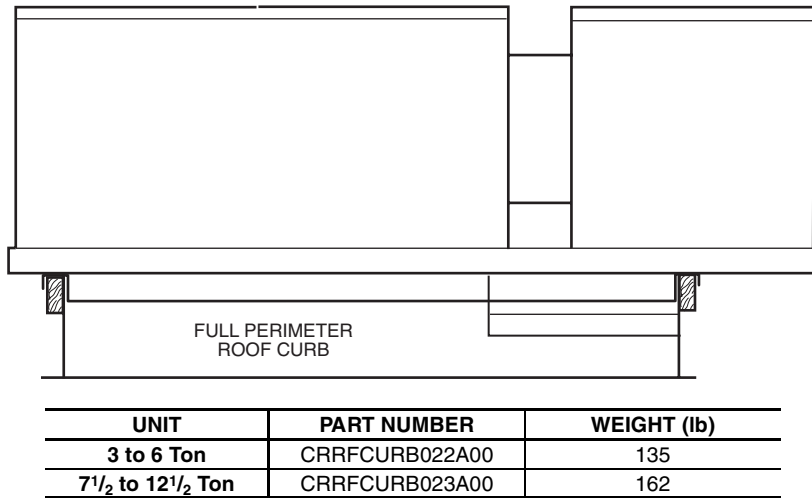


Fig. 2 — COBRA™ Energy Recovery Unit Mounting with Full Perimeter Unit Roof Curb

⚠ CAUTION

DO NOT USE THIS DRAWING TO FIELD-FABRICATE A CURB! SIGNIFICANT PROBLEMS CAN OCCUR IF A CARRIER APPROVED CURB IS NOT USED.

DUCT OPENING SIZES
Supply = 13 7/8" x 20 1/4"
R1 = 13 5/8" x 17 3/4"
R2 = 13 5/8" x 12 5/16"

R1 = Return from building to HVAC
R2 = Return from building to 62AQ

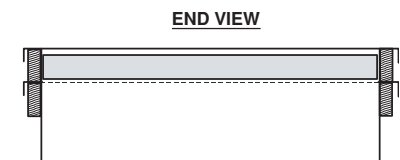
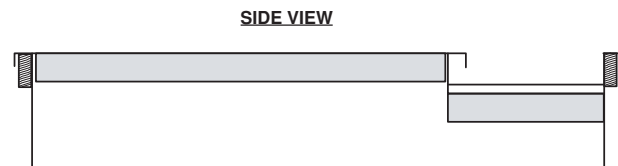
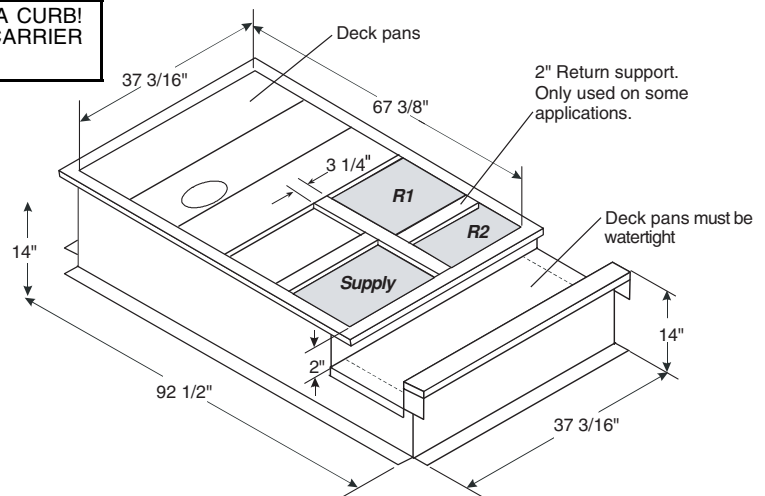


Fig. 3A — COBRA Energy Recovery Unit Full-Perimeter Roof Curb — 48/50HJ004-007 with 62AQ060, 100

⚠ CAUTION

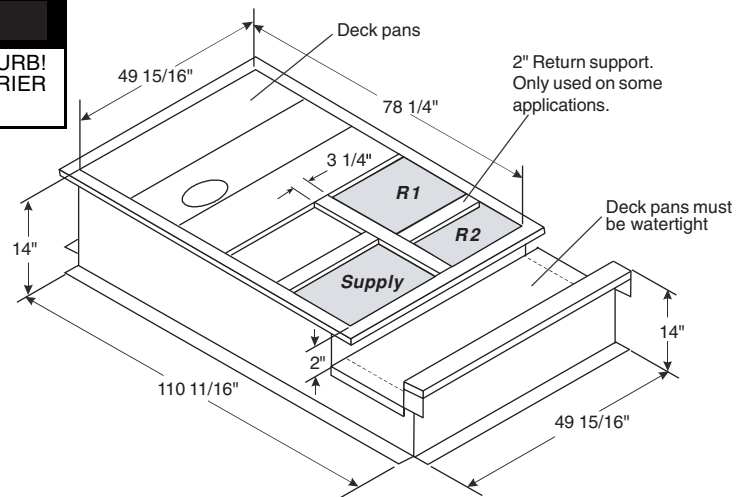
DO NOT USE THIS DRAWING TO FIELD-FABRICATE A CURB! SIGNIFICANT PROBLEMS CAN OCCUR IF A CARRIER APPROVED CURB IS NOT USED.

DUCT OPENING SIZES

Supply = 15 11/16" x 31 3/8"
R1 = 15 5/16" x 29 1/16"
R2 = 15 5/16" x 9"

R1 = Return from building to HVAC

R2 = Return from building to 62AQ



SIDE VIEW



END VIEW

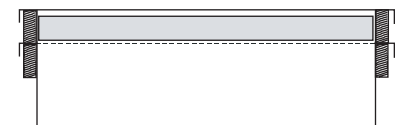


Fig. 3B — COBRA™ Energy Recovery Unit Full-Perimeter Roof Curb — 48/50HJ008-014 with 62AQ200, 300

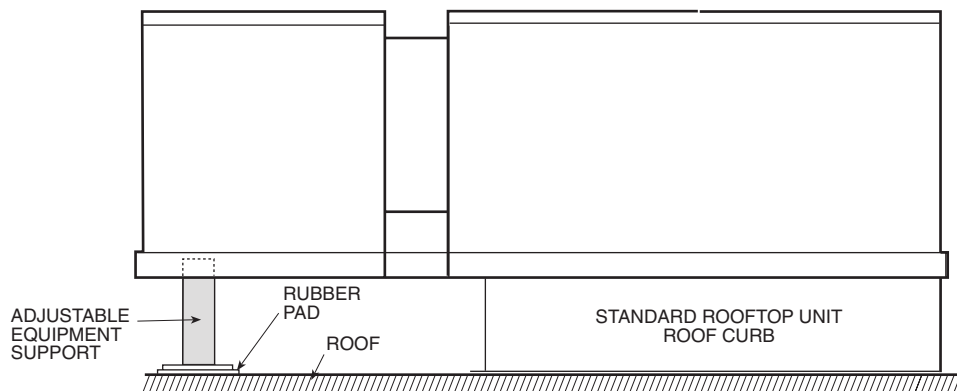


Fig. 4 — COBRA Energy Recovery Unit Mounting with Standard Roof Curb and Equipment Support

CONNECTOR PKG. ACCY.	B	C	D ALT DRAIN HOLE	GAS	POWER	CONTROL	ACCESSORY PWR
CRBTMPWR001A01	1'-9 11/16" [551]	1'-4" [406]	1 3/4" [44.5]	3/4" [19] NPT	3/4" [19] NPT	1/2" [12.7] NPT	1/2" [12.7] NPT
CRBTMPWR002A01				1 1/4" [31.7]	1 1/4" [31.7]		
CRBTMPWR003A01				1/2" [12.7] NPT	3/4" [19] NPT		
CRBTMPWR004A01				3/4" [19] NPT	1 1/4" [31.7]		

ROOF CURB ACCESSORY	A	UNIT SIZE
CRRFCURB001A01	1'-2" [356]	004-007
CRRFCURB002A01	2'-0" [610]	

NOTES:

1. Roof curb accessory is shipped disassembled.
2. Insulated panels.
3. Dimensions in [] are in millimeters.
4. Roof curb: galvanized steel.
5. Attach ductwork to curb (flanges of duct rest on curb).
6. Service clearance: 4 ft on each side.
7.  Direction of airflow.
8. Connector packages CRBTMPWR001A01 and 2A01 are for thru-the-curb type gas. Packages CRBTMPWR003A01 and 4A01 are for thru-the-bottom type gas connections.

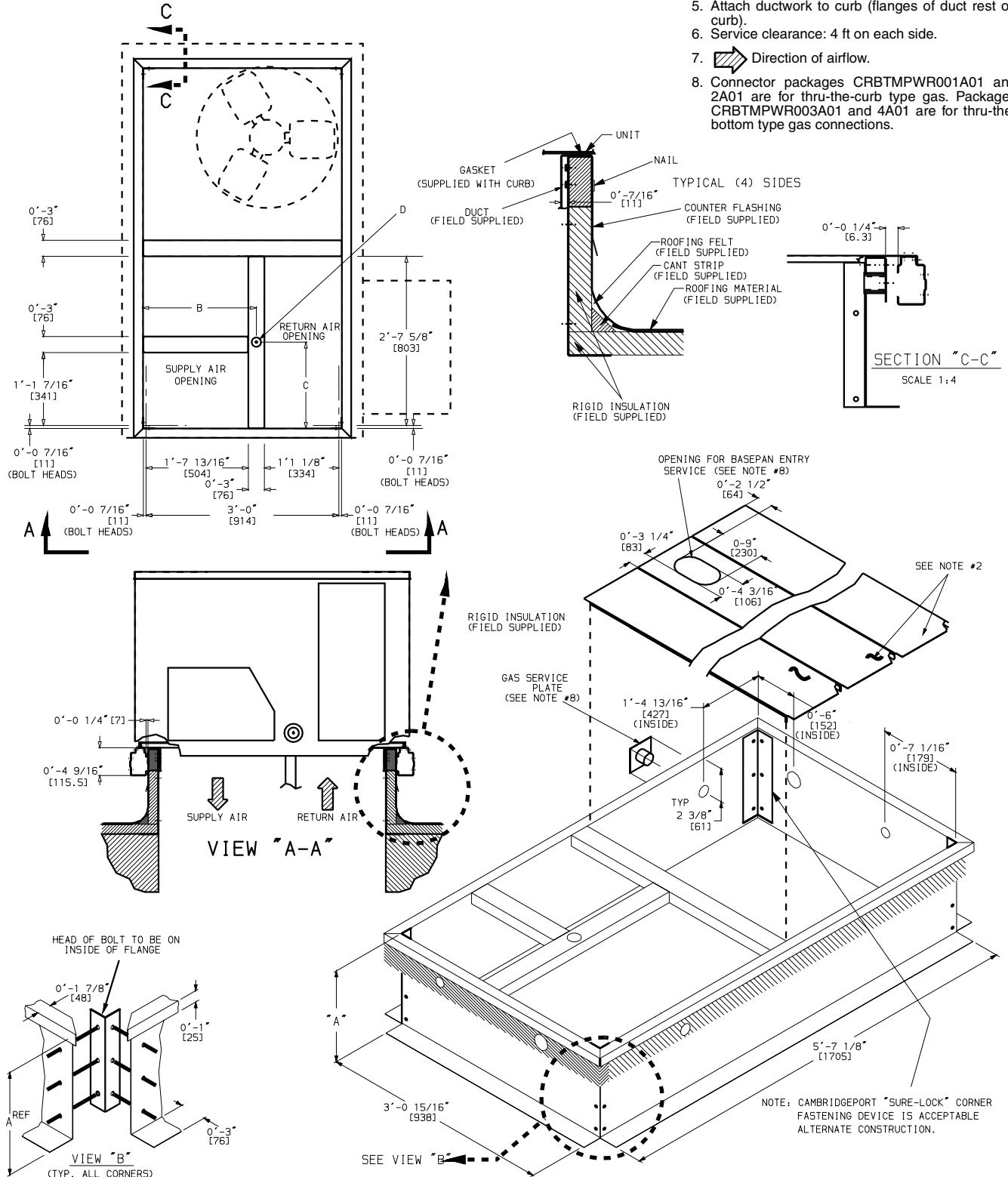


Fig. 5 — Roof Curb Details (48/50HJ004-007 Section Only)

CONNECTOR PKG. ACCY.	B	C	D ALT DRAIN HOLE	GAS	POWER	CONTROL	ACCESSORY PWR
CRBTMPWR001A01	2'-8 7/16" [827]	1'-10 15/16" [583]	1 3/4" [44.5]	3/4" [19] NPT	3/4" [19] NPT	1/2" [12.7] NPT	1/2" [12.7] NPT
CRBTMPWR002A01				1 1/4" [31.7]	1 1/4" [31.7]		
CRBTMPWR003A01				1/2" [12.7] NPT	3/4" [19] NPT		
CRBTMPWR004A01				3/4" [19] NPT	1 1/4" [31.7]		

ROOF CURB ACCESSORY	A	UNIT SIZE
CRRFCURB003A01	1'-2" [356]	008-014
CRRFCURB004A01	2'-0" [610]	

NOTES:

1. Roof curb accessory is shipped disassembled.
2. Insulated panels: 1-in. thick polyurethane foam, 1 3/4 lb density.
3. Dimensions in [] are in millimeters.
4. Roof curb: 16-gage steel.
5. Attach ductwork to curb (flanges of duct rest on curb).
6. Service clearance 4 ft on each side.
7.  Direction of airflow.
8. Connector packages CRBTMPWR001A01 and 2A01 are for thru-the-curb gas type. Packages CRBTMPWR003A01 and 4A01 are for thru-the-bottom type gas connections.

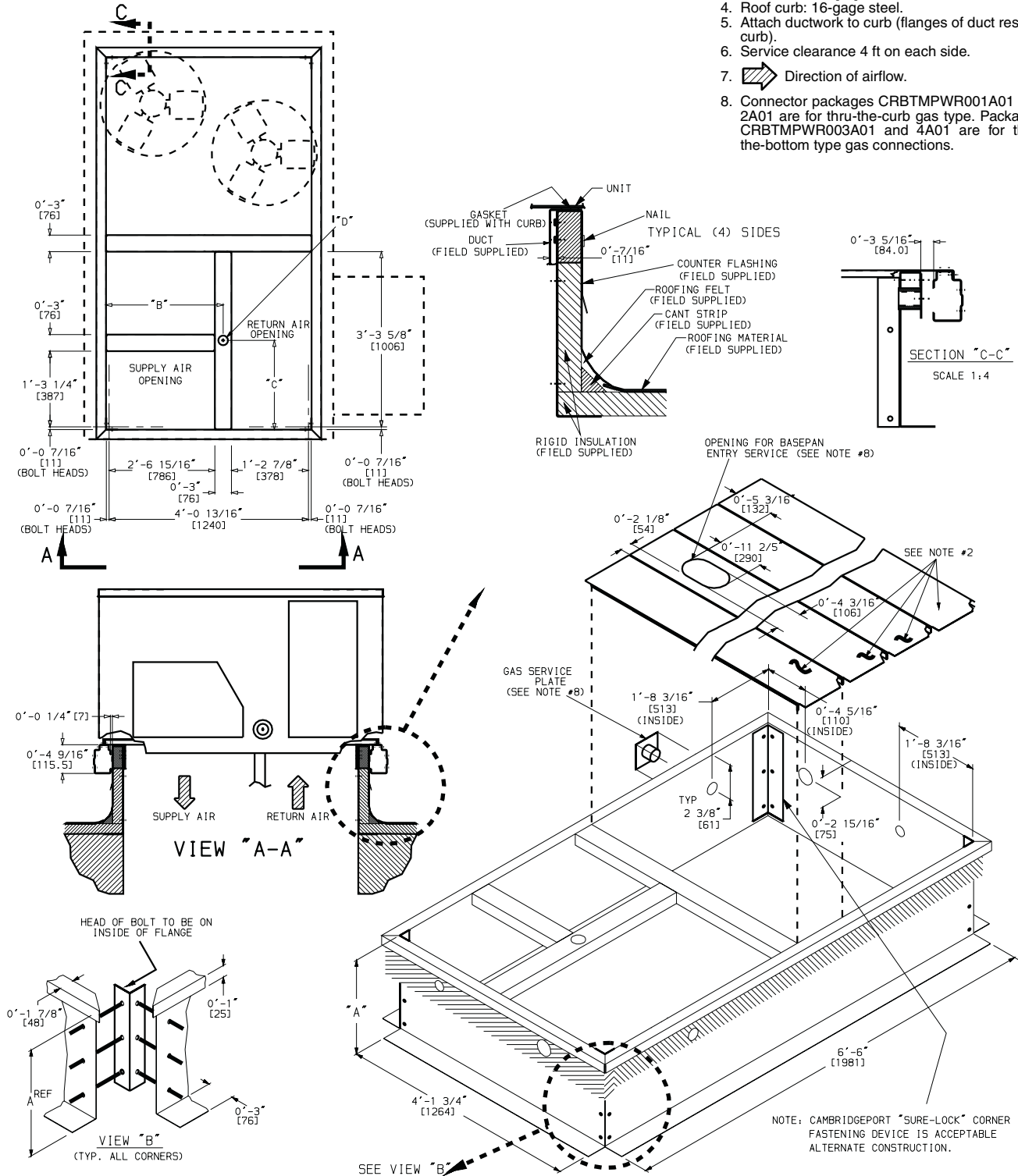


Fig. 6 — Roof Curb Details (48/50HJ008-014 Section Only)

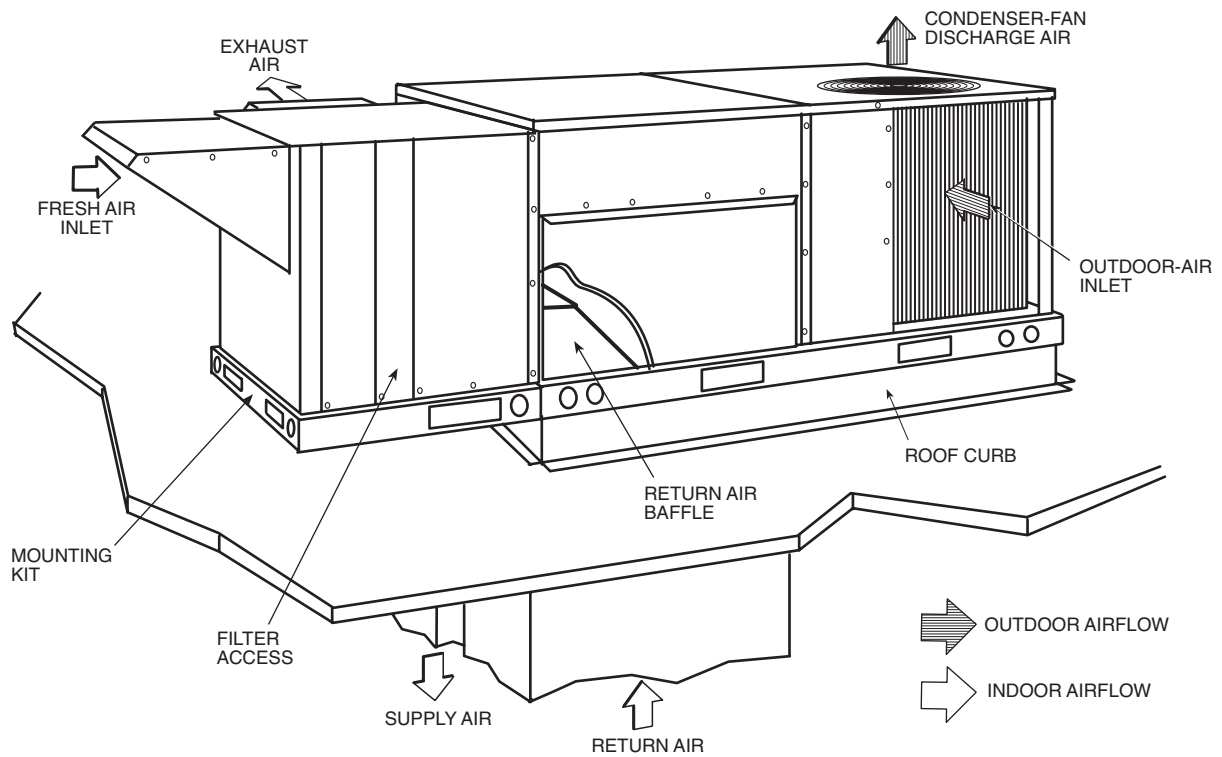
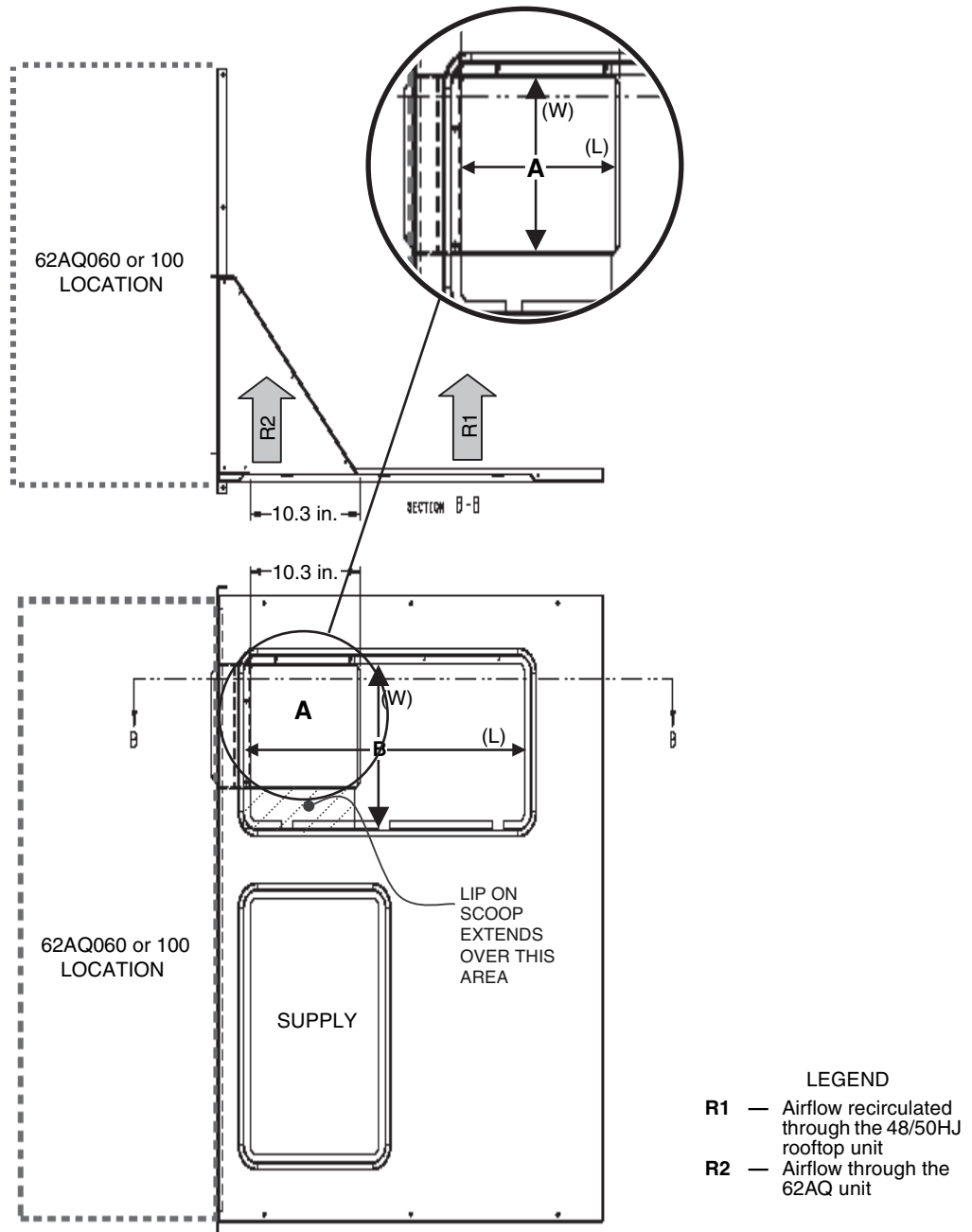


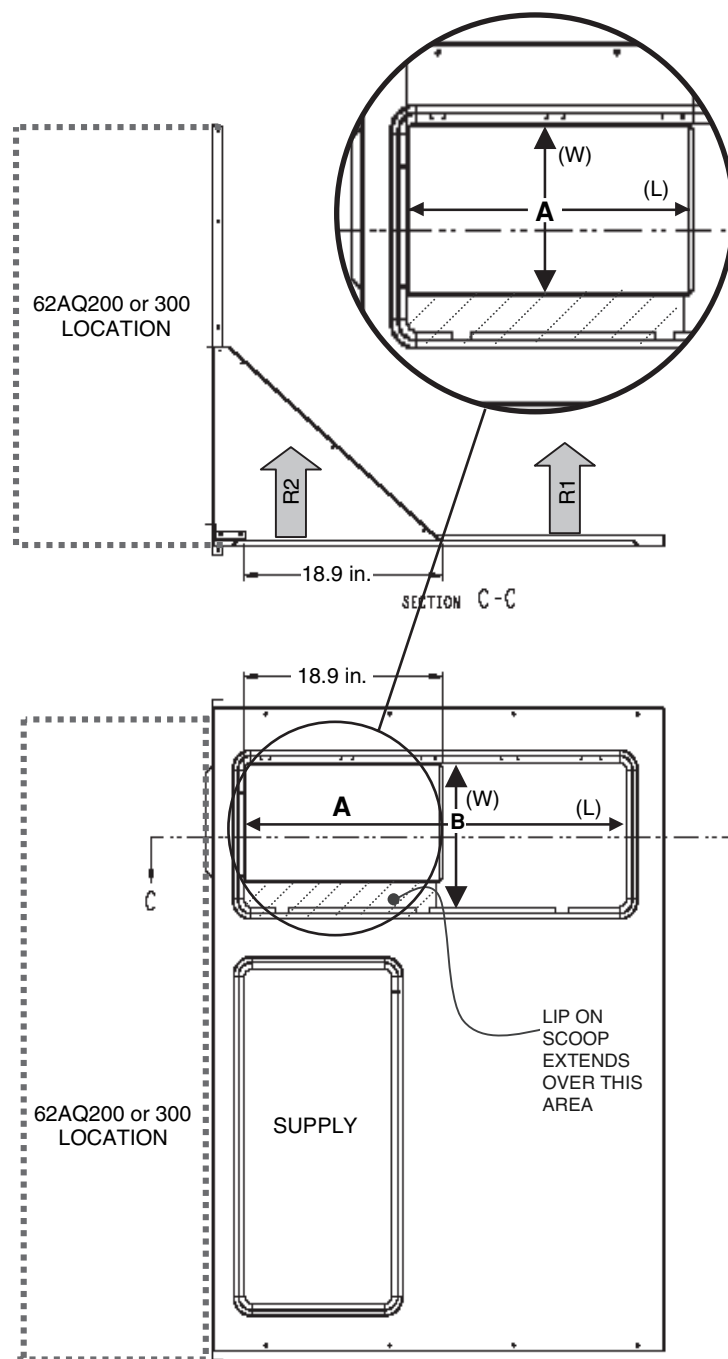
**Fig. 7 — Typical Energy\$Recycler™ Installation
(Field-Installed 62AQ with Standard Unit Roof Curb Shown)**



62AQ SIZE	COBRA SCOOP OPENING FOR RETURN AIR (A)	
	L (in.)	W (in.)
060,100	10.3	10.1

48/50HJ SIZE	ROOFTOP RETURN-AIR DUCT OPENING DIMENSIONS (B)	
	L (ft-in.)	W (ft-in.)
004-007	2-1 ¹¹ / ₁₆	0-10 ¹⁵ / ₁₆

**Fig. 8A — COBRA™ Iso-Exhaust Return Air Hood Dimensions —
48/50HJ004-007 Units with 62AQ060, 100**



- LEGEND
- R1 — Airflow recirculated through the 48/50HJ rooftop unit
- R2 — Airflow through the 62AQ unit

62AQ SIZE	COBRA SCOOP OPENING FOR RETURN AIR (A)	
	L (in.)	W (in.)
200, 300	18.9	10.1

48/50HJ SIZE	ROOFTOP RETURN-AIR DUCT OPENING DIMENSIONS (B)	
	L (ft-in.)	W (ft-in.)
008	2-9 ¹¹ / ₁₆	1-0 ⁵ / ₈
009-014	3-0 ³ / ₈	1-0 ⁵ / ₈

Fig. 8B — COBRA™ Iso-Exhaust Return Air Hood Dimensions —
48/50HJ008-014 Units with 62AQ200, 300

Field-Installed 62AQ Application — A field-installed 62AQ energy recovery unit cannot use a COBRA™ rooftop unit full perimeter curb. A standard curb with a mounting kit and an adjustable support are used, as shown in Table 1 and Fig. 9 and 10.

Ductwork attaches to the roof curb; do not attach ductwork to the unit.

See the 62AQ installation instructions for details on mounting kits, support rails and installation.

Table 1 — Field-Installed 62AQ Required Equipment Support

ROOFTOP UNIT SIZE	62AQ UNIT	MOUNTING KIT NUMBER	ADJUSTABLE EQUIPMENT SUPPORT RAIL			
			Part Number	Dimensions (in.)		
3-6 Ton	060, 100	CRMTGKIT001A00	CRAQSUPT001A00	36.9	40	8 to 14
			CRAQSUPT002A00	36.9	40	14 to 24
7½ -12½ Ton	200, 300	CRMTGKIT002A00	CRAQSUPT003A00	49.7	54	8 to 14
			CRAQSUPT004A00	49.7	54	14 to 24

NOTE: Pairing 3 to 6 ton rooftop units with 62AQ200 or 62AQ300 units is not a factory supported option. Contact Application Engineer for additional information.

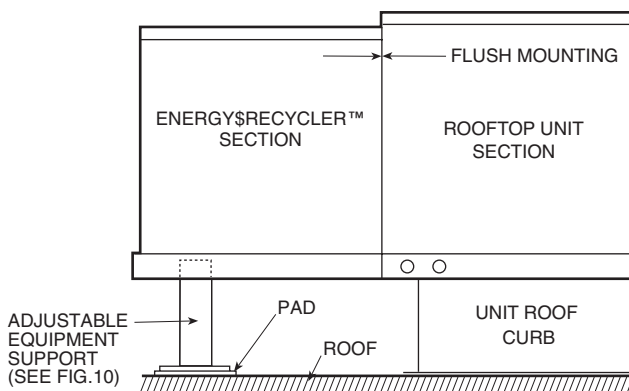
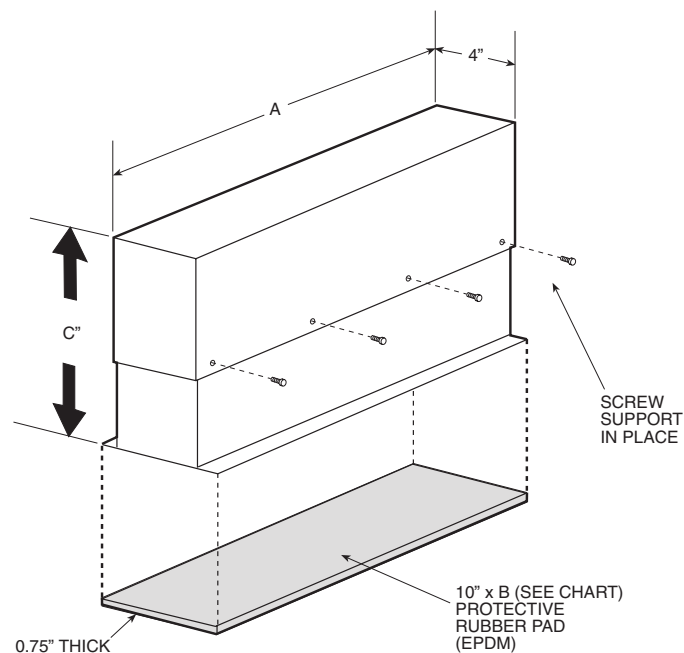


Fig. 9 — Rooftop Unit and Field-Installed 62AQ Unit (NOT a COBRA Unit)



NOTE: See dimensions in Table 1.

Fig. 10 — Adjustable Equipment Support

SYSTEM OPERATION

The COBRA™ and field-installed 62AQ Energy\$-Recycler™ units replace the rooftop unit economizer and contain their own powered two-position outdoor air (OA) damper. See Fig. 1. Outdoor air passes through the damper, then through the upper coil and into the rooftop unit, where it mixes with return air before entering the rooftop evaporator coil. The exhaust portion of the rooftop unit return air is directed past the 62AQ Energy\$Recycler (E\$R) compressor, through the lower coil and then out to the atmosphere. The E\$R portion of the unit is a heat pump that uses the preconditioned exhaust air as a heat source/sink. Refer to Fig. 11-17 and Tables 2A and 2B for operating information and system response.

In cooling mode the E\$R upper coil acts as the evaporator. When needed, the E\$R upper coil cools and dehumidifies the outdoor air before it enters the rooftop unit. The lower coil acts as the condenser, which is cooled by building exhaust air. The

net effect takes heat from the incoming outdoor air and rejects it into the exhaust air.

In heating mode, the E\$R lower coil acts as the evaporator, which absorbs heat from the exhaust air before it is ejected into atmosphere. The upper coil acts as the condenser, which adds heat to the outdoor air before it enters the rooftop unit. The net effect is to remove heat from the building exhaust air and use it to warm the incoming outdoor ventilation air.

Additionally, the COBRA and field-installed 62AQ units utilize an occupied/unoccupied strategy to maximize conditioning efficiency. In general, a maximum of three stages are available for cooling: OA (if suitable for free cooling), the 62AQ Energy\$Recycler unit and rooftop unit compressor 1, and the rooftop unit circuit 2. However, the 62AQ Energy\$-Recycler unit utilizes the occupied/unoccupied schedule, room temperature, humidity set points, and the OA thermostat set points to determine what is necessary to properly condition the air.

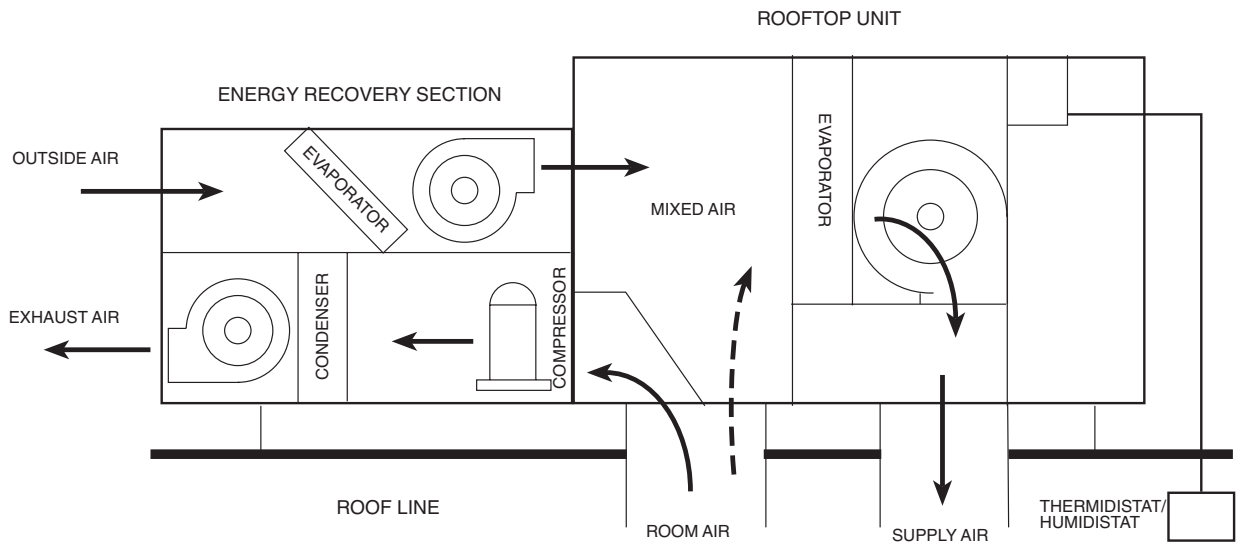
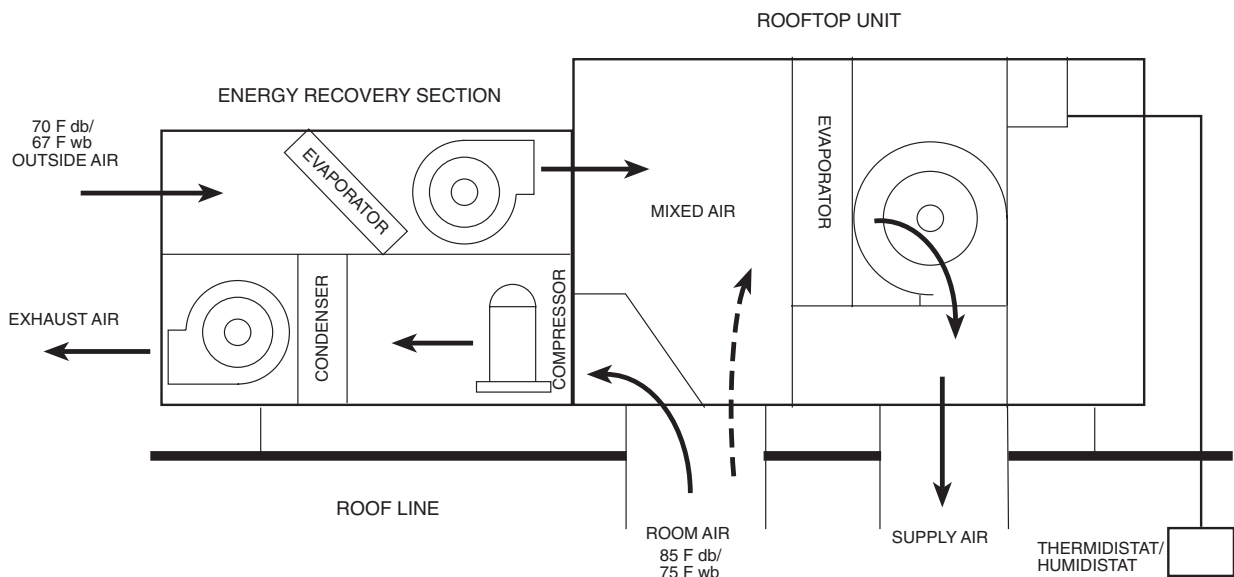


Fig. 11 — Typical Unit Airflow Diagram



LEGEND
db — Dry Bulb
RH — Relative Humidity
wb — Wet Bulb

NOTES:

1. If outdoor air quality is poor or outdoor air relative humidity is too high, only the rooftop unit compressor will be on during cooling. The energy recovery section will not energize when outdoor air is unsuitable.
2. Space temperature unoccupied set point = 84 F
Space temperature = 85 F
Space relative humidity set point = 65% RH
Space relative humidity = 63% RH

Fig. 12 — Typical Unoccupied Cooling Operation (Unsuitable Outdoor Air)

Cooling Mode — The cooling changeover thermostat located on the hood of COBRA™ and 62AQ energy recovery units determines when the energy recovery unit goes into economizer mode. When the outdoor temperature is below the cooling set point, the unit will be in economizer mode.

In the unoccupied mode, fans are normally set for AUTO operation, causing the fans to cycle on only as needed for heating or cooling. If the light commercial Thermidstat™ device is set for “AUTO” fan, the rooftop unit fan will be off except when cooling or humidity control is required. The energy recovery unit fans will be off except when unit is running in the economizer mode. If the light commercial Thermidstat device is set to “ON” for fan, the energy recovery unit and rooftop unit fans will run continuously. If outdoor air is below the outdoor air thermostat set point, the compressors are locked off and the unit operates in economizer mode when cooling is required. If outdoor air is unsuitable due to humidity or quality, the energy recovery unit turns off and only the rooftop unit compressor runs when cooling is required.

NOTE: The energy recovery unit does not run and dampers are closed when the outdoor air is unsuitable for cooling and the mode is unoccupied. If outdoor air is suitable, first stage cooling is energy recovery unit in economizer mode and all compressors are off. Second stage cooling adds the energy recovery unit compressor and rooftop unit compressor no. 1.

In occupied mode, when the energy recovery unit compressor runs in cooling mode, it is extracting heat from the incoming outdoor air and rejecting heat to the exhaust air. The energy recovery unit and rooftop unit fans run continuously. On a first stage call, all compressors will be off if the outdoor air is suitable for free cooling. Otherwise, the energy recovery unit compressor and rooftop unit compressor no. 1 will run whenever there is a first stage demand for cooling. For units with a 2-stage rooftop unit, the energy recovery unit compressor and the rooftop unit compressor no. 1 and 2 will run whenever there is a demand for cooling on a second stage call. Units with a single stage rooftop unit are not factory configured for a second stage call. If there is a demand for humidity control but not cooling, only the energy recovery unit

compressor will run. If there is a field-installed CO₂ sensor and the levels are below that sensor set point, then the unit will operate in the unoccupied mode sequence (the energy recovery unit dampers will be closed and rooftop unit operation maintains space conditions only).

Heating Mode — The heating changeover thermostat located on the energy recovery unit hood determines the stage 1 to stage 2 switchover point in heating mode.

In unoccupied mode, the energy recovery unit is off and all compressors are locked off. First stage heat is rooftop unit heat at 50%. Second stage heat is rooftop unit heat at 100%.

In unoccupied mode, when the energy recovery unit compressor runs in heat mode, it is extracting heat from the exhaust air and rejecting heat to the incoming outdoor air; it is returning energy to the building that would, otherwise, be “thrown away.” The energy recovery unit and rooftop unit fans run continuously. The rooftop unit compressors are always off. On a first stage call, the energy recovery unit compressor is on in heat mode. Rooftop unit heat is off if the outdoor air is above the set point. Rooftop unit heat is on at 50% if the outdoor air is below the set point. On a second stage call, the energy recovery unit compressor is on in heat mode. Rooftop unit heat is on at 50% if the outdoor air is above the set point. Rooftop unit heat is on at 100% if the outdoor air is below the set point.

Defrost — If the temperature of the 62AQ section condenser (exhaust air) coil drops below 28 F at the defrost thermostat (DFT) and the defrost timer is at the end of a timed period (adjustable to 30, 50 or 90 minutes), then the reversing valve solenoid (RVS) is energized and the condenser fan contactors are deenergized. This switches the position of the reversing valve and shuts off the 62AQ section condenser (exhaust air) fan. The unit continues to defrost until the coil temperature measured at the DFT reaches 65 F or the defrost cycle completes a 10-minute cycle. At the end of the defrost cycle the RVS deenergizes and the exhaust fan motor energizes to put the unit in heating mode. If the space thermostat is satisfied during a defrost cycle, then the 62AQ section will continue in the Defrost mode until the defrost cycle is complete.

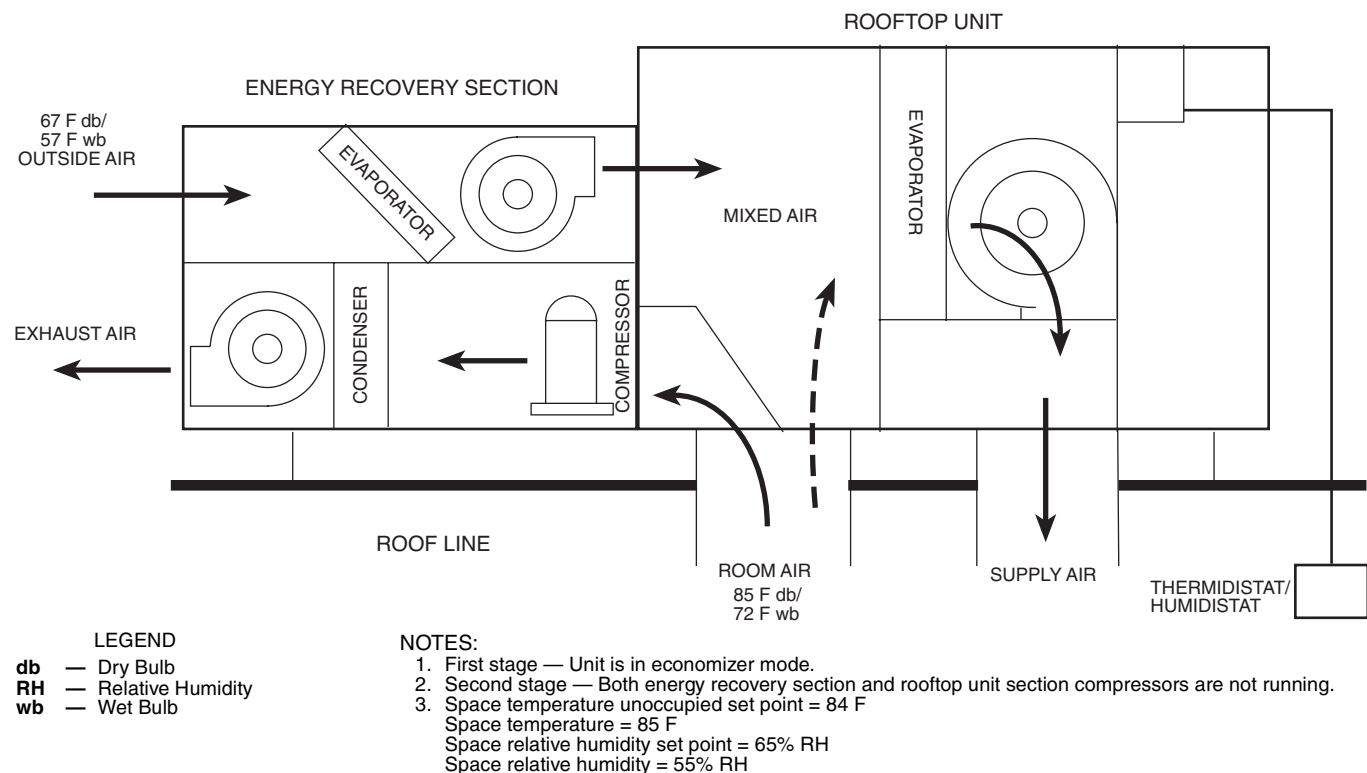
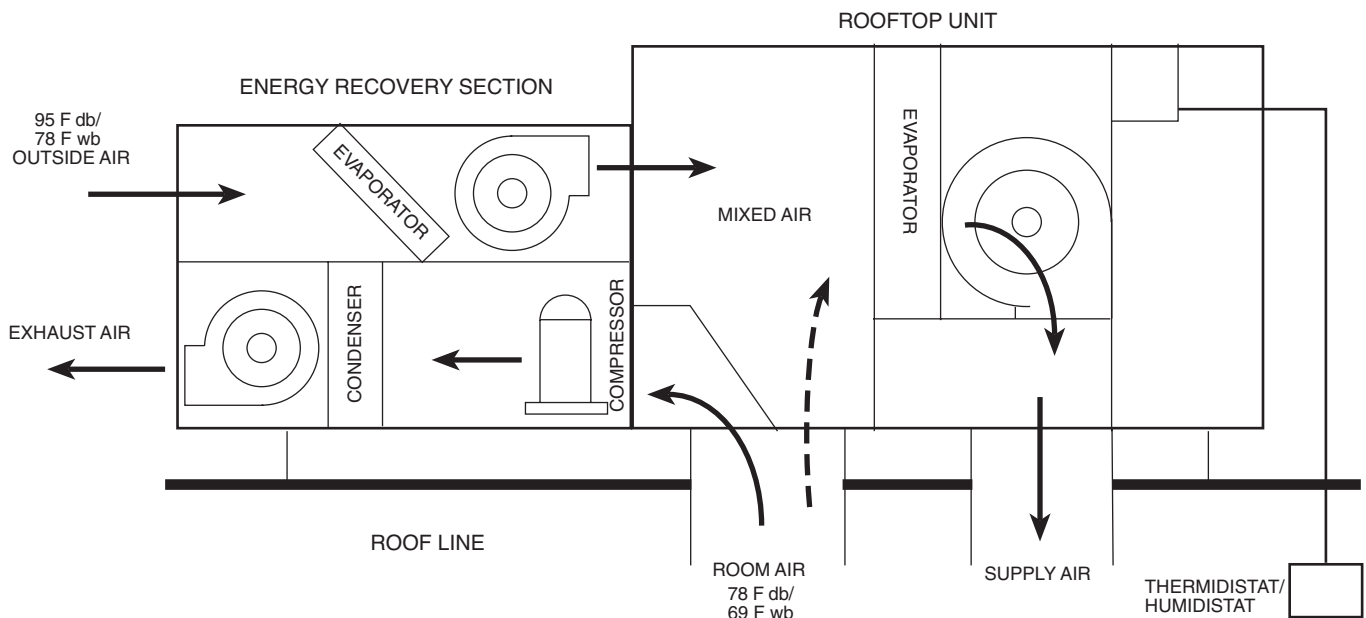


Fig. 13 — Typical Unoccupied Cooling Operation (Suitable Outdoor Air)

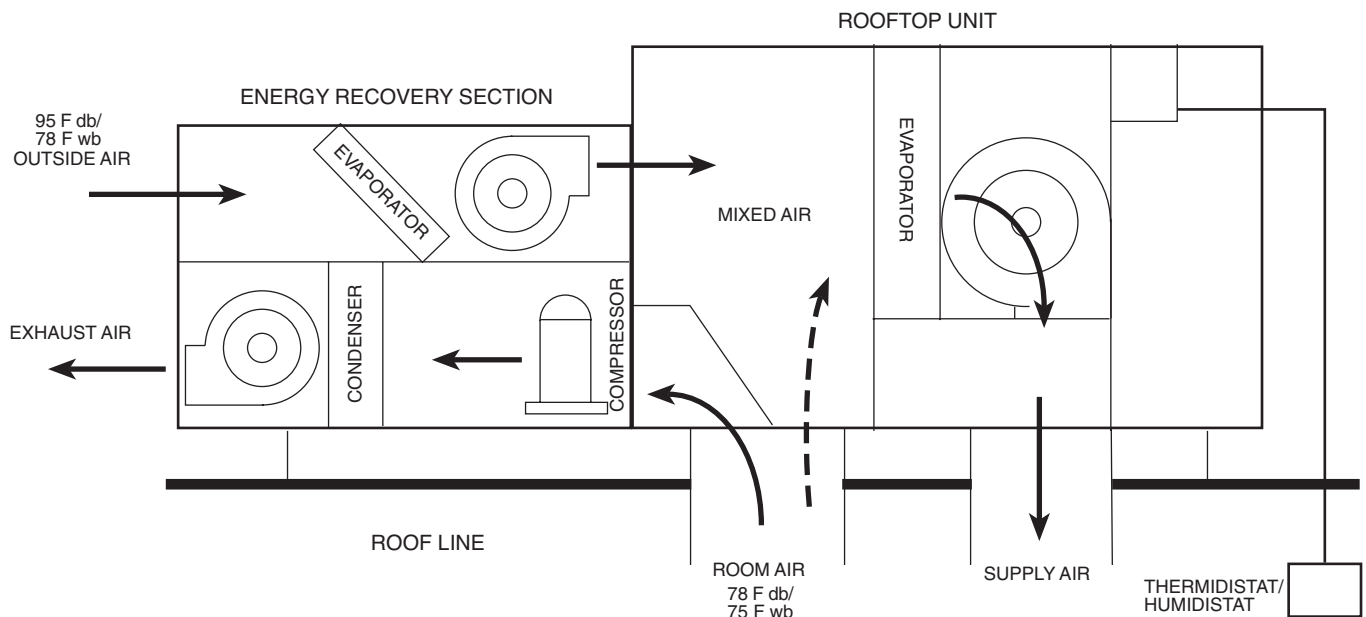


LEGEND
db — Dry Bulb
RH — Relative Humidity
wb — Wet Bulb

NOTES:

1. Space temperature occupied set points
 Stage 1 = 75 F
 Stage 2 = 76.5 F
 Space temperature = 78 F
 Space relative humidity set point = 60% RH
 Space relative humidity = 65% RH
2. Stage 1 Cooling = Energy Recovery section compressor ON, Rooftop Unit section compressor no. 1 ON.
 Stage 2 Cooling = Energy Recovery section compressor ON, Rooftop Unit section compressors no. 1 and 2 ON. (2-Stage Rooftop units only)

Fig. 14 — Typical Occupied Cooling Operation (Space Temperature and Humidity Above Set Points)

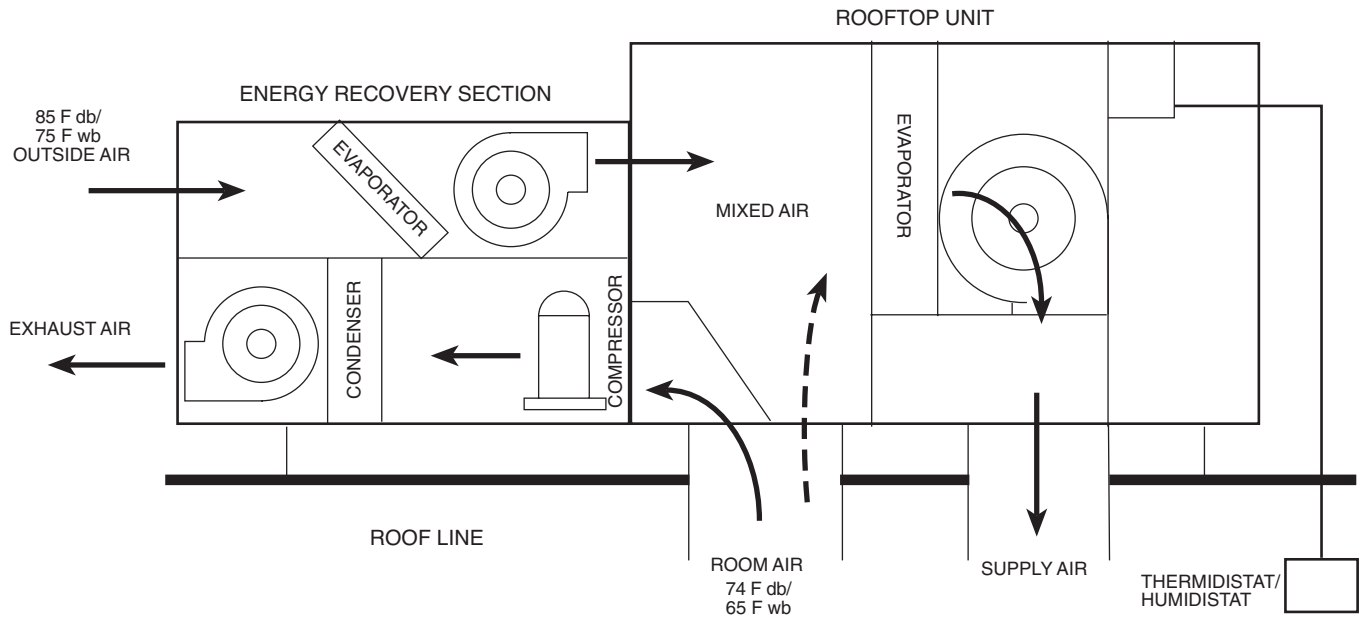


LEGEND
db — Dry Bulb
RH — Relative Humidity
wb — Wet Bulb

NOTES:

1. Space temperature occupied set points
 Stage 1 = 75 F
 Stage 2 = 76.5 F
 Space temperature = 78 F
 Space relative humidity set point = 60% RH
 Space relative humidity = 50% RH
2. Stage 1 Cooling = Energy Recovery section compressor ON, Rooftop Unit section compressor no. 1 ON.
 Stage 2 Cooling = Energy Recovery section compressor ON, Rooftop Unit section compressors no. 1 and 2 ON. (2-Stage Rooftop units only)

**Fig. 15 — Typical Occupied Cooling Operation
 (Space Temperature Above Set Point and Space Humidity Below Set Point)**

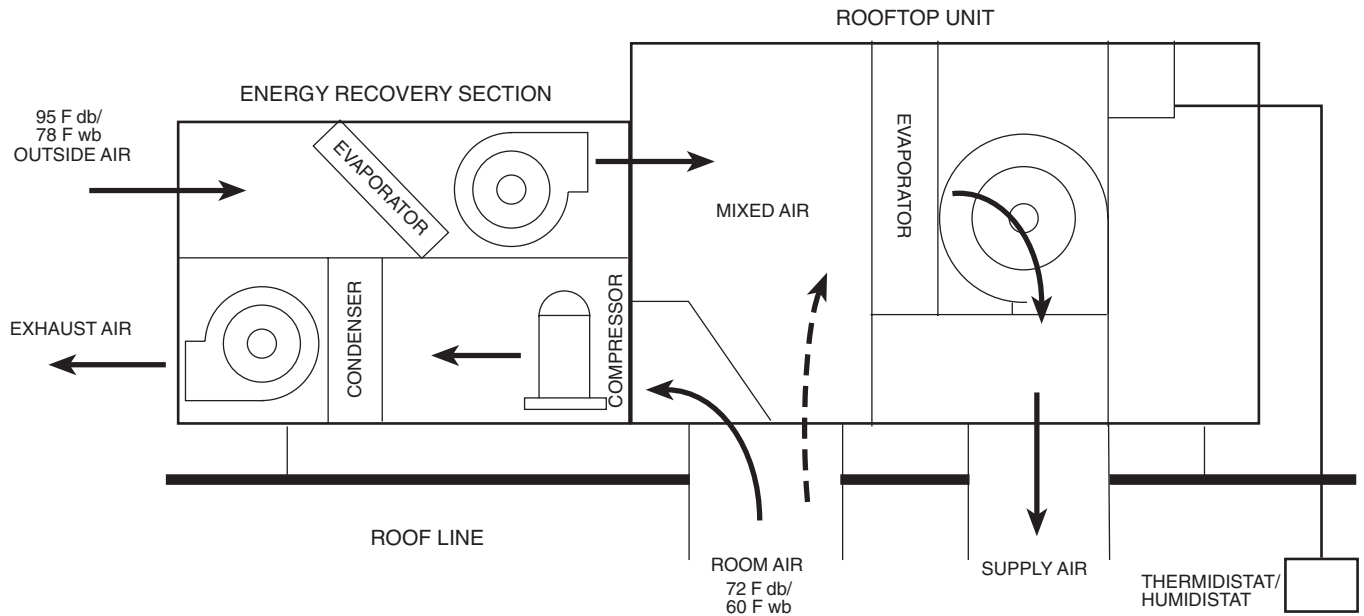


LEGEND
db — Dry Bulb
RH — Relative Humidity
wb — Wet Bulb

NOTES:

1. Space temperature occupied set points
 Stage 1 = 75 F
 Stage 2 = 76.5 F
 Space temperature = 74 F
 Space relative humidity set point = 60% RH
 Space relative humidity = 66% RH
2. Energy recovery section will energize compressors to provide humidity relief. Rooftop unit compressors will not energize.

**Fig. 16 — Typical Occupied Cooling Operation
 (Space Temperature Below Set Point and Space Humidity Above Set Point)**



LEGEND
db — Dry Bulb
IAQ — Indoor-Air Quality
RH — Relative Humidity
wb — Wet Bulb

NOTES:

1. Space temperature occupied set points
 Stage 1 = 75 F
 Stage 2 = 76.5 F
 Space temperature = 72 F
 Space relative humidity set point = 60% RH
 Space relative humidity = 50% RH
2. Unit will not bring on compressors. Energy recovery and rooftop supply fans will run to provide outdoor air to satisfy IAQ ventilation demand.

**Fig. 17 — Typical Occupied Cooling Operation
 (Space Temperature and Humidity Below Set Points)**

Table 2A — COBRA™ Energy Recovery Unit Sequence of Operation — Unoccupied

UNOCCUPIED						
COOLING	E\$R Compressor	E\$R Fans	RTU Compressor 1	RTU Compressor 2*	RTU Fans	RTU Heat
Indoor Temperature Above Y2*	On	On (cyc.)	On	Off	On (cyc.)	Off
Humidity Low & OAT Low	Off	Off	On	On	On (cyc.)	Off
Humidity Low & OAT High	Off	Off	On	On	On (cyc.)	Off
Humidity High & OAT Low	Off	Off	On	On	On (cyc.)	Off
Humidity High & OAT High	Off	Off	On	On	On (cyc.)	Off
Indoor Temperature Between Y1 & Y2*	Off	On (cyc.)	Off	Off	On (cyc.)	Off
Humidity Low & OAT Low	Off	Off	On	Off	On (cyc.)	Off
Humidity Low & OAT High	Off	Off	On	On	On (cyc.)	Off
Humidity High & OAT Low	Off	Off	On	On	On (cyc.)	Off
Humidity High & OAT High	Off	Off	On	On	On (cyc.)	Off
Indoor Temperature Below Y1	Off	Off	Off	Off	Off	Off
Humidity Low	Off	Off	On	On	On (cyc.)	Off
Humidity High	Off	Off	On	On	On (cyc.)	Off
NOTE: OAT < 55 F all compression off						
HEATING	E\$R Compressor	E\$R Fans	RTU Compressor 1	RTU Compressor 2*	RTU Fans	RTU Heat†
Indoor Temperature Above W1	Off	Off	Off	Off	Off	Off
Indoor Temperature Between W1 & W2	Off	Off	Off	Off	On (cyc.)	On, 50%
Indoor Temperature Below W2	Off	Off	Off	Off	On (cyc.)	On, 100%

LEGEND

E\$R — Energy\$Recycler™ Unit
OAT — Outdoor Air Temperature
RTU — Rooftop Unit

*Second stage for Y2 call applicable on rooftop units with 2 circuits only.
†50% rooftop unit heat only applicable with 2-stage electric or gas heating units.

Table 2B — COBRA Energy Recovery Unit Sequence of Operation — Occupied

OCCUPIED						
COOLING	E\$R Compressor	E\$R Fans	RTU Compressor 1	RTU Compressor 2*	RTU Fans	RTU Heat
Indoor Temperature Above Y2*	On	On	On	Off	On	Off
Humidity Low & OAT Low	On	On	On	On	On	Off
Humidity Low & OAT High	On	On	On	On	On	Off
Humidity High & OAT Low	On	On	On	On	On	Off
Humidity High & OAT High	On	On	On	On	On	Off
Indoor Temperature Between Y1 & Y2*	Off	On	Off	Off	On	Off
Humidity Low & OAT Low	On	On	On	Off	On	Off
Humidity Low & OAT High	On	On	On	On	On	Off
Humidity High & OAT Low	On	On	On	On	On	Off
Humidity High & OAT High	On	On	On	On	On	Off
Indoor Temperature Below Y1	Off	On	Off	Off	On	Off
Humidity Low	On	On	Off	Off	On	Off
Humidity High	On	On	Off	Off	On	Off
NOTE: OAT < 55 F all compression off						
HEATING	E\$R Compressor	E\$R Fans	RTU Compressor 1	RTU Compressor 2	RTU Fans	RTU Heat
Indoor Temperature Above W1	Off	On	Off	Off	On	Off
Indoor Temperature Between W1 & W2	On	On	Off	Off	On	Off
OAT >Set Pt (30 F)	On	On	Off	Off	On	On, 50%
OAT <Set Pt (30 F)	On	On	Off	Off	On	On, 100%
Indoor Temperature Below W2	On	On	Off	Off	On	On, 50%
OAT >Set Pt (30 F)	On	On	Off	Off	On	On, 100%
OAT <Set Pt (30 F)	On	On	Off	Off	On	On, 100%

LEGEND

E\$R — Energy\$Recycler Unit
OAT — Outdoor Air Temperature
RTU — Rooftop Unit

*Second stage for Y2 call applicable on rooftop units with 2 circuits only.
†50% rooftop unit heat only applicable with 2-stage electric or gas heating units.

Changeover Thermostats — Changeover thermostats are used to adjust the changeover set points for heating and cooling. The thermostats must be relocated from the shipping location to the operating location in the supply outdoor air hood. See Fig. 18 for shipping arrangement.

COOLING — The cooling outdoor air changeover thermostat set point determines when the energy recovery unit goes into economizer mode (energy recovery compressor OFF, energy recovery supply fan ON). It is adjustable from 45 F to 75 F, will “make” as the temperature falls and will reset at 4° F differential above the set point.

For example, if the cooling changeover thermostat is set for 72 F, the unit is in unoccupied or occupied mode, the outdoor-air temperature is 70 F, there is low space relative humidity, and the unit cooling set point (Y1) is 75 F, then the first stage of cooling is the 62AQ Energy\$Recycler section economizer. The second stage of cooling is the 62AQ Energy\$Recycler section and the rooftop unit compressor no. 1. The rooftop unit no. 2 compressor is locked out below 55 F.

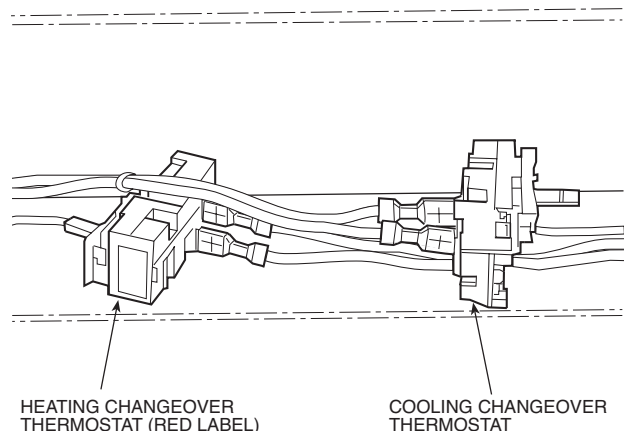


Fig. 18 — Changeover Thermostat Shipping Location

HEATING — The heating outdoor air changeover thermostat determines the heating stage 1 to heating stage 2 switchover point. During heating, the rooftop unit supply fan and energy recovery unit supply fan are both always on. It is adjustable from 5 F to 50 F, will “make” as the temperature falls and will reset at 4° F differential above the set point.

As an example, if the switchover set point is 30 F and the outdoor ambient temperature is above 30 F, then the first stage of heating is the energy recovery unit. The second stage of heating is the energy recovery unit and the first stage of heating for the rooftop unit.

If the switchover set point is 30 F and the outdoor ambient temperature is below 30 F, then the first stage of heating is the 62AQ Energy\$Recycler™ unit and the first stage of heating for the rooftop unit. The second stage of heating is the 62AQ Energy\$Recycler unit and the second stage of heating for the rooftop unit.

NOTES:

1. On rooftop units with only single stage heat, set the heating changeover thermostat as low as possible for 2-stage heat capability.
2. On units produced prior to December 2004, the labels for the Heating thermostats may require replacement. The correct label is shown in Fig. 19. See Service Managers Bulletin (SMB) 04-0044 for obtaining a current outdoor air thermostat for heating label.

Fans — There are two fans in the Energy\$Recycler (E\$R) portion of the COBRA™ energy recovery unit or field-installed 62AQ unit: the supply fan and exhaust fan. For applicable fan curves, see the 62AQ Energy\$Recycler Installation, Start-Up and Service Instructions or the 62AQ Energy\$Recycler Product Data manual.

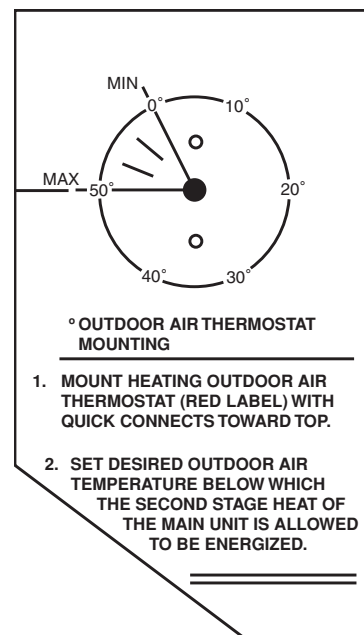


Fig. 19 — Outdoor-Air Thermostat Heating Label

If the desired fan speed is not specified during the job selection, the proper settings for the E\$R supply fan and damper and exhaust fan and damper must be determined using the applicable fan tables, the desired outdoor air cfm and return static pressure. See applicable Supply Air Fan Kit Accessory Installation Instructions for additional details on altering fan speeds.

COBRA™ and 62AQ Unit Options

HUMIDI-MIZER™ OPTION (Units after October 2004) — Units equipped with the Humidi-MiZer dehumidification option are capable of increased humidity control by utilizing a common subcooling/reheat dehumidification coil. This unique and innovative design provides the capability of the rooftop unit to operate in both a subcooling mode and a hot gas reheat (HGRH) mode. A 48/50HJ rooftop unit equipped with the Humidi-MiZer system can be used with or without a 62AQ Energy\$Recycler™ unit. See Fig. 20 for the HGRH mode of operation. See the Humidi-MiZer Application Data manual for additional details.

The incorporation of the Humidi-MiZer adaptive dehumidification system on a COBRA unit or a rooftop unit with a field-installed 62AQ unit adds significant flexibility to the overall system. The response of the Humidi-MiZer system to varying space conditions is extremely dynamic. The 48/50HJ rooftop unit equipped with the Humidi-MiZer system, with or without a COBRA energy recovery unit, will respond based on the temperature and humidity requirements as sensed in the space. Either a Carrier Thermidstat™ device (combined temperature and humidity sensing capability) or separate thermostat and humidistat can be used with the Humidi-MiZer system. Tables 3A and 3B outline the sequence of operation for

COBRA/62AQ energy recovery units equipped with the Humidi-MiZer dehumidification option.

Unoccupied mode with Humidi-MiZer (Table 3A) — In the unoccupied mode, the Energy\$Recycler (E\$R) unit is off and all compressors are locked off. First stage heat is rooftop unit heat at 50%. Second stage heat is rooftop unit heat at 100%.

Occupied Mode with Humidi-MiZer (Table 3B) — In the occupied mode, when the E\$R compressor runs in heat mode, it extracts heat from the exhaust air and rejects heat to the incoming outdoor air, returning energy to the building that otherwise would be wasted. The E\$R and rooftop unit fans run continuously. Rooftop unit compressors are always off.

On a first stage call, the E\$R compressor is on in heat mode. If the outdoor air is above the set point, rooftop unit heat is off. Rooftop unit heat is on at 50% if the outdoor air is below the set point. On a second stage call, the E\$R compressor is on in heat mode. Rooftop unit heat is on at 50% if the outdoor air is above the set point. Rooftop unit heat is on at 100% if the outdoor air is below the set point.

NOTE: If there is a thermostat call from the space for heating, all dehumidification (both subcooling mode and hot gas reheat mode) will not operate.

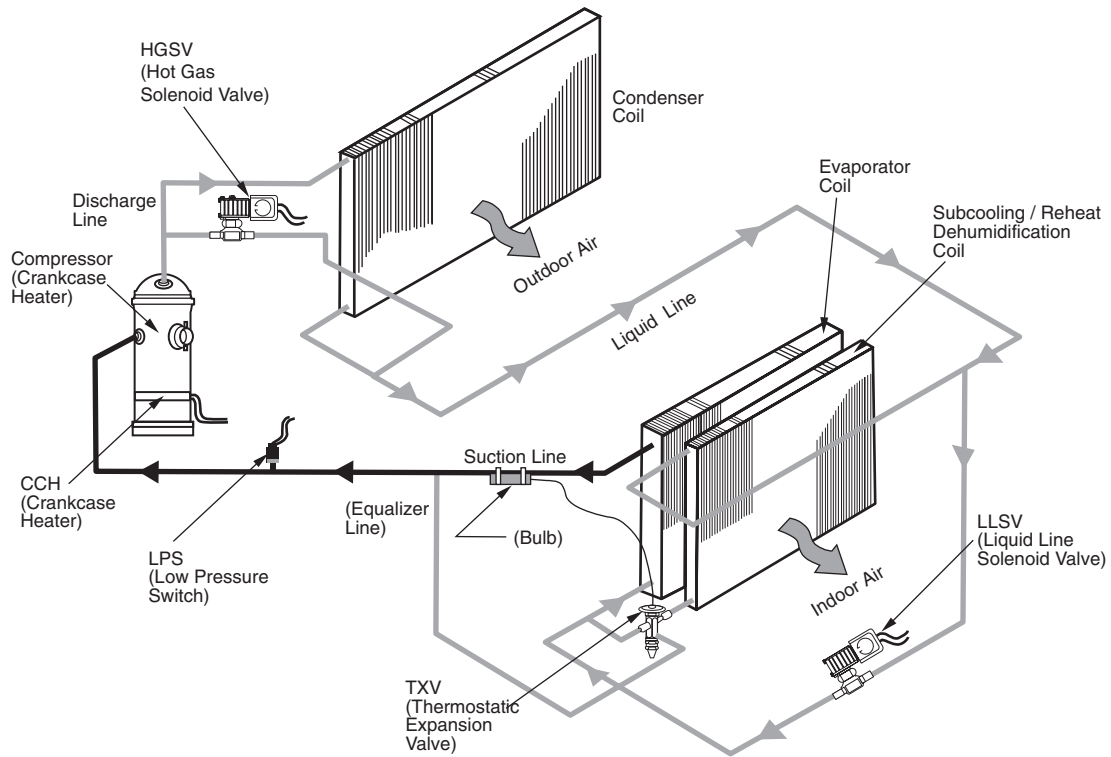


Fig. 20 — Humidi-MiZer Dehumidification Option Schematic (Hot Gas Reheat Mode of Operation)

**Table 3A — Humidi-MiZer™ Adaptive Dehumidification System Rooftop with COBRA™ Energy Recovery Unit
Sequence of Operation — Unoccupied**

UNOCCUPIED						
COOLING	ESR Compressor	ESR Fans	RTU Compressor 1	RTU Compressor 2	RTU Fans	RTU Heat
Indoor Temperature Above Y2	On	On (cyc.)	On without SC	Off	On (cyc.)	Off
Humidity Low & OAT Low	Off	Off	On without SC	On without SC	On (cyc.)	Off
Humidity Low & OAT High	Off	Off	On with SC	On with SC	On (cyc.)	Off
Humidity High & OAT Low	Off	Off	On with SC	On with SC	On (cyc.)	Off
Humidity High & OAT High	Off	Off	On with SC	On with SC	On (cyc.)	Off
Indoor Temperature Between Y1 & Y2	Off	On (cyc.)	Off	Off	On (cyc.)	Off
Humidity Low & OAT Low	Off	Off	On without SC	Off	On (cyc.)	Off
Humidity Low & OAT High	Off	Off	On with SC	On with HGRH	On (cyc.)	Off
Humidity High & OAT Low	Off	Off	On with SC	On with HGRH	On (cyc.)	Off
Humidity High & OAT High	Off	Off	On with SC	On with HGRH	On (cyc.)	Off
Indoor Temperature Below Y1	Off	Off	Off	Off	Off	Off
Humidity Low	Off	Off	On with HGRH	On with HGRH	On (cyc.)	Off
Humidity High	Off	Off	On with HGRH	On with HGRH	On (cyc.)	Off
NOTE: OAT < 55 F all compression off						
HEATING	ESR Compressor	ESR Fans	RTU Compressor 1	RTU Compressor 2	RTU Fans	RTU Heat
Indoor Temperature Above W1	Off	Off	Off	Off	Off	Off
Indoor Temperature Between W1 & W2	Off	Off	Off	Off	On (cyc.)	On, 50%
Indoor Temperature Below W2	Off	Off	Off	Off	On (cyc.)	On, 100%

LEGEND

ESR — Energy\$Recycler™ Unit
HGRH — Hot Gas Reheat
OAT — Outdoor Air Temperature
RTU — Rooftop Unit
SC — Subcooling

**Table 3B — Humidi-MiZer Adaptive Dehumidification System Rooftop with COBRA Energy Recovery Unit
Sequence of Operation — Occupied**

OCCUPIED						
COOLING	ESR Compressor	ESR Fans	RTU Compressor 1	RTU Compressor 2	RTU Fans	RTU Heat
Indoor Temperature Above Y2	On	On	On without SC	Off	On	Off
Humidity Low & OAT Low	On	On	On without SC	On without SC	On	Off
Humidity Low & OAT High	On	On	On with SC	On with SC	On	Off
Humidity High & OAT Low	On	On	On with SC	On with SC	On	Off
Humidity High & OAT High	On	On	On with SC	On with SC	On	Off
Indoor Temperature Between Y1 & Y2	Off	On	Off	Off	On	Off
Humidity Low & OAT Low	On	On	On without SC	Off	On	Off
Humidity Low & OAT High	On	On	On with SC	On with HGRH	On	Off
Humidity High & OAT Low	On	On	On with SC	On with HGRH	On	Off
Humidity High & OAT High	On	On	On with SC	On with HGRH	On	Off
Indoor Temperature Below Y1	Off	On	Off	Off	On	Off
Humidity Low	On	On	On with HGRH	On with HGRH	On	Off
Humidity High	On	On	On with HGRH	On with HGRH	On	Off
NOTE: OAT < 55 F all compression off						
HEATING	ESR Compressor	ESR Fans	RTU Compressor 1	RTU Compressor 2	RTU Fans	RTU Heat
Indoor Temperature Above W1	Off	On	Off	Off	On	Off
Indoor Temperature Between W1 & W2	On	On	Off	Off	On	Off
OAT >Set Pt (30 F)	On	On	Off	Off	On	On, 50%
OAT <Set Pt (30 F)	On	On	Off	Off	On	On, 100%
Indoor Temperature Below W2	On	On	Off	Off	On	On, 50%
OAT >Set Pt (30 F)	On	On	Off	Off	On	On, 100%
OAT <Set Pt (30 F)	On	On	Off	Off	On	On, 100%

LEGEND

ESR — Energy\$Recycler Unit
HGRH — Hot Gas Reheat
OAT — Outdoor Air Temperature
RTU — Rooftop Unit
SC — Subcooling

MOISTUREMISER™ OPTION (Units prior to October 2004) — Units equipped with the MoistureMiSer dehumidification option have an up to 40% increase in latent capacity in hot, humid climates. The MoistureMiSer dehumidification option increases humidity control and comfort in the occupied space by automatically lowering the evaporator coil temperature down to optimum dehumidification levels while simultaneously reheating the leaving air to prevent overcooling. The MoistureMiSer capabilities have been incorporated into the Humidi-MiZer system; the MoistureMiSer is no longer an available option for units produced after October 2004.

INDOOR AIR QUALITY AND CO₂ SENSORS — If a space CO₂ sensor is desired, a field-installed 25% outdoor-air damper must be used for proper Demand Control Ventilation (DCV) operation. If not, the 62AQ Energy\$Recycler Unit outdoor-air dampers will remain shut unless the space CO₂ levels are above the CO₂ set point.

The 25% outdoor-air damper should be placed in the normal location on the base rooftop unit. See Fig. 21. This damper

will allow additional outdoor air to be brought in if the CO₂ level is high, independent of 62AQ unit operation. In the occupied mode, the 62AQ will usually bring in enough fresh air to maintain CO₂ levels below the set point. If not, the 25% outdoor-air damper will open to allow additional fresh air to be brought in. See Fig. 22 and 23 for control wiring. The recommended CO₂ sensor is a 33ZCSENCO2 and the recommended 25% outdoor-air damper is a CRTWOPOS001A01 or a CRTWOPOS002A01 (dependent on rooftop unit size). See 33ZCSENCO2 or 25% outdoor-air damper installation instructions for additional information.

ENERGY EFFICIENCY RATIO (EER) — The Air Conditioning and Refrigeration Institute (ARI) rates rooftop units with specific external static pressure per net capacity rating with no outdoor air. The 62AQ Energy\$Recycler unit uses outdoor air that is pre-conditioned by the return air. Therefore, no ARI rating is available for COBRA™ and field-installed 62AQ units since there is no standard for these types of units.

ECONOMIZER USAGE — The energy recycler portion of a COBRA unit or a field-installed 62AQ energy recovery unit contains an integral economizer with barometric relief for “free” cooling when conditions are right. Therefore, an additional economizer is not needed and cannot be mounted on a rooftop unit equipped with the 62AQ Energy\$Recycler™ feature.

AIRFLOW CONSIDERATIONS — A rooftop unit equipped with a 62AQ Energy\$Recycler section is potentially capable of allowing up to 100% OA. This application depends specifically on the air conditions and the amount of airflow desired. Table 4 shows typical OA expectations for a COBRA or field-installed 62AQ Energy\$Recycler unit. For exact capabilities on specific COBRA applications, refer to the Packaged Rooftop Builder (PRB) selection software. Field-installed 62AQ applications on similar rooftop models as COBRA units will have similar OA capabilities. See Table 5 for factory supported rooftop and 62AQ unit combinations.

When sizing the E\$R unit, it is also important to select the correct ratio of outdoor air to exhaust air. When using the electronic selection software, the program will not allow unacceptable ratios. In general, the exhaust airflow determines the energy capacity available to condition the incoming outside air. Typically, the exhaust air cfm must be at least 50% the

value of the OA cfm to satisfactorily precondition the OA. Conversely, the OA flow must be great enough to properly transfer energy from the OA coil.

Therefore, a minimum OA flow exists; the exhaust air flow cannot be greater than the incoming OA flow. Additionally, allowing the exhaust airflow to be greater than the incoming outdoor airflow could result in space pressurization problems.

See Table 5 for minimum and maximum airflow parameters.

Table 5 — Factory Supported Rooftop Unit with 62AQ Unit Combination and Allowable Airflows

48/50HJ UNIT SIZE	62AQ MODEL (E\$R)	OUTDOOR AIR CFM RANGE (Min-Max)	EXHAUST CFM RANGE (Min-Max)
004-007	060	300 - 600	300 - 100% of OA Value
	100	500 - 1000	500 - 100% of OA Value
008-014	060*	300 - 600	300 - 100% of OA Value
	100*	500 - 1000	500 - 100% of OA Value
	200	1000 - 2000	1000 - 100% of OA Value
	300	1800 - 3000	1800 - 100% of OA Value

LEGEND

E\$R — Energy\$Recycler Unit
OA — Outdoor Air

*This unit combination is available only when the 62AQ is field-installed as an accessory.

Table 4 — Typical COBRA™ Unit Outdoor Air Usage

48/50HJ UNIT SIZE	NOM. TONS	RETURN AIR AT 325 Cfm/Ton (Total Cfm)	OUTDOOR AIR (Cfm)	% OA	RETURN AIR AT 350 Cfm/Ton (Total Cfm)	OUTDOOR AIR (Cfm)	% OA	RETURN AIR AT 375 Cfm/Ton (Total Cfm)	OUTDOOR AIR (Cfm)	% OA	RETURN AIR AT 325 Cfm/Ton (Total Cfm)	OUTDOOR AIR (Cfm)	% OA
004	3	975	1000	103	1050	1000	95	1125	1000	89	1200	1000	83
005	4	1300	1000	77	1400	1000	71	1500	1000	67	1600	1000	63
006	5	1625	1000	62	1750	1000	57	1875	1000	53	2000	1000	50
007	6	1950	1000	51	2100	1000	48	2250	1000	44	2400	1000	42
008	7½	2438	3000	123	2625	3000	114	2813	3000	107	3000	3000	100
009	9½	2763	3000	109	2975	3000	101	3188	3000	94	3400	3000	88
012	10	3250	3000	92	3500	3000	86	3750	3000	80	4000	3000	75
014	12½	4063	3000	74	4375	3000	69	4688	3000	64	5000	3000	60

LEGEND

OA — Outdoor Air

NOTE: Shading indicates outdoor-air usage capabilities of at least 100%.

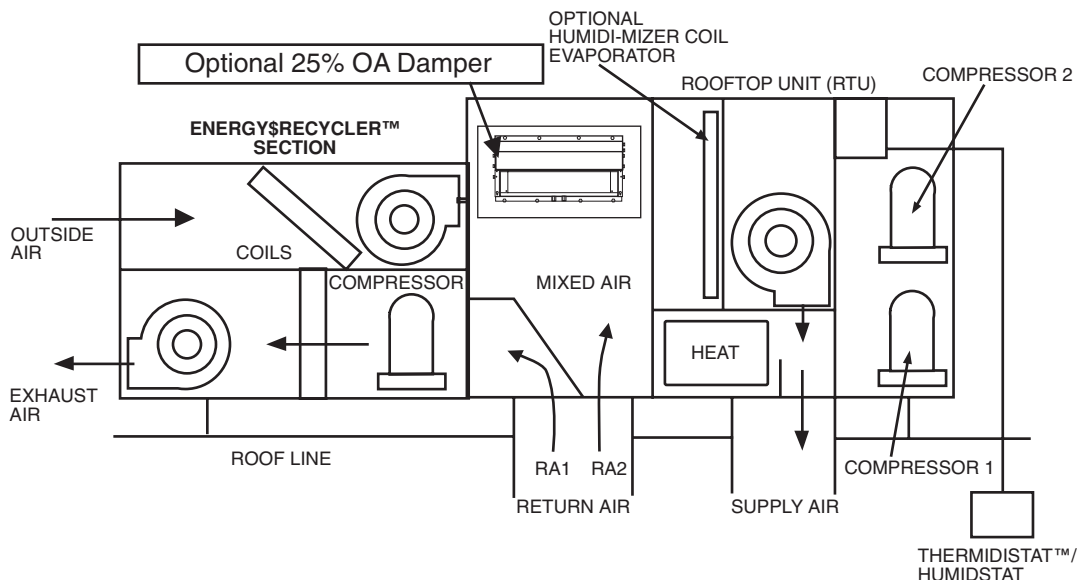
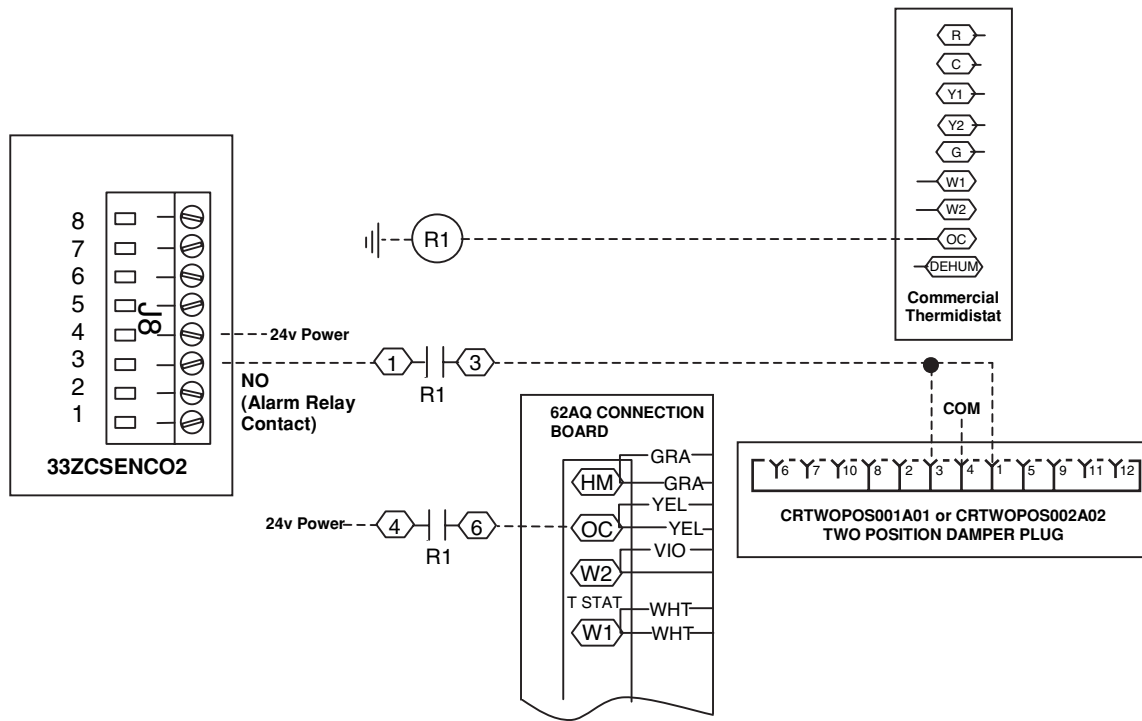


Fig. 21 — 25% Outdoor Air Damper Location



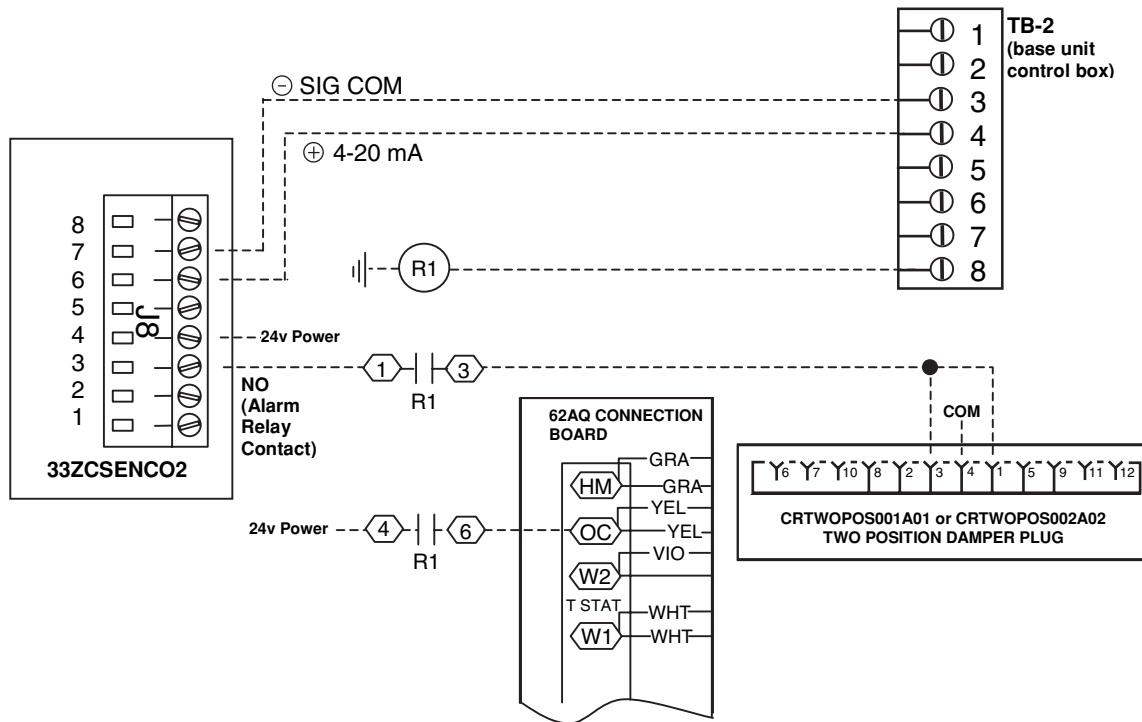
LEGEND

----- Field-Provided Wires

NOTES:

1. R1 is a 2-pole, normally open relay (recommended relay: HN61KK040).
2. The space CO₂ level and set point can be read and changed locally.

Fig. 22 — CO₂ Sensor Wiring with Electro-Mechanical Controls



LEGEND

----- Field-Provided Wires

NOTES:

1. R1 is a 2-pole, normally open relay (recommended relay: HN61KK040).
2. The space CO₂ level can be read on the Carrier Comfort Network®; set point must be changed locally.

Fig. 23 — CO₂ Sensor Wiring with PremierLink™ Direct Digital Control (DDC)

CONTROLS

There are three required inputs to properly control COBRA™ or field-installed 62AQ units: temperature, humidity and an occupied/unoccupied schedule. The four recommended control combinations are:

- Thermidistat™ and electro-mechanical controls (Fig. 24)
- digital thermostat, humidistat and electro-mechanical controls (Fig. 25)
- humidistat, space temperature sensor and PremierLink™ controls (Fig. 26)
- Thermidistat and PremierLink controls (Fig. 27)

The most widely used combinations are the light commercial Thermidistat or PremierLink with thermostat and humidistat.

If the unit is equipped with the Humidi-MiZer™ or MoistureMiSer™ option, these systems also require a humidity input. Non-E\$R units require this humidity input to be wired into terminals in the rooftop unit. However, this is not necessary for a COBRA or field-installed 62AQ E\$R unit. The E\$R wiring accepts the sensed space humidity input and sends the appropriate signal to the rooftop unit. See Fig. 24-27.

NOTE: The humidity sensor device used with a COBRA or field-installed 62AQ unit with or without a Humidi-MiZer or MoistureMiSer dehumidification option must be a contact closure type device such as a humidistat or a light commercial Thermidistat device.

Thermidistat Device — The light commercial Thermidistat device is a 7-day programmable, wall-mounted, low voltage field-installed control. It combines temperature and humidity control in a single unit and provides separate set points for heating and cooling. The control adds a dehumidification control function with separate set points for up to 2 occupied and unoccupied periods per day.

Different heating and cooling set points and times are programmable for up to 4 periods per day, 7 days per week. In case of a power loss, an internal memory stores programs and settings for unlimited time, and the clock continues to run for at least 8 hours. Batteries are not used. The light commercial Thermidistat device (or Humidistat and temperature sensor) provides direct control of the energy recovery section, rooftop unit fans, and rooftop unit compressor in response to the programmed time schedules and temperature settings. The dehumidification output signal controls the energy recovery compressor to cool and dehumidify the supply air.

The light commercial Thermidistat device provides many operational control features which include a time guard timer, staging timer, minimum on-time, set point adjustment, equipment run indicators, dehumidification output and set point adjustment, auto changeover, power checks, error codes and smart recovery.

For additional information on the light commercial Thermidistat device, refer to the light commercial Thermidistat device installation instructions.

PremierLink Controller — The PremierLink digital controller, is a Direct Digital Control (DDC) box that mounts in the rooftop unit under the main unit control box. It is designed

to be connected to the Carrier Comfort Network® (CCN) system, where all the input and output points and control screens can be monitored for servicing and troubleshooting purposes. However, the PremierLink can also be connected and operated via a thermostat. For details and additional information, refer to the Retrofit PremierLink Installation Instructions and Application Data.

The PremierLink controller is available factory-installed or as a field retrofit accessory. The PremierLink controller is designed to allow users the access and ability to change factory defined settings, thus expanding the function of the standard rooftop unit control. However, the PremierLink controller does not have an incorporated visual interface. It requires a CCN accessory such as a Navigator™ device, System Pilot or personal computer equipped with Carrier's Proprietary ComfortWORKS® or ServiceTool software.

The PremierLink controller does not support humidity control. A separate field-supplied humidity device that supports contact closure must be used. However, remote humidity sensing and control on a CCN system is possible using a PremierLink controller, a 3V™ universal controller and a 3V compatible humidity sensor. In this configuration, the universal controller provides 24 vdc power to the humidity sensor and accepts a 4 to 20 mA humidity signal from the humidity sensor. The universal controller provides an output relay contact that is connected to the HM terminal in the 62AQ section's control box. The humidity sensor output does not connect directly to the COBRA unit. The universal controller is used to configure the humidity sensor's set point; when the sensed humidity level is reached, the controller sends a signal to the HM terminal.

The universal controller is also connected to the CCN bus wiring, therefore the humidity set point and sensed humidity value is displayed on the network. One universal controller can be used for up to eight (8) different COBRA units.

The PremierLink controller has two modes of sensor input: Temperature mode or Sensor mode. In Temperature mode, the PremierLink controller accepts input from a Carrier approved space thermostat. Input connections for this mode use terminal strip TB3 as shown in Fig. 28-30. Terminal strip TB3 connects to the J4 contacts on the PremierLink module. When the PremierLink controller is factory-installed, it is completely wired, except for the field-installed sensors. Currently, the only sensor that is included from the factory is the supply air temperature sensor. The following field installed sensors are required for PremierLink controller operation:

- space temperature — in sensor mode a space temperature sensor (SPT) is required, or for thermostat mode a thermostat is required, for all applications.
- outdoor-air temperature sensor (OAT) — required for all applications.
- supply-air temperature sensor (SAT) — required for all applications (included when PremierLink controller is factory-installed).
- indoor-air quality sensor (IAQ) — required for demand control ventilation.
- outdoor-air quality sensor (OAQ) — required for demand control ventilation.

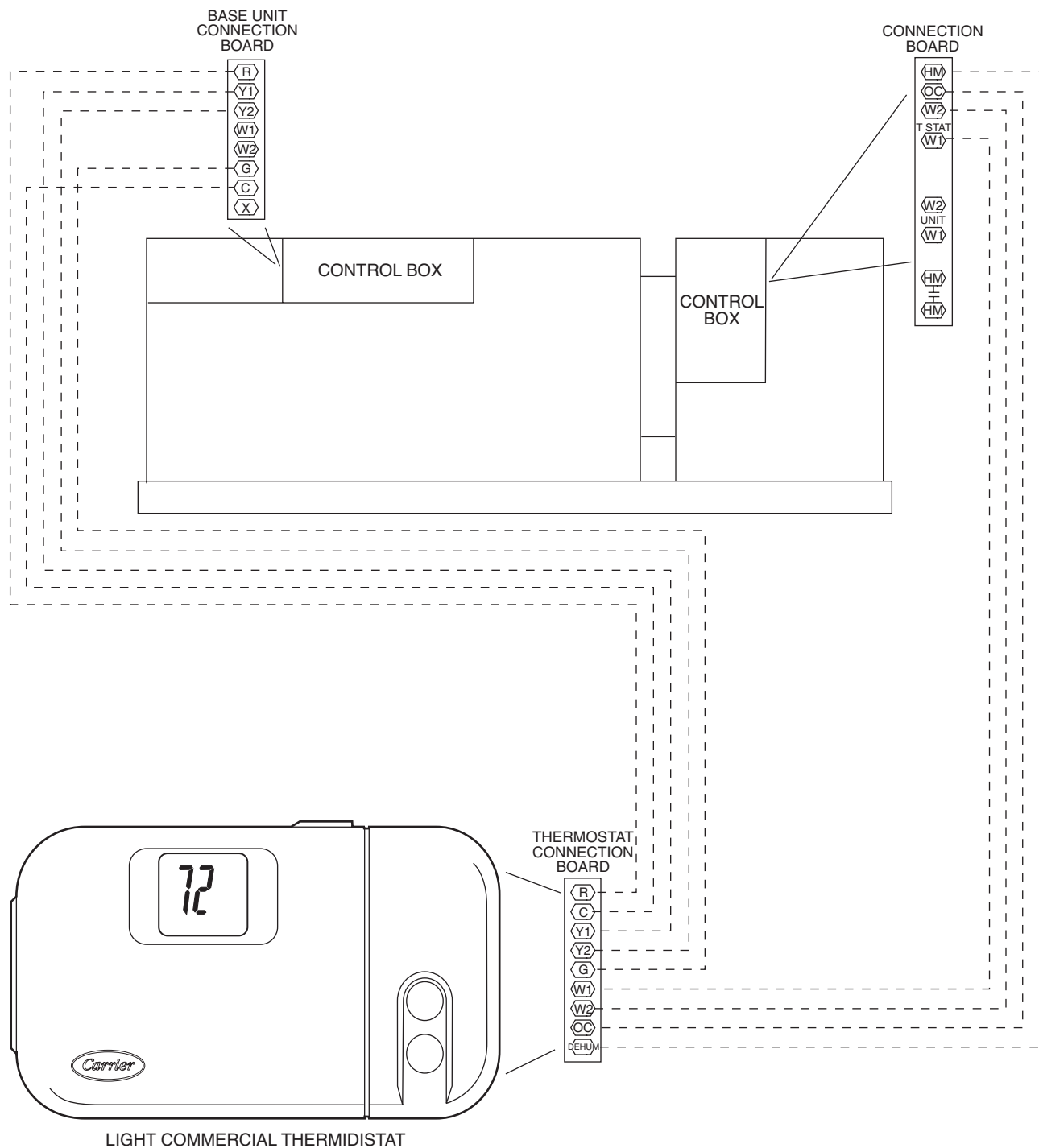


Fig. 24 — Control Wiring with Thermidistat™ and Electro-Mechanical Controls

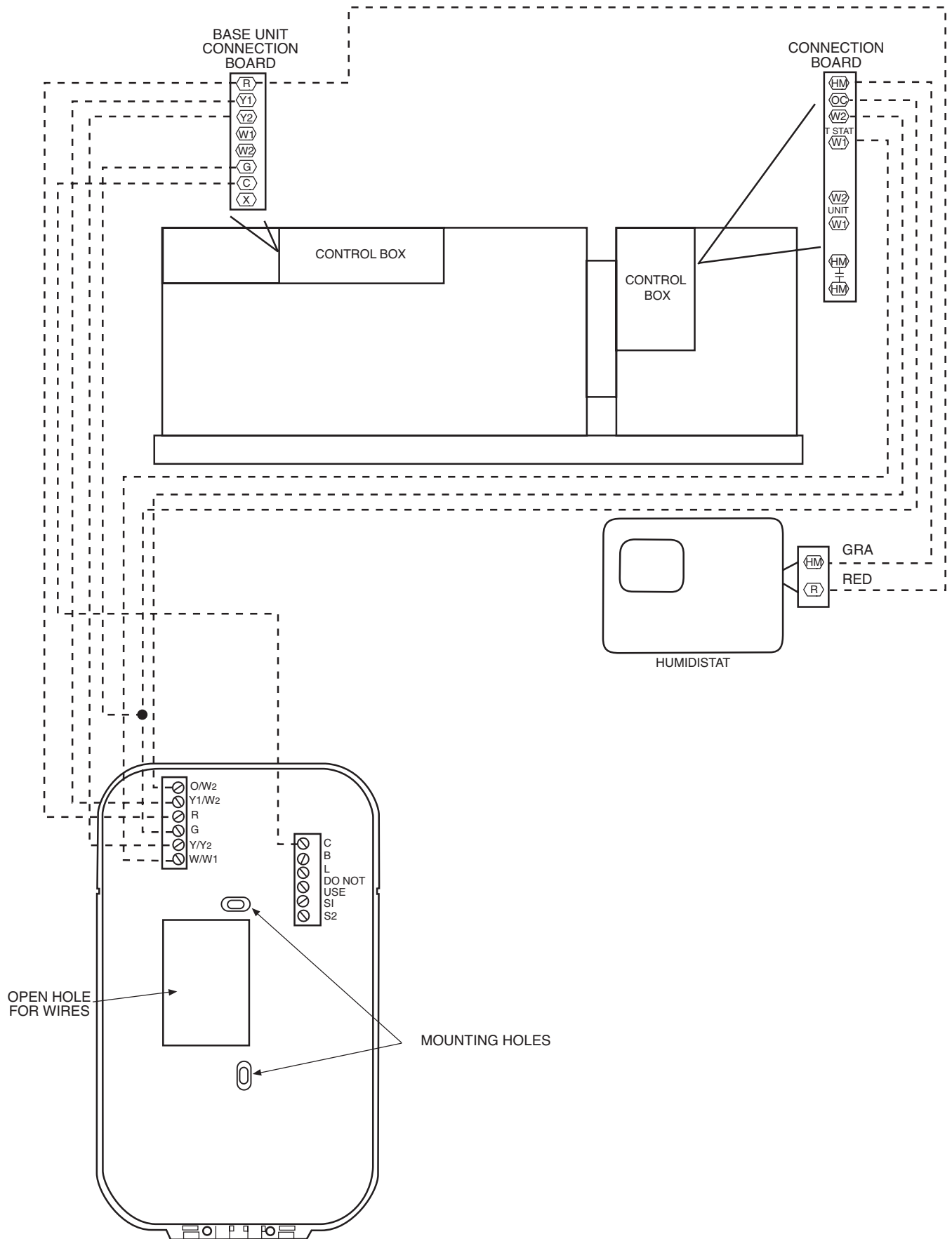


Fig. 25 — Control Wiring with Digital Thermostat, Humidistat and Electro-Mechanical Controls

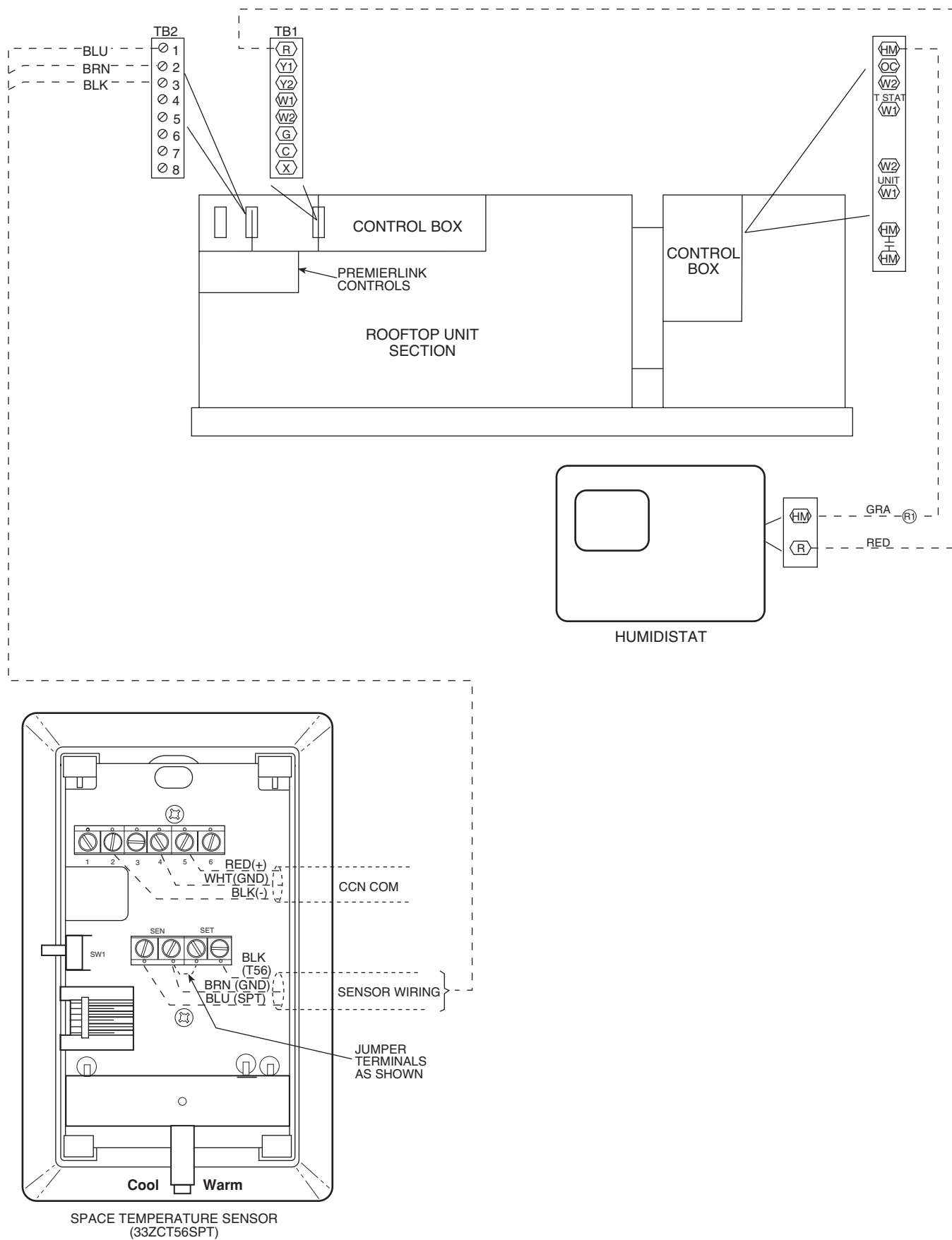
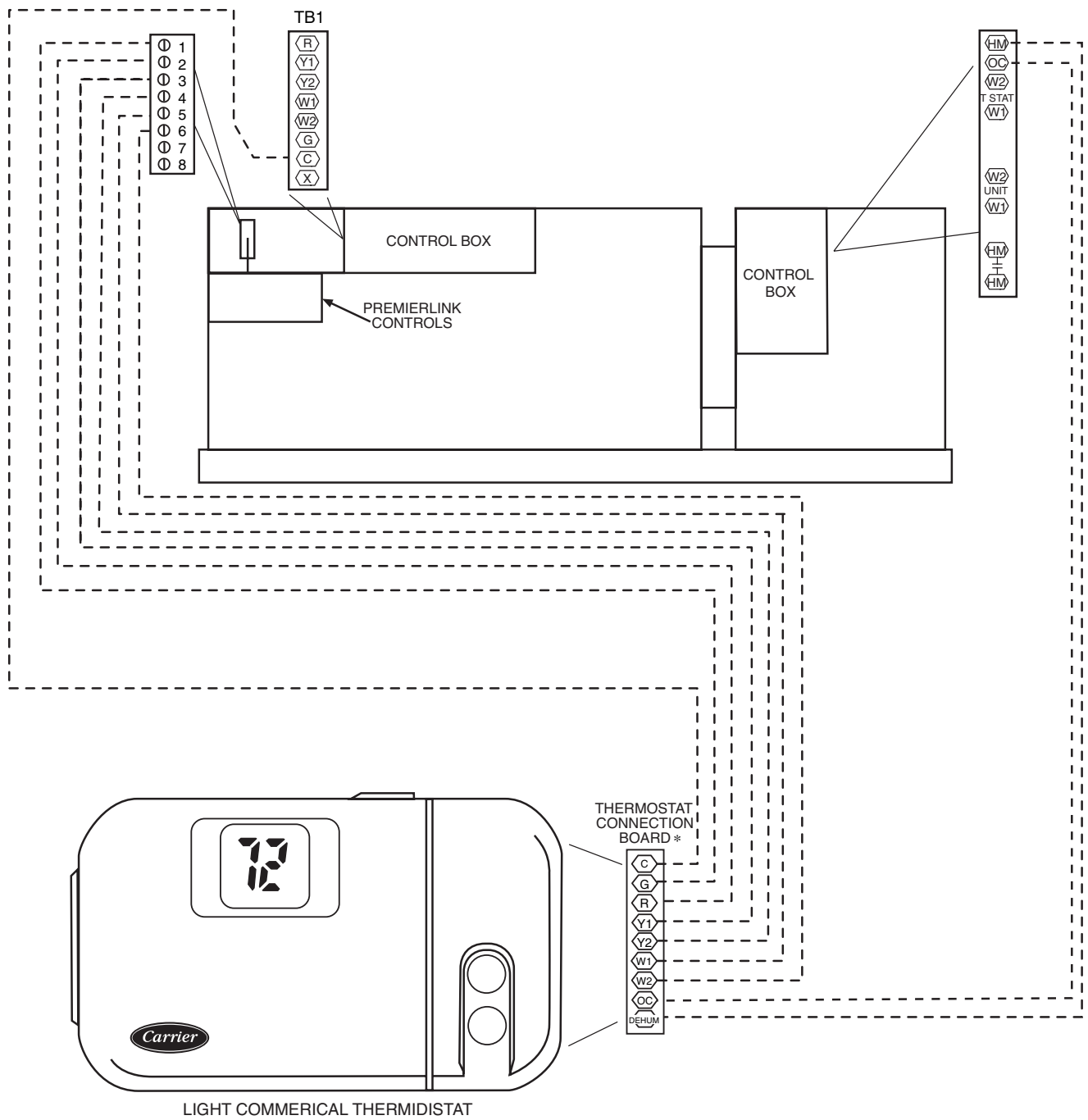
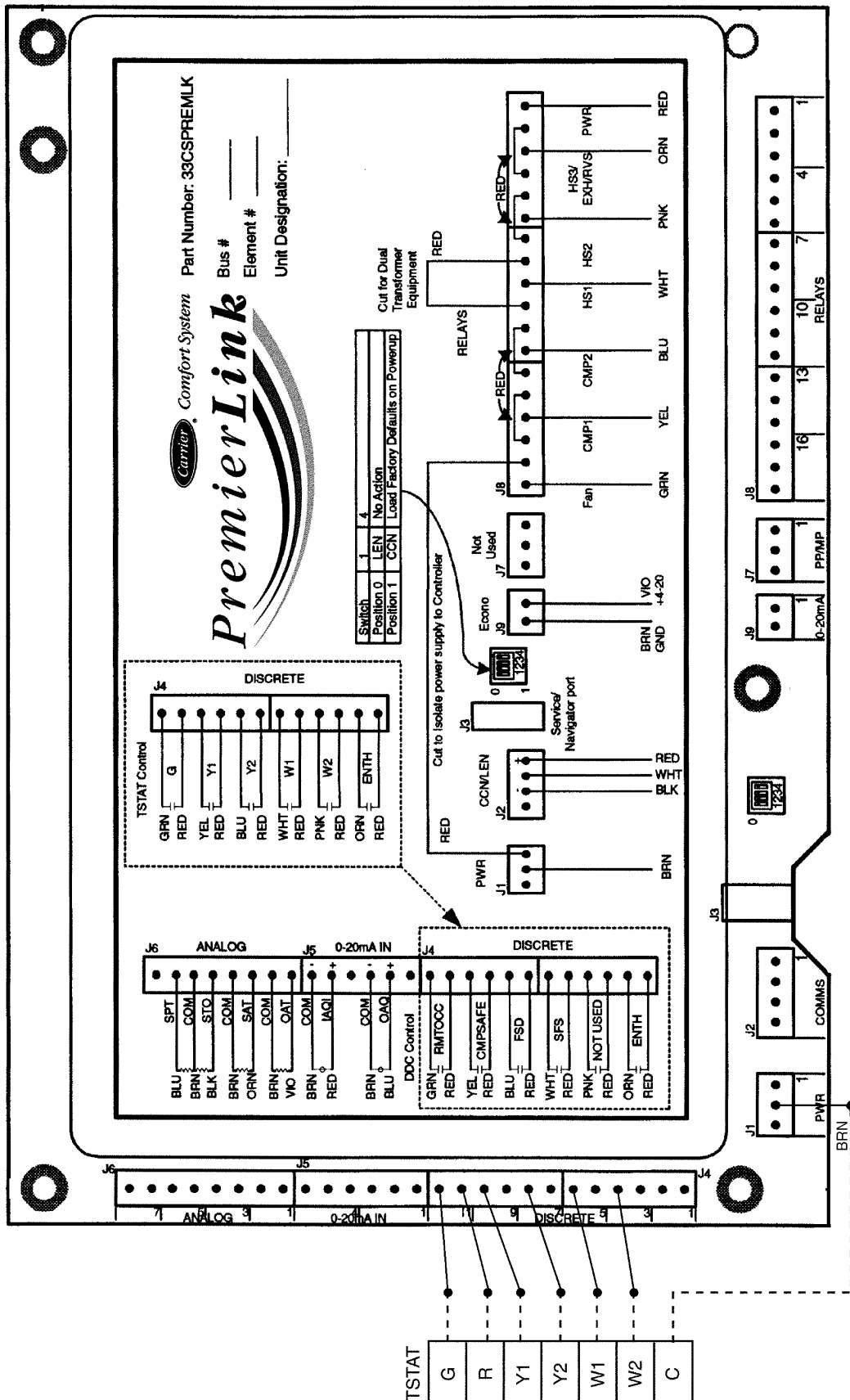


Fig. 26 — Control Wiring with Humidistat, Space Temperature Sensor, and PremierLink™ Controls



NOTE: Thermostat connection terminal arrangement for schematic purposes only.

Fig. 27 — Control Wiring with Thermidistat™ and PremierLink™ Controls



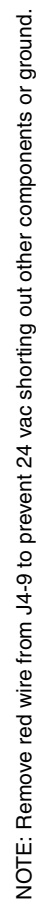


Fig. 29 — PremierLink™ Field-Installed Controller Sensor Mode Contacts

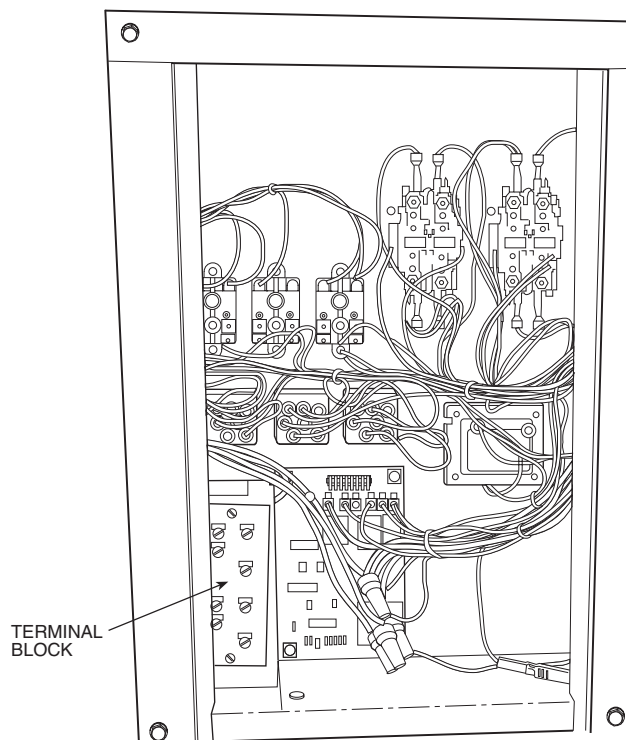


**Fig. 30 — Field Wiring Connections
(Terminal Block in Energy Recovery Section)**

Gas Supply — The gas supply for 48HJ gas heat units can be run through the curb or through the bottom of the unit. See Fig. 31 and 32. When installing the gas supply through the curb, the gas piping will exit through the side of the roof curb. The thru-the-curb accessory service connections (part numbers CRBTMPWR001A01 and CRBTMPWR02A01) are required. A field-supplied regulator is installed outside the unit and the piping is connected to the unit gas valve.

When installing gas supply through the bottom of the unit, the gas piping is routed through a knockout in the unit basepan and then connected to the unit gas valve. The thru-the-bottom accessory service connections (part numbers CRBTMPWR003A01 and CRBTMPWR004A01) are required. See Fig. 33 and 34.

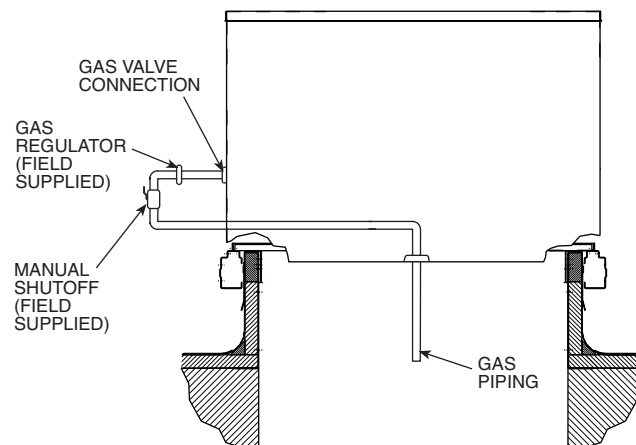


Fig. 32 — Thru-the-Bottom Gas Connections

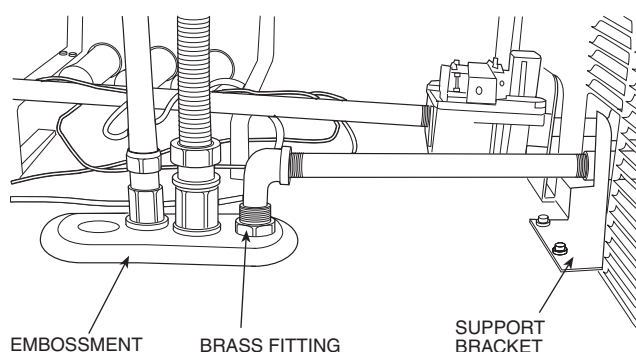


Fig. 33 — Internal Gas Piping with Thru-the-Bottom Connection (3 to 6 ton Models Shown)

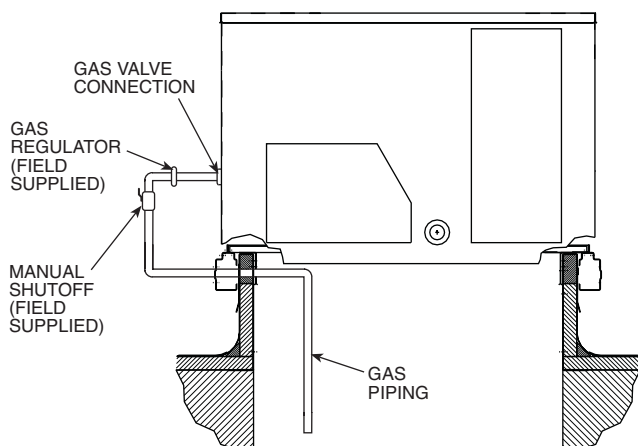


Fig. 31 — Thru-the-Curb Gas Connections

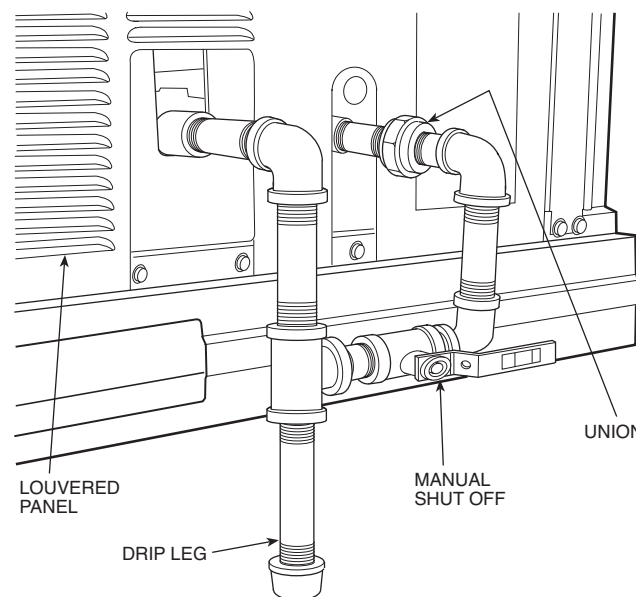


Fig. 34 — External Gas Piping with Thru-the-Bottom Connection (3 to 6 Ton Models Shown)

WIRING

For a COBRA™ unit, all interconnecting wiring between the rooftop unit section and the energy recovery section is factory-supplied and factory-wired. Wiring from power supply to unit is field-supplied. See the COBRA installation manual or the 62AQ Energy\$Recycler™ Installation Manual for applicable unit wiring diagrams.

For routing of electrical wires through the base of the unit, via thru-the-bottom service connections (part numbers CRBTMPWR001A01, 002A01, 003A01, and 004A01) see applicable installation instructions. See Fig. 35. See Fig. 36 for factory-supplied wiring routing in unit. These connections must be installed prior to setting the unit on the roof curb. DO NOT install wire or gas connections through the base of the unit without proper watertight connectors.

Field Power Supply

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

Refer to unit label diagram for additional information. Pigtails are provided for field wire connections. Use factory-supplied splices or UL (Underwriters' Laboratories) approved copper/aluminum connector. See Fig. 35-38 for COBRA power wiring information.

When installing units, provide a disconnect per the NEC (National Electrical Code). All field wiring must comply with NEC and local requirements.

FIELD-INSTALLED 62AQ UNITS — Field-installed 62AQ units are labeled with a separate nameplate from the rooftop unit. Both units must be provided with a disconnect; unlike a COBRA unit, the 62AQ unit cannot be powered with a single rooftop disconnect. However, Fig. 39 and 40 show two available methods of providing power wiring for field-installed 62AQ units. Note that Method A requires use of the "combined power" information, as seen on a typical electronic performance selection. Fig. 35, 36, 39 and 40 for field-installed 62AQ power wiring.

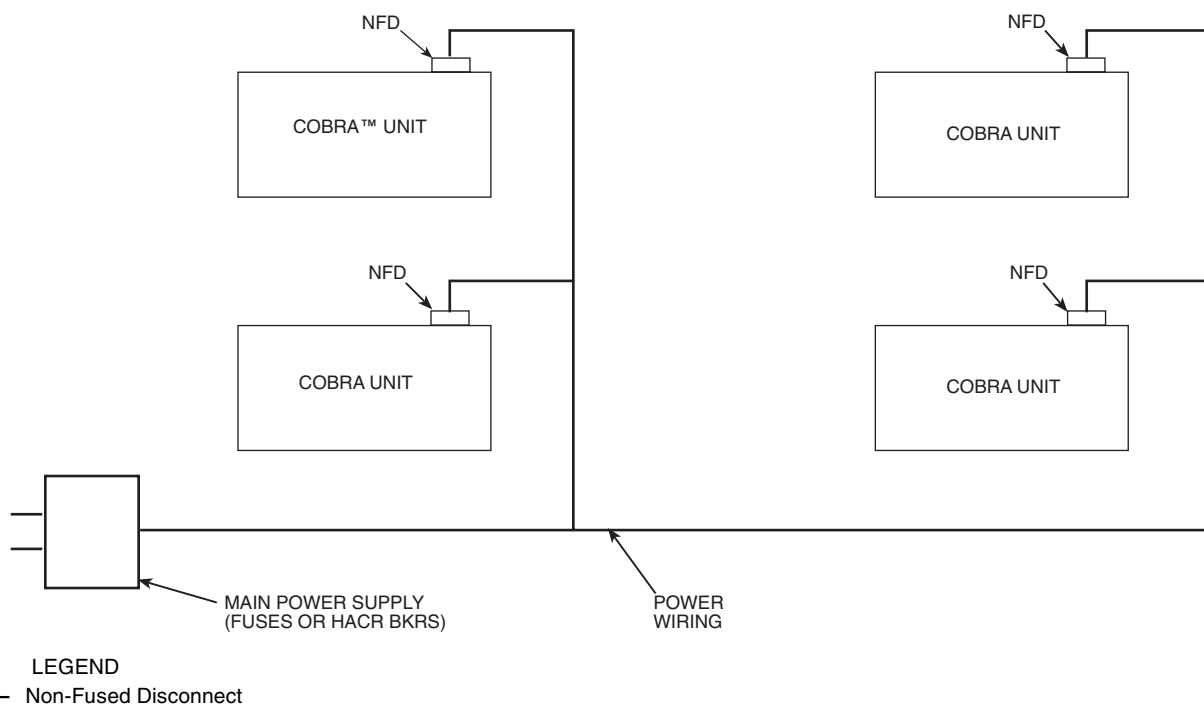
See the installation manual for 62AQ units for additional information.

When installing units, provide a disconnect per the NEC (National Electrical Code). All field wiring must comply with NEC and local requirements.

Factory-Supplied Non-Fused Disconnect — The factory-supplied disconnect is capable of handling disconnect amps up to 80 A for the Weathermaster® COBRA unit. For disconnect amps greater than 80 A, a field-supplied disconnect is required.

Field Control Wiring — A COBRA or field-installed 62AQ unit requires 3 inputs for proper control of the unit: temperature, humidity and an occupied/unoccupied schedule. Table 1 shows the recommended sensor configurations.

See Fig. 30 and 41 for terminal block locations. See Fig. 24-27 for control wiring information. See Fig. 42 for CCN (Carrier Comfort Network®) wiring information.



NOTE: If disconnect amps exceed 80 amps, a field-supplied disconnect is required.

Fig. 35 — Typical Field Wiring Power Connections

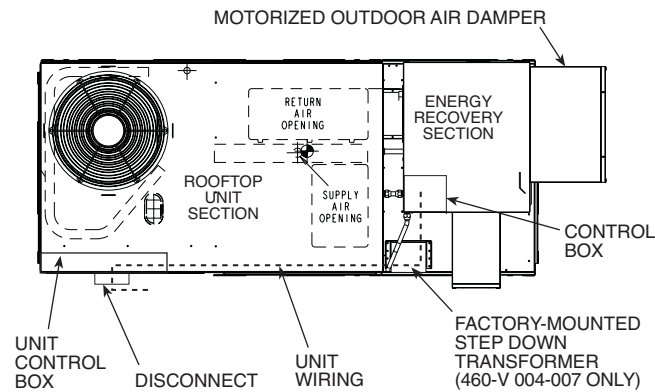
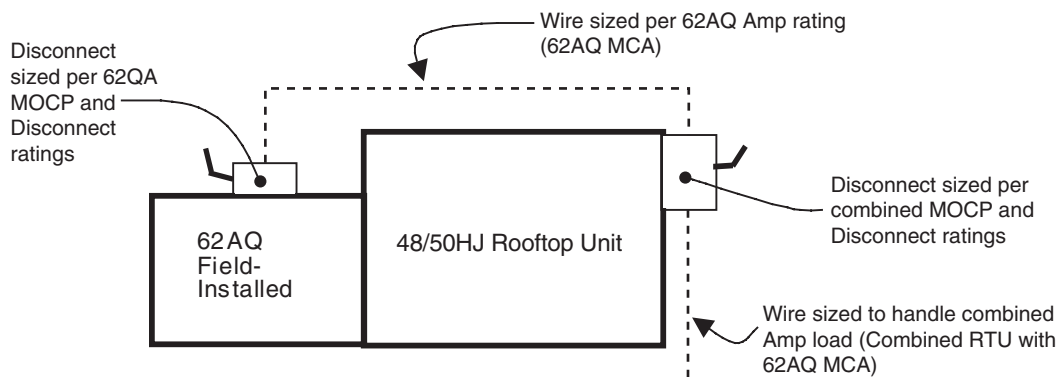


Fig. 36 — Factory Wire Routing for COBRA™ Energy Recovery Unit

**POWER WIRING OPTIONS FOR FIELD INSTALLED 62AQ ENERGY RECYCLER
(NOT Applicable to COBRA Units)**

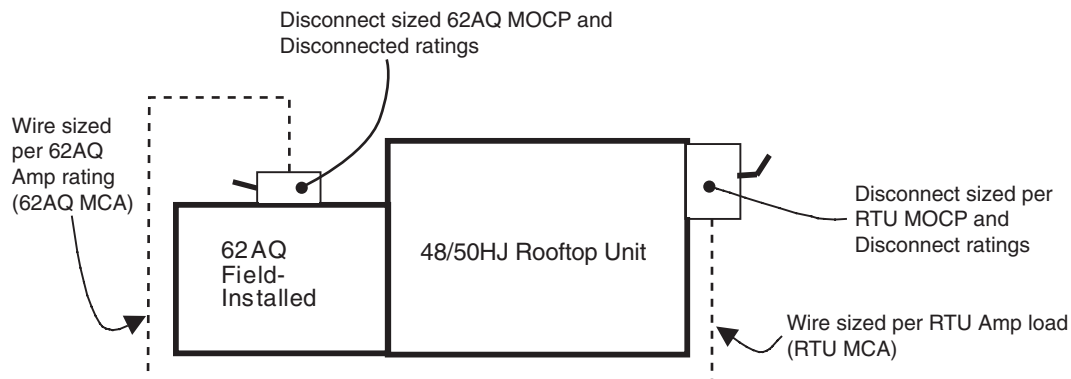


NOTE: Single power feed to rooftop unit and branch feed to 62AQ unit.

LEGEND

- MCA** — Minimum Circuit Amps
- MOCP** — Maximum Overcurrent Protection
- RTU** — Rooftop Unit

Fig. 37 — Method A: Field-Installed 62AQ Combined Power Wiring Connections



NOTE: Dual power feed to both rooftop and 62AQ units.

LEGEND

- MCA** — Minimum Circuit Amps
- MOCP** — Maximum Overcurrent Protection
- RTU** — Rooftop Unit

Fig. 38 — Method B: Field-Installed 62AQ With Separate Power Wiring

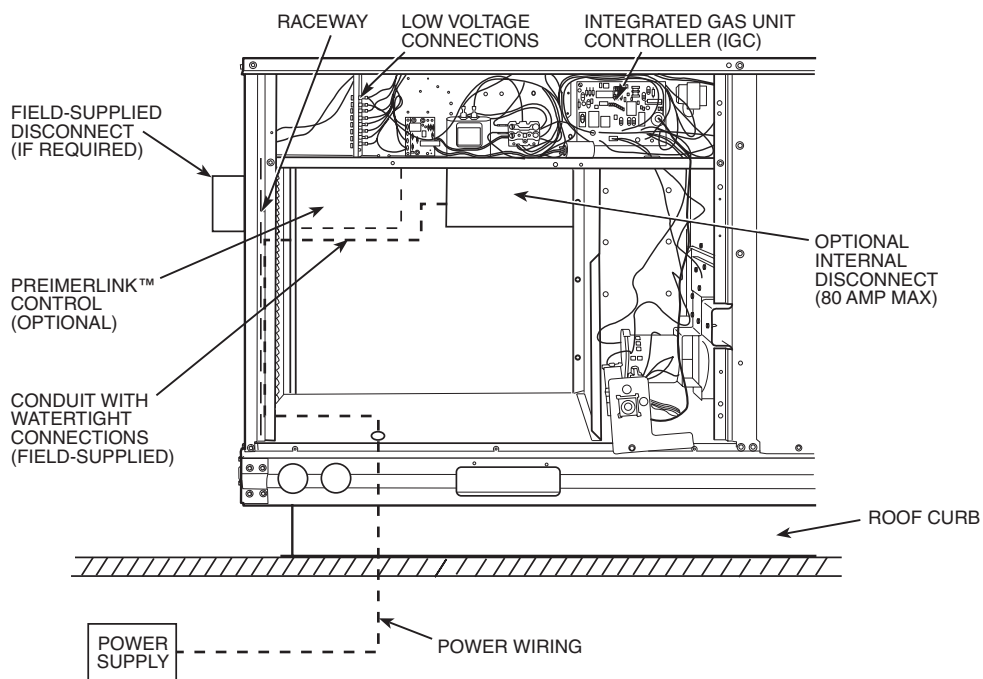


Fig. 39 — Power Wiring Routing with Thru-the-Bottom Accessory (COBRA™ and 62AQ Units)

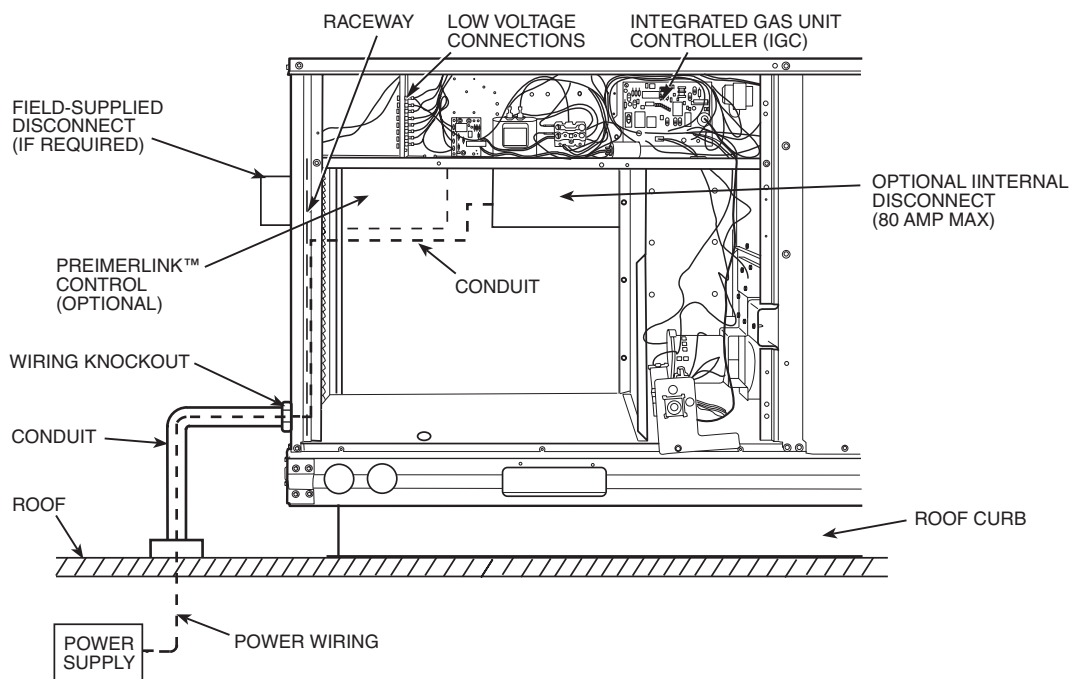


Fig. 40 — Power Wiring Routing from Outside of Unit (COBRA and 62AQ Units)

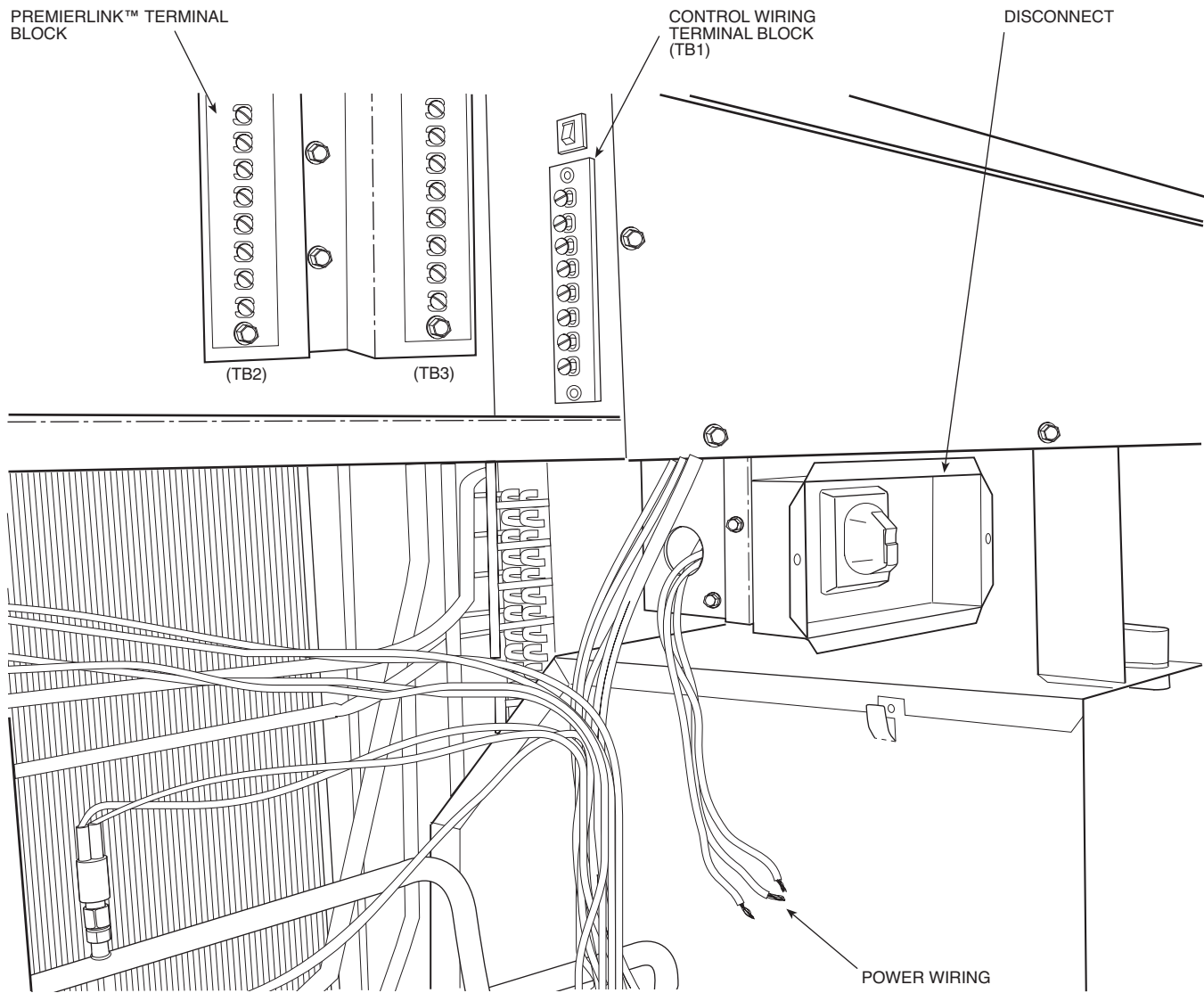
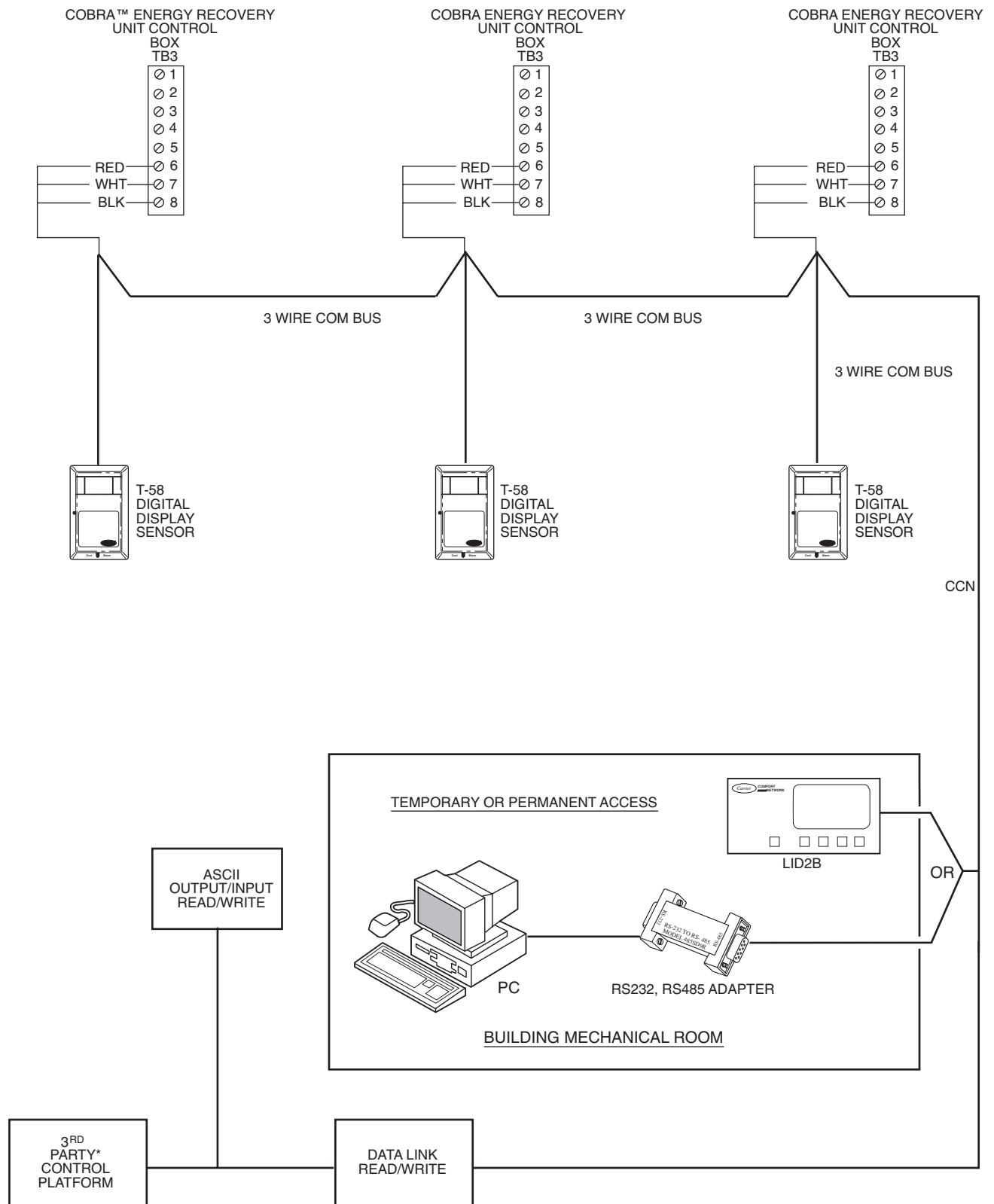


Fig. 41 — Field Wiring Connections (Terminal Blocks in Rooftop Unit Section)



*Example: METASYS, Allerton, ALC, Landis Stafa.

Fig. 42 — CCN Bus Wiring

CONDENSATE PIPING

Condensate piping from the COBRA™ energy recovery unit exits at the Energy\$Recycler™ unit, near the bottom left corner of the exhaust air outlet. Condensate from the rooftop unit is piped to the Energy\$Recycler condensate pan, so only one field-installed condensate line is required.

The bottom drain on the rooftop unit cannot be used as a condensate drain on a COBRA unit. An external P trap at least 4 in. deep is required, and must be protected against freeze-up in cold climates. Do not use pipe smaller than ¾ in. See Fig. 43.

Additionally, ensure that condensate drain from the rooftop section and the condensate drain hose from the drain pan is not crimped or sagging or water will not flow through the tubing.

DAMPERS

The outdoor-air dampers of the energy recovery section are fully adjustable. See Fig. 44.

Supply-Air Dampers — The supply-air damper is a motorized, two-position (open/closed), spring-return type damper. There are 3 adjustable outdoor air intake stops to fix the amount of outdoor air intake in economizer mode. The factory set position is 45 degrees. The supply air fan motor is a 3-speed motor that is factory set for medium speed.

Barometric Relief Damper — The barometric relief damper is located in the exhaust fan section. The exhaust air fan motor is a 3-speed motor that is factory set for medium speed. The damper limiter can be set for 30, 45, or 60 degrees open (90 degrees open is not required) based on cfm and fan speed.

Multiple Stage Cooling Control — Stage 1 is free cooling by opening the supply-air dampers and bringing in

cool outside air. Stage 2 is efficient cooling with the energy recovery section as outdoor temperatures rise. Stage 3 is cooling operation of the rooftop unit during peak outdoor conditions.

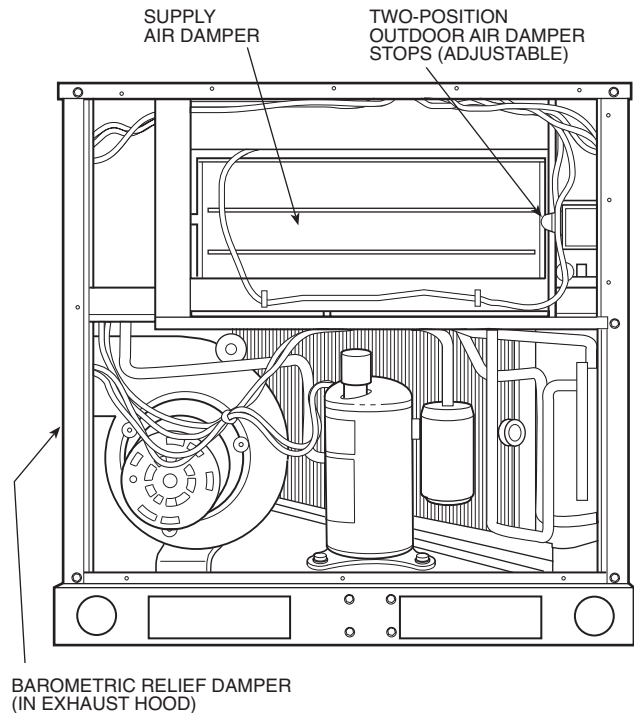


Fig. 44 — Outdoor-Air Dampers

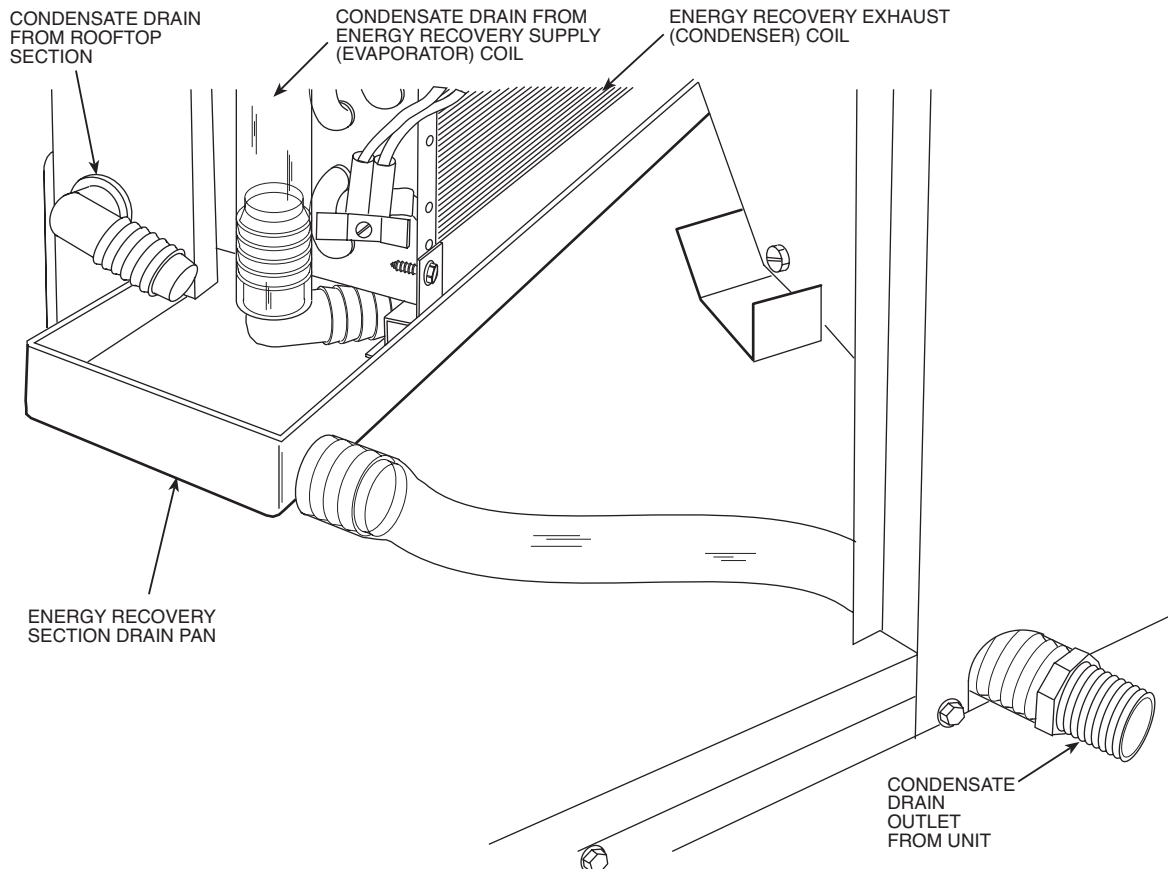


Fig. 43 — Condensate Drain Location

DESIGN EXAMPLES

Design Example 1 — Carrier's COBRA™ energy recovery unit pre-conditions ventilation air by recovering energy from the building exhaust air during both summer and winter operation. Additionally, the COBRA energy recovery unit will benefit the application by potentially allowing higher amounts of outdoor air to be utilized. This section outlines two brief design examples to illustrate the flexibility and dehumidification capacity of a COBRA energy recovery unit or Weathermaster® 48/50HJ rooftop unit with the field-installed 62AQ Energy\$Recycler™ section and how this system would perform.

Consider a school classroom in Houston, Texas with the following design characteristics:

- Total classroom area = 1,500 sq ft
- Total classroom volume = 15,000 cu ft

The design occupancy for this classroom is 30 students or roughly 10 people per 500 sq ft. Based on this occupancy, in accordance with ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) 62, the design ventilation rate would be 15 cfm/person or 450 cfm total for this classroom.

To evaluate the full and part load rooftop performance, design requirements for the classroom will be evaluated at three conditions to assess annual full and part load operation to include:

1. Peak dry bulb (outdoor)
2. Peak dew point (outdoor)
3. Extremely high humidity (outdoor)

For each condition, the necessary rooftop performance will be calculated to evaluate the capacity requirements and associated required supply-air temperature from the unit to maintain space comfort conditions. The following formulas will be used:

$$\text{OA Sensible Load} = 1.08 \times \text{cfm}_{\text{oa}} \times (T_{\text{oa}} - T_{\text{sp}})$$

$$\text{OA Latent Load} = 0.7 \times \text{cfm}_{\text{oa}} \times (W_{\text{oa}} - W_{\text{sp}})$$

Where:

Cfm_{oa} = outdoor airflow in cu ft/min

T_{oa} = temperature of outdoor air in degrees of Fahrenheit

T_{sp} = temperature of space in degrees of Fahrenheit

W_{oa} = grains of water per pound of dry air of outdoor air

W_{sp} = grains of water per pound of dry air of space

NOTE: The W_{oa} and W_{sp} values of outdoor air can be obtained using the psychrometric chart.

For Houston, the outdoor peak dry bulb (db) and coincident mean wet bulb (mwb) 1% conditions are 94 F db and 77 F (per the ASHRAE Fundamentals Handbook). The design room conditions are 75 F (space temperature) db and 62.5 F wet bulb (wb) (or roughly 50% relative humidity). At these conditions, the calculated indoor sensible (wall, roof, solar, windows, etc.) and latent (people) room loads for the classroom are **33,000 Btuh** and **6,150 Btuh**. The total room load is **33,000 + 6,150 = 39,150 Btuh**.

For design purposes, there will be roughly 6.5 air changes per hour for the classroom. Therefore, the constant volume supply air from the rooftop unit would be $(15,000 \text{ cu ft} \times 6.5) / 60 = \text{approximately } 1,600 \text{ cfm}$. For this design supply airflow rate, the mixed air conditions entering the standard evaporator coil is 80.3 F db/66.7 F wb. See Table 6 for summary of peak db temperature conditions. In addition the calculated outdoor air loads are:

$$\text{OA (sensible)} = 1.08 \times 450 \times (94 - 75) = 9,276 \text{ Btuh}$$

$$\text{OA (latent)} = 0.7 \times 450 \times (111 - 72) = 11,934 \text{ Btuh}$$

The total capacity required of the rooftop unit including all sensible and latent room and outdoor loads is:

$$33,000 + 6,150 + 9,276 + 11,934 = 60,360 \text{ Btuh}$$

Including total sensible capacity:

$$33,000 + 9,276 = 42,776$$

Total latent capacity:

$$6,150 + 11,934 = 18,084$$

Select the 48/50HJ006 5-ton rooftop unit based on the total outdoor air and room load requirements.

Table 6 — Peak Dry Bulb Temperature Summary

TEMPERATURE SUMMARY	DRY BULB	WET BULB
Outside-Air Temperature	94 F	77 F
Space Temperature	75 F	62.5 F
Entering-Air Temperature	80.3 F	66.7 F

Now that the desired supply air quantity is known, it is possible to estimate the required supply-air temperature and performance for the rooftop unit to maintain the desired indoor conditions. At peak conditions, the SHR (the sensible to total heat rise in the room) and associated supply air temperature requirement is:

$$\text{SHR (Peak Dry Bulb)} = 33,000 / 39,150 = 0.84$$

$$33,000 \text{ Btuh} = 1.08 \times 1,600 \text{ cfm} \times (75 \text{ F} - T)$$

$$\text{Supply Air Temperature} = 56 \text{ F}$$

A supply-air temperature of 56 F is required for the sensible to total (SHR) heat ratio of 0.84 in the room. A supply-air temperature of 56 F is required to absorb the proportions of sensible and latent room load (per the SHR), so that space conditions are maintained at 75 F. Table 7 outlines a comparison of classroom requirements vs. actual rooftop performance to summarize the required classroom conditioning and the associated rooftop capacity under peak dry bulb conditions.

Table 7 — Peak Dry Bulb Operation Summary, Normal Design Cooling Mode

48/50HJ006	CLASSROOM REQUIREMENTS (Computer Simulation)	ROOFTOP PERFORMANCE (ECAT)
Total Capacity	60,360 Btuh	61,113 Btuh
Outdoor Sensible	9,276 Btuh	—
Outdoor Latent	11,934 Btuh	—
Sensible Capacity	—	42,930 Btuh
Latent Capacity	—	18,183 Btuh
Room Sensible	33,000 Btuh	33,718 Btuh
Room Latent	6,150 Btuh	6,249 Btuh
Supply Air	56 F	55.8 F
SHR	0.84	0.84

LEGEND

DB — Dry Bulb
ECAT — Carrier Electronic Catalog Program
SHR — Sensible Heat Ratio
WB — Wet Bulb

NOTES:

1. Data provided in terms of gross capacities.
2. Peak Dry Bulb Condition = 94 F DB/77 F WB.

Table 7 provides a breakdown of all the room load information and rooftop performance. To determine the available capacity that the rooftop unit has for room sensible and latent conditioning, the outdoor loads were subtracted from the total loads. For example, to evaluate the sensible capacity available for room conditioning, the outdoor sensible load of **9,276 Btuh** was subtracted from the total rooftop sensible capacity of **42,930 Btuh**. This yields a sensible capacity of **33,718 Btuh**, which closely matches the classroom sensible requirement of **33,000 Btuh**. The same calculation can be made to evaluate latent capacity requirements as shown in Table 7. Overall, under the peak dry bulb condition, the rooftop unit is sized appropriately to handle both the outdoor ventilation loads and room loads.

A COBRA™ energy recovery unit makes it possible to:

- Select a smaller 4-ton 48/50HJ rooftop to operate with the same total airflow to satisfy the same conditions.
- Pre-condition the same or larger quantities of outdoor air, depending on the application and climate.
- Provide an additional stage of capacity for both cooling and heating mode for enhanced part load performance.

In the previous example the following design changes would be made to accommodate more people. The occupancy would be increased from 30 to 35 people, increasing the required ventilation to 525 cfm (35 x 15 cfm/person).

A COBRA energy recovery unit is sized to accommodate and pre-treat the outdoor air to the rooftop unit. The COBRA unit brings in 600 cfm of outdoor air and pretreats it. Using the peak dry bulb information from the example (94 F db/ 77 wb F), the pre-treated outdoor air is mixed with the portion of the return air that is not used for energy recovery, resulting in a 75 F db/63 F wb mixed air condition entering the rooftop evaporator coil.

The outdoor and total equipment capacity requirements are as follows:

$$OA \text{ (sensible)} = 1.08 \times 570 \times (94 - 75) = 10,882 \text{ Btuh}$$

$$OA \text{ (latent)} = 0.7 \times 570 \times (111 - 72) = 13,923 \text{ Btuh}$$

Notice that these outdoor air loads are higher than was previously calculated in the example using 30 people. See Table 8 for peak db with COBRA unit temperature summary. In addition, the indoor latent load will increase as follows:

$$35 \times 205 \text{ Btuh/person} = 7,175 \text{ Btuh}$$

Table 8 — Peak Dry Bulb with COBRA Unit, Temperature Summary

TEMPERATURE SUMMARY	DRY BULB	WET BULB
Outside-Air Temperature	94 F	77 F
Space Temperature	75 F	62.5 F
Entering-Air Temperature	75 F	63 F

The total capacity required of the rooftop unit including all sensible and latent room and outdoor loads is:

$$33,000 + 7,175 + 10,882 + 13,923 = 64,980 \text{ Btuh.}$$

Table 9 outlines the performance of the 4-ton 48/50HJ005 unit in combination with a COBRA energy recovery unit.

Overall, the combined unit capacities and supply-air temperature closely match the conditions for the room loads to maintain space conditions. In addition, the combined system is able to condition more outdoor air. Since the energy recovery unit consists of a heat pump that can operate as the first stage of heating or cooling, additional system flexibility is provided utilizing a smaller size rooftop unit.

Additionally, use of the Humidi-MiZer™ adaptive dehumidification system with the COBRA or field-installed 62AQ unit will significantly affect the capacity and performance of the unit. For a design example in this application, reference Carrier's electronic software or the Humidi-MiZer Application Data manual.

Table 9 — Peak Dry Bulb Operation Summary, 48/50HJ005 with COBRA™ Energy Recovery Unit

48/50HJ005	CLASSROOM REQUIREMENTS (Computer Simulation)	COBRA UNIT PERFORMANCE (ECAT)
Total Capacity	64,980 Btuh	62,920 Btuh
Outdoor Sensible	10,882 Btuh	—
Outdoor Latent	13,923 Btuh	—
Sensible Capacity	—	40,380 Btuh
Latent Capacity	—	22,540 Btuh
Room Sensible	33,000 Btuh	29,498 Btuh
Room Latent	7,175 Btuh	8,617 Btuh
Supply Air	56 F	58.3 F
SHR	0.84	0.77

LEGEND

DB — Dry Bulb
ECAT — Carrier's Electronic Catalog Program
SHR — Sensible Heat Ratio
WB — Wet Bulb

NOTES:

1. Data provided in terms of gross capacities.
2. Outdoor Peak Dry Bulb Condition = 94 F DB/77 F WB.

Design Example 2 — Carrier's COBRA energy recovery unit preconditions the outdoor air, resulting in the ability of the combined rooftop unit and 62AQ Energy\$Recycler section to condition larger latent loads. However if the latent requirements are large enough, the Humidi-MiZer dehumidification system may also be required to properly control the space humidity.

Consider an application where the COBRA unit is designed to operate in a region and/or application where a low sensible/ high latent load exists. In this example, a COBRA unit consisting of a 10-ton 48HJ012 rooftop with a 62AQ200 unit is used to supply 4000 cfm to the space, with the following conditions:

AIRFLOW SUMMARY	AIRFLOW (Cfm)
Total Supply Air	4000
Outdoor Air (RA1)	2000
Recirculation Air (RA2)	1400

Table 10 — Dry Bulb with COBRA Unit Temperature Summary

TEMPERATURE SUMMARY	DRY BULB	WET BULB	% RH
Outside-Air Temperature	75 F	73 F	90
Space Temperature Set Point	75 F	64 F	55
Return-Air Temperature	75 F	66 F	63
Evaporator Entering-Air Temperature	74 F	66 F	65
COBRA Supply-Air Temperature	54 F	52 F	87

The given COBRA supply air temperatures indicate that the supply air humidity level is over 90%. Therefore, another device is necessary to control humidity levels in this application. By using a Humidi-MiZer dehumidification system, the latent capacity can be significantly increased and the sensible capacity decreased. In this situation, the Humidi-MiZer system will operate in the hot gas reheat mode (HGRH) and will result in leaving air conditions of 72 F db/60 F wb with 50% humidity.

SELECTION PROCEDURE WITH PACKAGED ROOFTOP BUILDER

The selection procedure with Packaged Rooftop Builder (PRB) works like a normal selection procedure, except that ratings for the rooftop section, 62AQ Energy\$Recycler™ section, and the combined COBRA™ energy recovery unit ratings are all shown. See Fig. 45 and 46.

First, select the desired COBRA unit and applicable options in the Factory Options tab. To select the field-installed 62AQ only, go to the Accessories tab. Note that the COBRA option is only applicable for 3 to 12½ ton 48HJ and 50HJ unit selections. All other 3 to 12½ ton models are for field installation only.

Next, select the applicable operating requirements for the Energy\$Recycler section (62AQ) in the Design Criteria tab.

Finally, click on the Performance tab. The performance output screen will be shown with the pre-treated (energy recovery unit) airflow data included on the screen. The rooftop unit performance data, energy recovery unit performance data, and the combined COBRA energy recovery unit performance data are all shown on the same page. The rooftop unit electrical data, 62AQ Energy\$Recycler unit electrical data, and the combined COBRA energy recovery unit electrical data are also shown on the page.

Packaged Rooftop - Example 50HJ008 - example 50HJ008

File View Tools Products Reports Help

Products Rep

Tag Name: 50HJ008 Quantity: 1

Model Number: 50HJ-007B-J6 Master Price:

☒ Base Unit ☒ Factory Options ☒ Accessories ☒ Warranty ☒ Design Criteria ☒ Performance

Altitude: 0.0 ft

External Static: 0.70 in wg

Supply Air Flow: 2400.0 CFM

Return Duct Static: 0.00 in wg

Power Exhaust Data

Glycol Coil Data

Humidifier Data

Outdoor and Return Air

Outdoor Air

Location: [Dropdown]

City: [Dropdown]

Airflow: 1000.0 CFM

Cooling Heating

Dry Bulb (F): 95.0 35.0

Wet Bulb (F): 78.0 33.0

Return Air

Exhaust (RA1): 1000.0 CFM

Return (RA2): 1400.0 CFM

Cooling Heating

Dry Bulb (F): 78.0 70.0

Wet Bulb (F): 65.0 57.0

Coil Conditions

Mixed Air (Entering Indoor Coil)

Cooling Heating

Dry Bulb (F): 77.6 63.7

Wet Bulb (F): 68.3 51.9

Outdoor Air (Entering Outdoor Coil)

Cooling

Dry Bulb (F): 95.0

Fig. 45 — Electronic Selection Program — COBRA Design Criteria

Packaged Rooftop - Example 50HJ008 - example 50HJ008

File View Tools Products Reports Help

Products Rep

Tag Name: 50HJ008 Quantity: 1

Model Number: 50HJ-007B-J6 Master Price:

☒ Base Unit
 ☒ Factory Options
 ☒ Accessories
 ☒ Warranty
 ☒ Design Criteria
 ☒ Performance

Review Capacity Requirements

Performance Summary For 50HJ008

Project: Example 50HJ008
Prepared By: n/a

Part Number: 50HJ-007B-J6 (Cobra)

ARI EER:	11.10
Application EER:	9.93
Base Unit Weight:	895 lb
Base Unit Dimensions	
Unit Length:	105.4 in
Unit Width:	50.1 in
Unit Height:	41.2 in
Unit Voltage-Phase-Hertz:	460-3-60
Air Discharge:	Vertical
Fan Drive Type:	Belt
Actual Airflow:	2400 CFM

Fig. 46 — Electronic Selection Program — Performance Summary

