INSTALLATION MANUAL FOR CARRIER/BRYANT 3-15 TON ECONOMIZERS

<u>3-6 TON MODELS</u>

PART# 1022355 - STANDARD ECONOMIZER
PART# 1022911 - RETROFIT ECONOMIZER (FOR UNITS WITH NO CTB)
PART# 1023736 - ULTRA LOW LEAK ECONOMIZER

<u>7.5 - 12.5 TON MODELS</u>

PART# 1022356 - STANDARD ECONOMIZER
PART# 1022912 - RETROFIT ECONOMIZER (FOR UNITS WITH NO CTB)
PART# 1023737 - ULTRA LOW LEAK ECONOMIZER

<u>12.5 TON HIGH EFFICIENCY & 15 TON MODELS</u>

PART# 1022558 - STANDARD ECONOMIZER
PART# 1022936 - RETROFIT ECONOMIZER (FOR UNITS WITH NO CTB)
PART# 1023738 - ULTRA LOW LEAK ECONOMIZER

TABLE OF CONTENTS

READ COMPLETELY BEFORE INSTALLING!!!
CAMBRIDGEPORT IS NOT RESPONSIBLE FOR IMPROPERLY INSTALLED EQUIPMENT

INSTALLATION INSTRUCTIONS FOR DOWNSHOT CONFIGURATION

(LOW & ULTRA LOW LEAK)
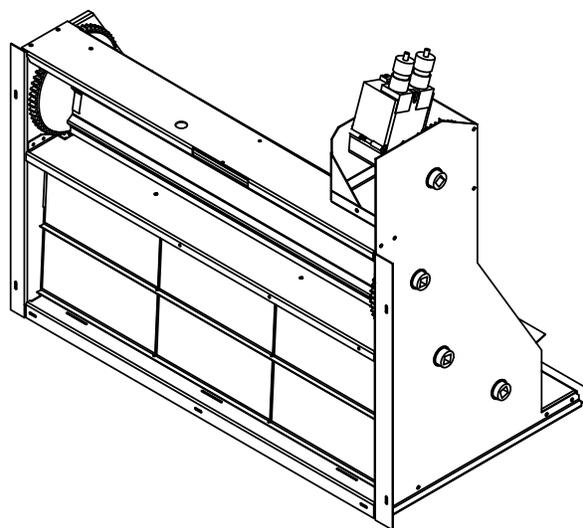
3-6 TON
STANDARD ECONOMIZER

7.5-15 TON
STANDARD ECONOMIZER

PAGE 1
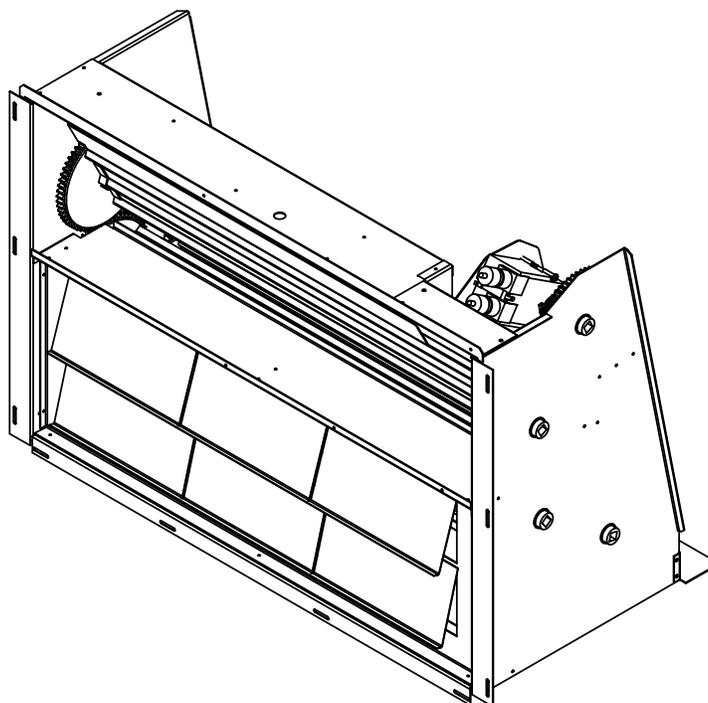
READ COMPLETELY BEFORE INSTALLING!!!
CAMBRIDGEPORT IS NOT RESPONSIBLE FOR IMPROPERLY INSTALLED EQUIPMENT

STEP 1: PANEL REMOVAL

REMOVE FILTER ACCESS PANEL (KEEP FOR LATER USE). REMOVE AND DISCARD FACTORY BLOCK-OFF PANEL

FILTER ACCESS PANEL
(SAVE FOR LATER USE)

FACTORY BLOCK
OFF PANEL (DISCARD)
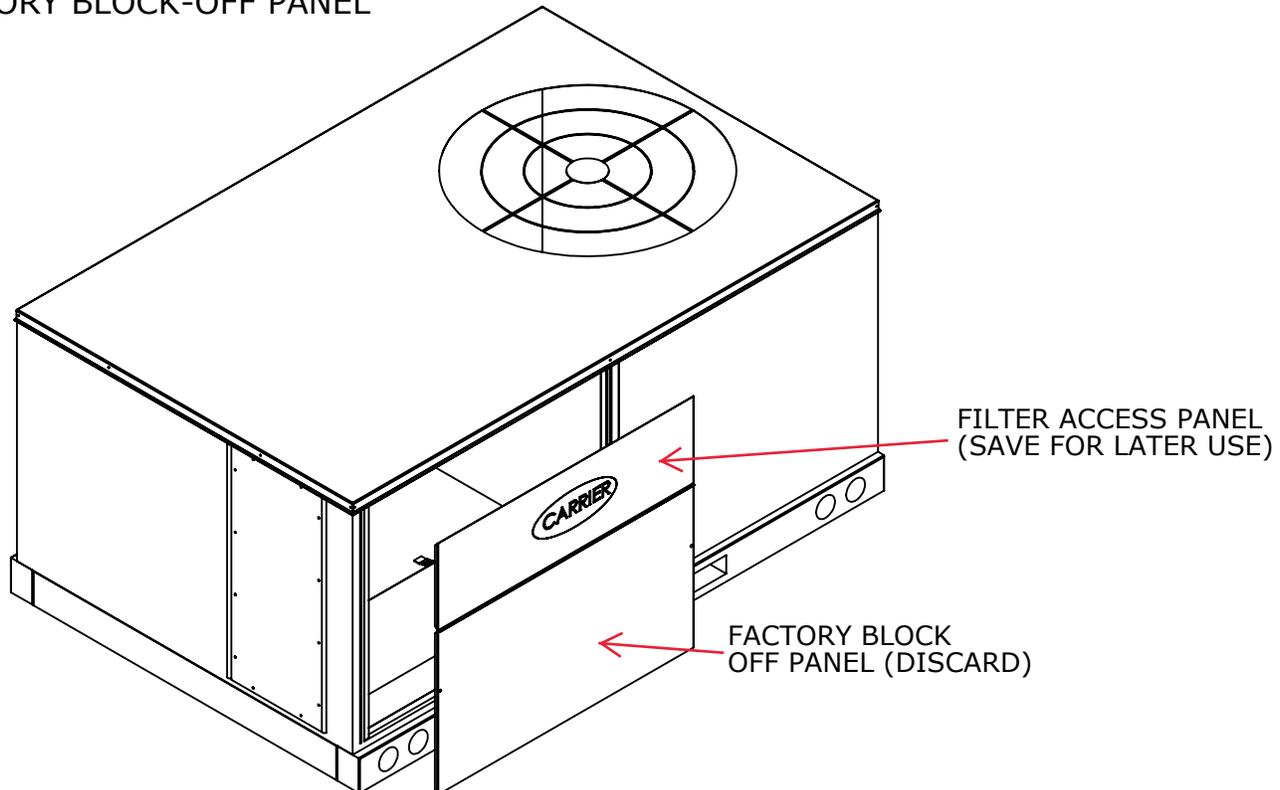
STEP 2: DUAL ENTHALPY

IF DUAL ENTHALPY OPTION HAS BEEN ADDED NOW IS THE TIME TO INSTALL THE SECOND ENTHALPY SENSOR (SOLD SEPARATELY) BELOW THE ECONOMIZER IN THE RETURN AIR DUCT. SEE PAGE 20 FOR ENTHALPY SENSOR WIRING DETAIL

STEP 3: BLOCK OFFS

IF 10-15 TON UNIT IS BEING INSTALLED, AN ADDITIONAL BLOCK OFF PANEL IS REQUIRED. INSTALL PANEL ON THE RIGHT SIDE OF THE BOTTOM RETURN OPENING AS SHOWN

10-12.5 TON STD = 14" X 5 1/4" PART# 1113944

12.5 TON H.E. & 15 TON = 14" X 6 3/8" PART# 1147670

PART#1113944
OR
PART#1147670
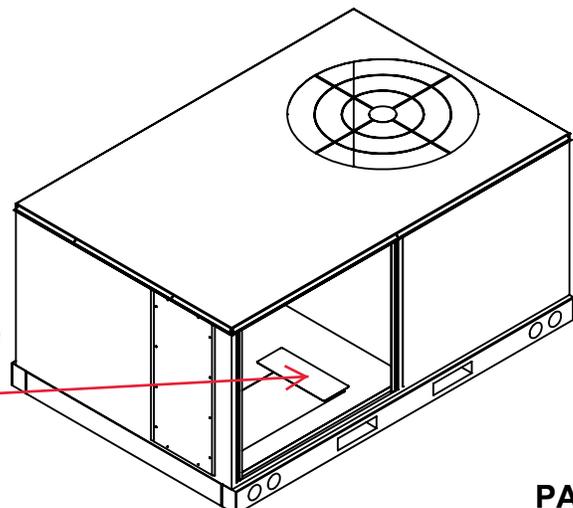
PAGE 2

STEP 4: ECONOMIZER INSTALL

MUST BE SQUARE TO PREVENT DAMAGE, DAMPER BINDING, AND ACHIEVE LEAKAGE REQUIREMENTS.

SQUARENESS TOLERANCE:

STD LOW LEAK	+/- 1/16"	(D1 = D2 +/- 1/8")
ULTRA LOW LEAK	+/- 1/32"	(D1 = D2 +/- 1/16")
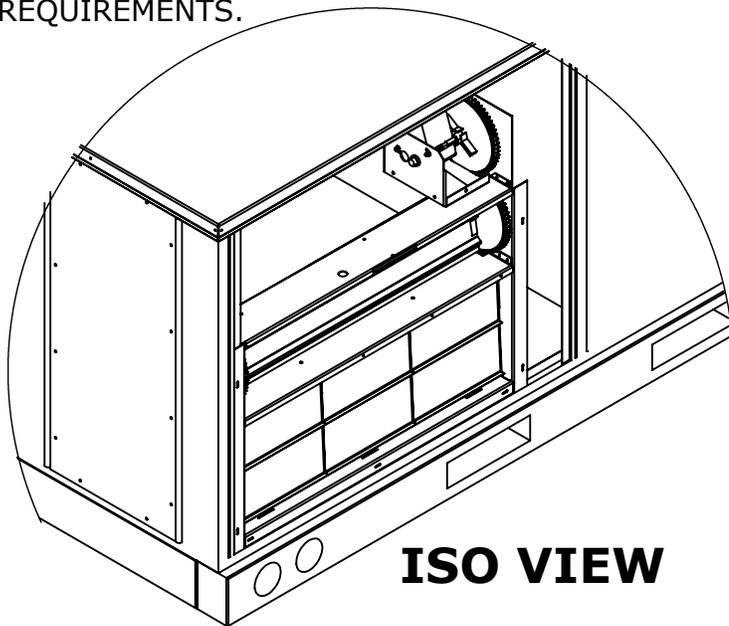
ISO VIEW
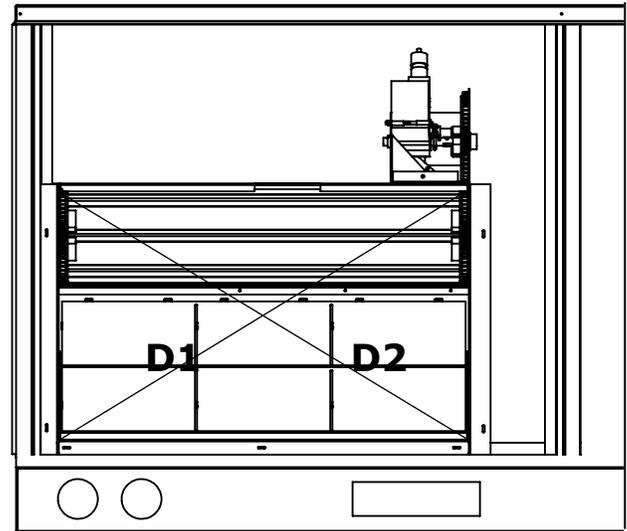
FRONT VIEW

INSERT ECONOMIZER INTO BOTTOM LEFT CORNER OF UNIT. SLIDE BACK FOOT OF ECONOMIZER INTO CLIPS LOCATED ON UNIT BEHIND THE BOTTOM RETURN OPENING (SEE DETAIL "A" BELOW).

MAKE SURE ECONOMIZER IS SQUARE TO WITHIN REQUIRED TOLERANCES (SEE ABOVE). ATTACH ECONOMIZER TO UNIT USING [2] SCREWS ON LEFT HAND SIDE AND [2] SCREWS ON BOTTOM EDGE (SCREWS PROVIDED BY CAMBRIDGEPORT).

WARNING: PRE-DRILLED HOLES MAY NOT ALWAYS LINE UP WITH HOLES IN UNIT. KEEPING ECONOMIZER SQUARE IS OF UTMOST IMPORTANCE. DO NOT FORCE SCREWS INTO PRE-DRILLED HOLES AND COMPROMISE THE ECONOMIZERS POSITION. IF NECESSARY DRILL NEW HOLES.

CLIP IN UNIT (X3)

ECONOMIZER BACK FOOT

DETAIL A

LEFT VIEW

PAGE 3

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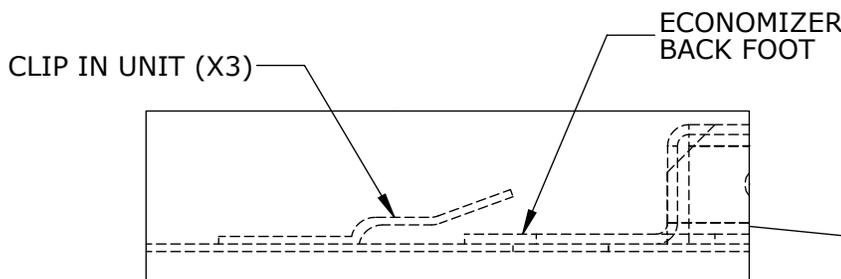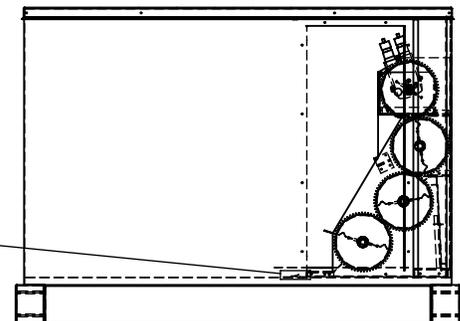
STEP 5: BLOCK OFF INSTALL

I) FOR 3-12.5 TON STD. UNITS

INSTALL EXTRA BLOCK OFF PANEL ON RIGHT HAND SIDE OF ECONOMIZER. POSITION PANEL SUCH THAT HOLES/SLOTS LINE UP WITH BOTH THE ECONOMIZER AND UNIT. PANEL WILL MEASURE EITHER 4-7/8" X 17-5/8" PART#(M1A BLOCKOFF) OR 4-3/4" X 23-1/8" PART#(1113946) DEPENDING ON UNIT SIZE.

BLOCK-OFF PANEL LOCATED BEHIND ECONOMIZER FLANGE AND IN FRONT OF UNIT FLANGE

UNIT

ECONOMIZER
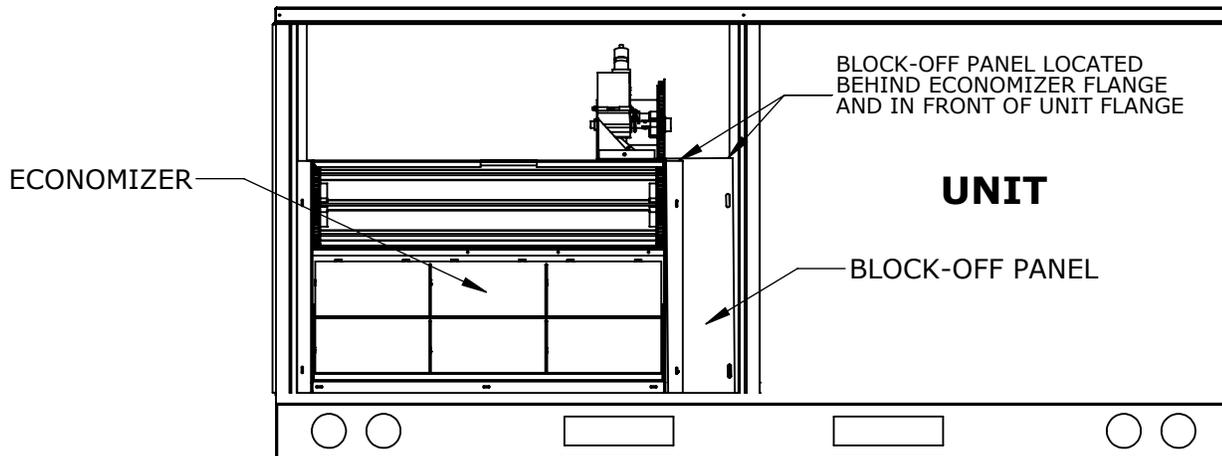
BLOCK-OFF PANEL

II) FOR 12.5 [HIGH EFF] & 15 TON UNITS

NOTE: BEFORE INSTALLING PANELS SEE STEP 6 AND STEP 7 ON FOLLOWING PAGE

INSTALL THREE [3] SUPPLIED BLANK-OFF PANELS AS SHOWN.

(PART##1147672)
9-7/8" X 23-1/8"

(PART##1147672)
9-7/8" X 23-1/8"

7" X 32-3/8"
(PART#1147671)
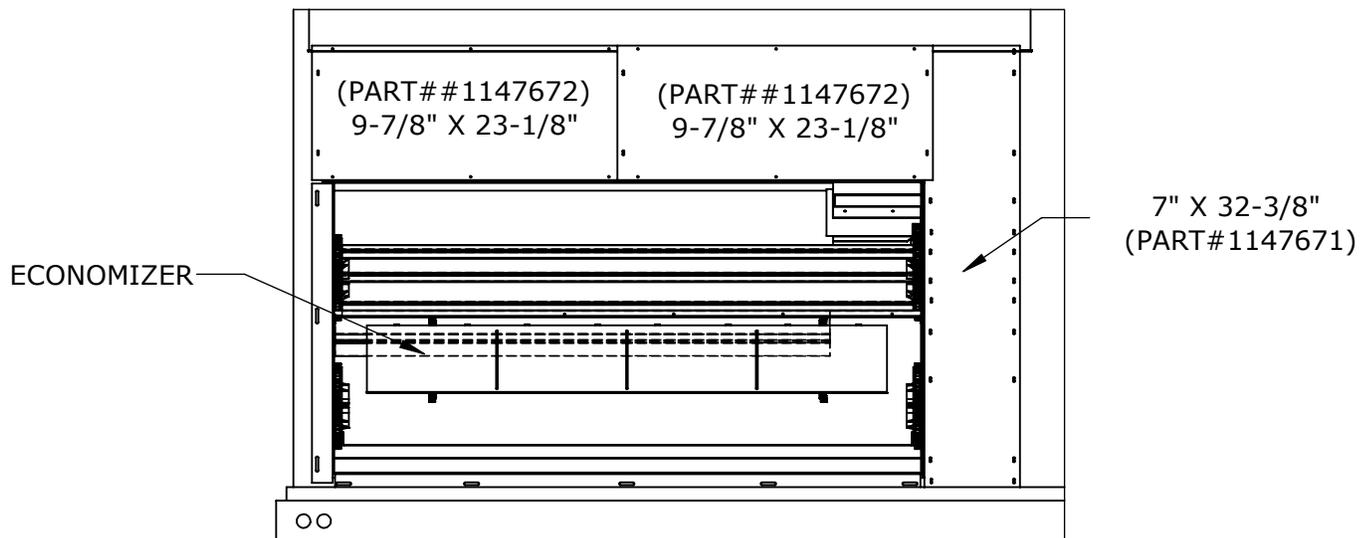
ECONOMIZER

STEP 6: WIRING HARNESS

IN ECONOMIZER SECTION OF THE RTU LOCATE FACTORY WIRING HARNESS "PL-6" AND REMOVE FACTORY HARNESS JUMPER LABELED "PL6-R".

(NOTE: SAVE JUMPER "PL6-R" FOR FUTURE USE IF ECONOMIZER NEEDS TO BE BYPASSED.

STEP 7: PLUG CONNECTION

CONNECT CAMBRIDGEPORT ECONOMIZER WIRING HARNESS PLUG INTO THE UNIT WIRING HARNESS "PL-6". (WILL ONLY FIT ONE WAY)

LOCATE HARNESS   →   REMOVE JUMPER PLUG   →   PLUG ECONOMIZER INTO UNIT

STEP 7B: CHECK ACTUATOR DRIVE DIRECTION

LOCATE WINDOW ON SIDE OF ACTUATOR BRACKET WHICH IS MOUNTED ON TOP OF DAMPER BLADE ASSEMBLY.

ENSURE BLACK SWITCH IS LOCATED IN THE COUNTERCLOCKWISE (POINTED UP) POSITION AS SHOWN HERE. IF SWITCH IS CLOCKWISE THEN FLIP SWITCH TO BE IN CCW POSITION.

WARNING: IF SWITCH IS NOT IN THE CORRECT POSITION THE ACTUATOR WILL DRIVE IN THE WRONG DIRECTION. CORRECT OPERATION: (10V DC = O/A FULL OPEN / 2V DC = O/A FULL CLOSED

STEP 8: HOOD INSTALL
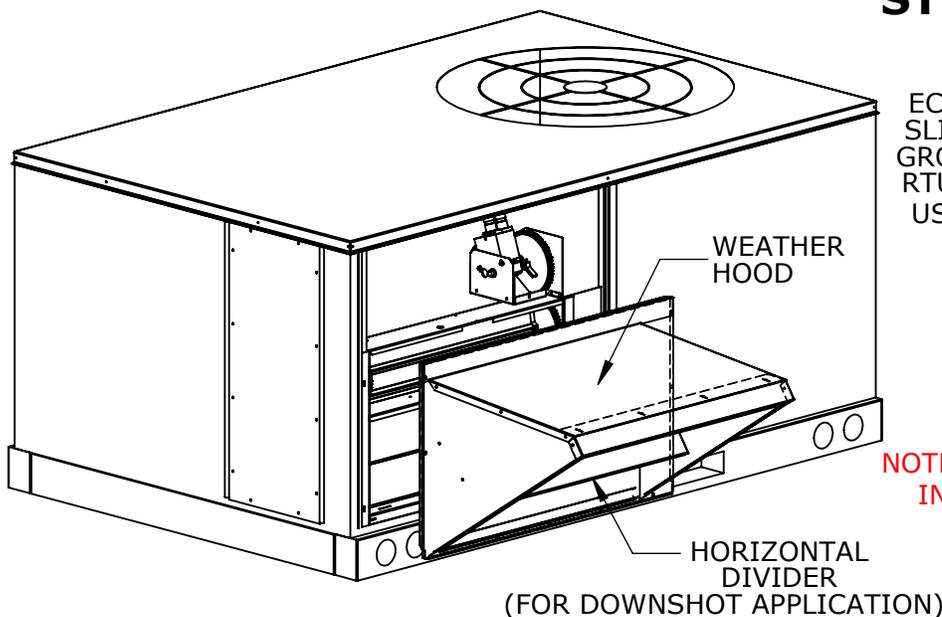
INSTALL WEATHER HOOD OVER ECONOMIZER AND BLOCK OFF PANEL. SLIDE WEATHER HOOD FLANGES INTO GROOVES ON LEFT AND RIGHT SIDE OF RTU OPENING. SECURE HOOD TO UNIT USING SCREWS REMOVED IN STEP 1.

WEATHER HOOD

NOTE: HORIZONTAL DIVIDER IS FACTORY INSTALLED FOR THIS ORIENTATION.

HORIZONTAL DIVIDER (FOR DOWNSHOT APPLICATION)

PAGE 5

STEP 9 - WEATHER HOOD FILTERS

i. LOOSEN [4/5] SCREWS AND REMOVE FILTER CAP.

ii. PUT FILTERS TOGETHER AND CAP TOP/BOTTOM WITH FILTER CLIPS.

iii. SLIDE ADJOINED FILTERS DOWN FILTER TRACKS LOCATED ON EITHER SIDE OF WEATHER HOOD.

iv. SLIDE FILTER CAP UNDER HOOD ROOF BUT ENSURE SIDE FLANGES CAP OVER OUTSIDE OF WALLS (SEE "ASSEMBLED VIEW").

v. SLIDE FILTER CAP UP AS FAR AS POSSIBLE AND REATTACH AT [4/5] LOCATIONS.

vi. VERIFY FILTERS ARE SECURE AND ALL PARTS ARE ASSEMBLED CORRECTLY.

FILTER CAP

FILTERS

FILTER CLIPS

NOTE HOW FILTER CAP SLIDES UNDER TOP OF HOOD
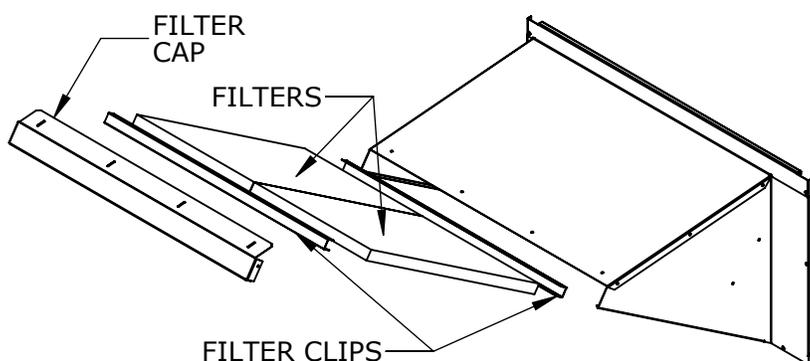
EXPLODED VIEW
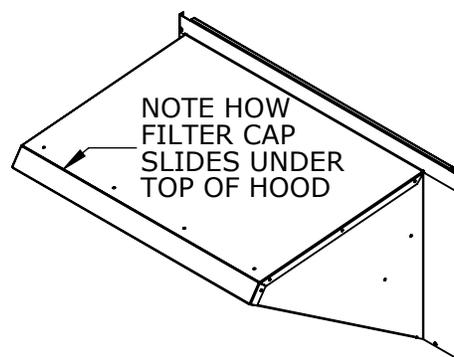
ASSEMBLED VIEW

STEP 10: FILTER ACCESS AND WIRING

REINSTALL FILTER ACCESS PANEL (REMOVED FROM STEP 1) ON TOP OF WEATHERHOOD.

FOLLOW INSTRUCTIONS FOR WIRING AND BELIMO ZIP MODULE SETUP ON PAGE 15.

FILTER ACCESS PANEL (FROM STEP 1)

CARRIER

WEATHERHOOD

READ COMPLETELY BEFORE INSTALLING!!!
CAMBRIDGEPORT IS NOT RESPONSIBLE FOR IMPROPERLY INSTALLED EQUIPMENT
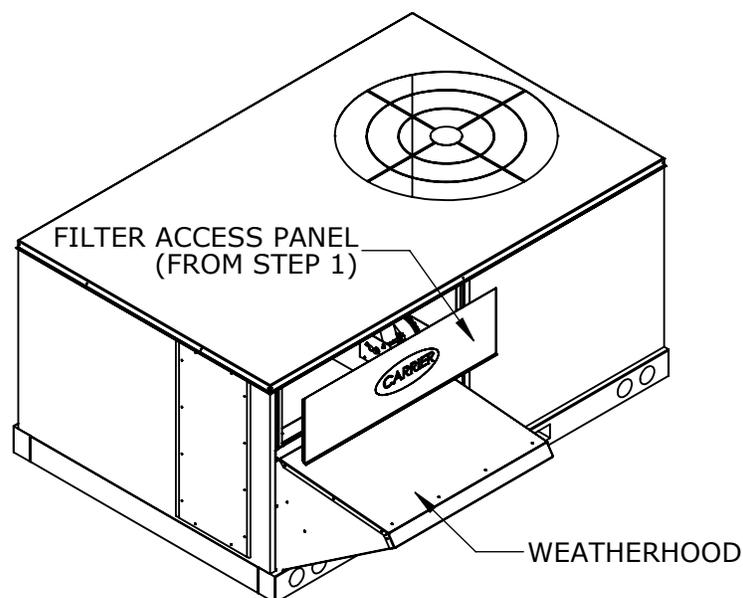
INSTALLATION INSTRUCTIONS FOR SIDE RETURN CONFIGURATION

(LOW & ULTRA LOW LEAK)
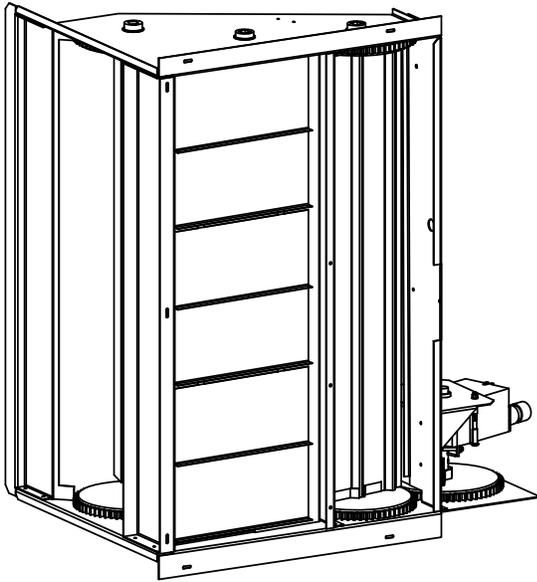
3-6 TON STANDARD
ECONOMIZER
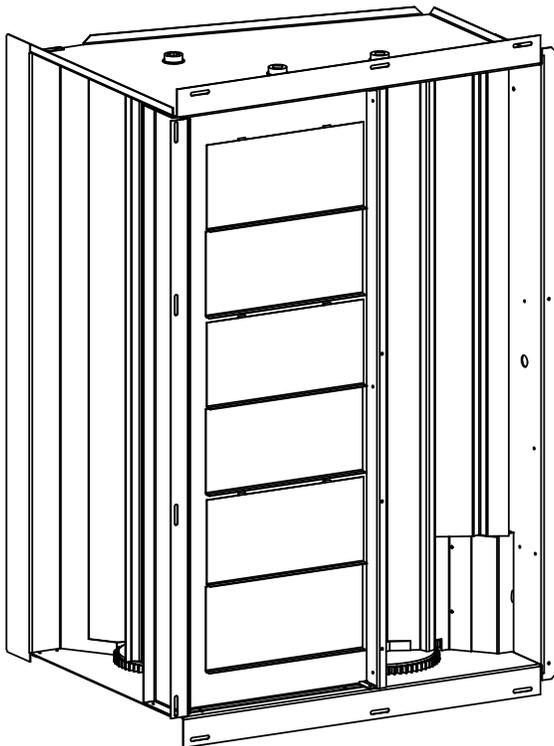
7.5-15 TON STANDARD
ECONOMIZER

READ COMPLETELY BEFORE INSTALLING!!!
CAMBRIDGEPORT IS NOT RESPONSIBLE FOR IMPROPERLY INSTALLED EQUIPMENT
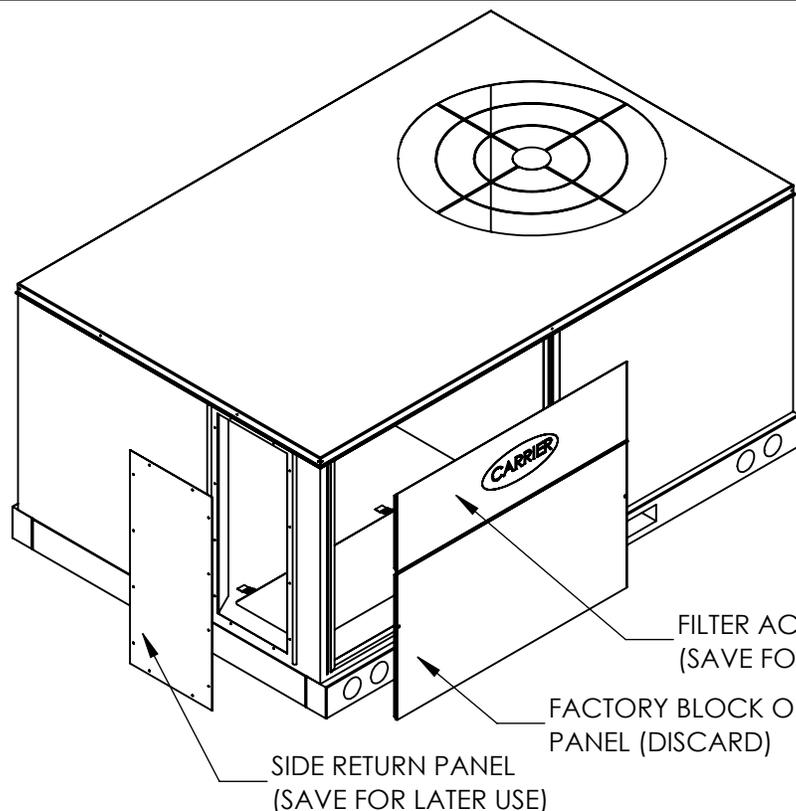
STEP 1: PANEL REMOVAL

REMOVE FILTER ACCESS PANEL (SAVE FOR LATER USE),FACTORY BLOCK OFF PANEL (DISCARD), AND SIDE RETURN PANEL (SAVE FOR LATER USE) FROM CARRIER UNIT AS SHOWN HERE.

FILTER ACCESS PANEL
(SAVE FOR LATER USE)

FACTORY BLOCK OFF
PANEL (DISCARD)

SIDE RETURN PANEL
(SAVE FOR LATER USE)

STEP 2 (OPTION): DUAL ENTHALPY

IF DUAL ENTHALPY OPTION HAS BEEN ADDED NOW IS THE TIME TO INSTALL THE SECOND ENTHALPY SENSOR (SOLD SEPARATELY) IN THE RETURN AIR DUCT. SEE PAGE 20 FOR ENTHALPY SENSOR WIRING DETAIL
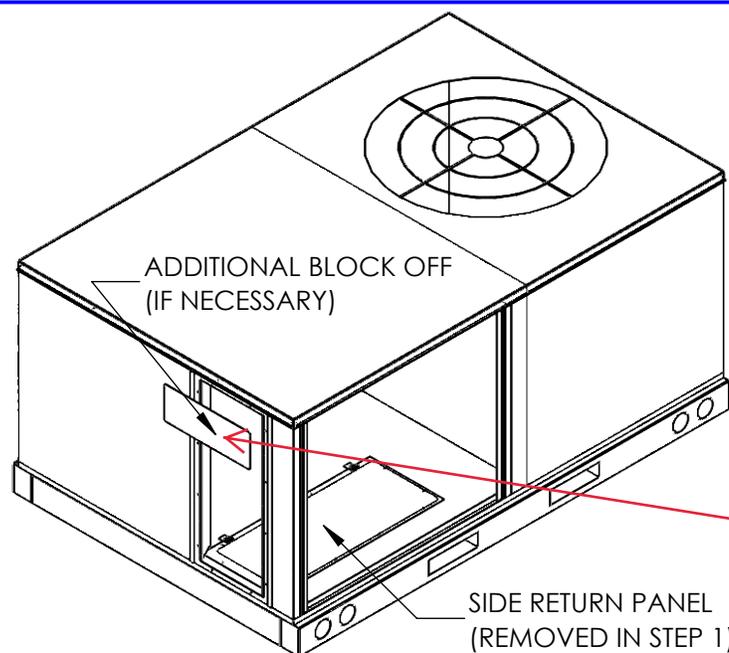
STEP 3: BLOCK OFFS

INSTALL SIDE RETURN PANEL (REMOVED FROM LEFT SIDE OF UNIT IN STEP 1) OVER THE UNIT BOTTOM RETURN OPENING AS SHOWN.

IF 10-12.5 TON UNIT IS BEING INSTALLED, AN ADDITIONAL BLOCK OFF IS REQUIRED AT THE TOP OF THE SIDE RETURN OPENING. INSTALL THE 5-1/4" X 14" PANEL AT TOP OF SIDE RETURN OPENING.

ADDITIONAL BLOCK OFF
(IF NECESSARY)

SIDE RETURN PANEL
(REMOVED IN STEP 1)

14"

(PART#1113944)

5 1/4"

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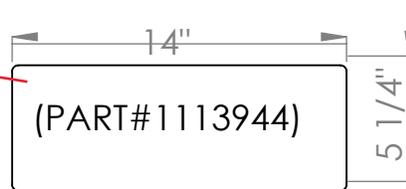
STEP 4A: STANDARD BAROMETRIC RELIEF BLADES

IF USING ULTRA LOW LEAK ECONOMIZER SKIP TO 4B

BAROMETRIC RELIEF BLADES ARE SHIPPED CONFIGURED FOR DOWNSHOT ECONOMIZERS. REPOSITION BLADES FOR HORIZONTAL APPLICATION.

i) FLATTEN TABS, REMOVE BLADES FROM ECONOMIZER, THEN CUT AT SLOTS.

FLATTEN TABS TO REMOVE FROM ECONOMIZER

CUT HERE
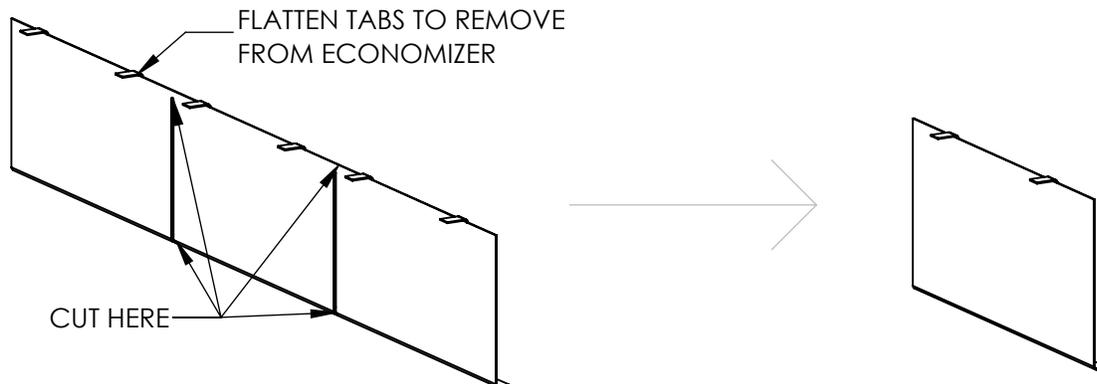
ii) ROTATE BLADES 90° AND PLACE IN ECONOMIZER AT SIX (6) LOCATIONS.

A
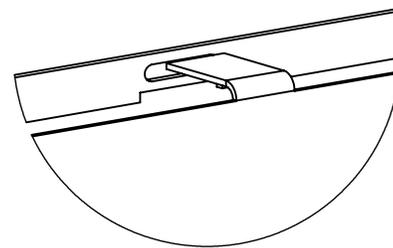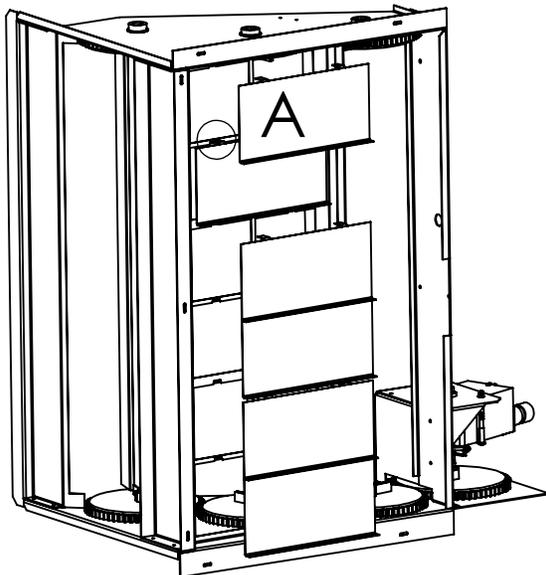
DETAIL A
SCALE 1 : 1

iii) BEND TABS BACK TO 45° TO HOLD IN ECONOMIZER AND ALLOW FOR OPENING

IMPORTANT
TABS MUST BE BENT BACK AS SHOWN OR THEY WILL
PREVENT DAMPER FROM OPENING

45°
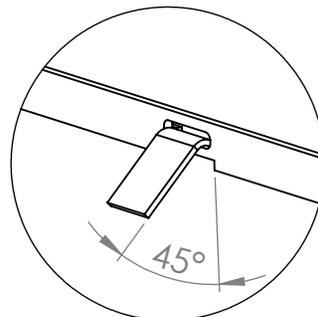
STEP 4B: ULTRA LOW LEAK BAROMETRIC RELIEF BLADES

IF AN ULTRA LOW LEAK ECONOMIZER IS USED REMOVE 2 DOWNSHOT BAROMETRIC RELIEF BLADES THEN INSTALL 3 (OR MORE DEPENDING ON ECONOMIZER SIZE) SIDE RETURN BAROMETRIC RELIEF BLADES AS SHOWN.

ECONOMIZER SIDE

CANE BOLT

BAROMETRIC RELIEF BLADE
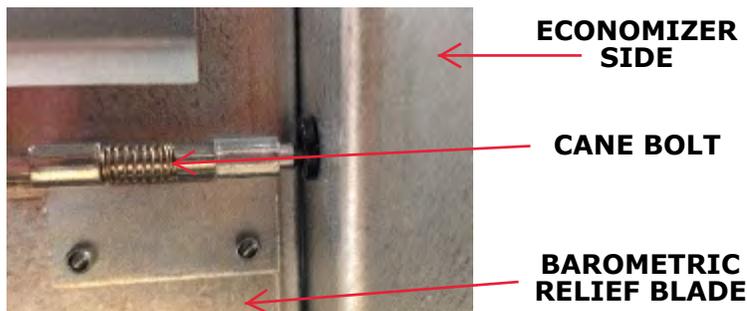
PULL CANE BOLT AWAY FROM ECONOMIZER WALL TO UNLATCH BLADE. THEN REMOVE BLADE.

DOWNSHOT OPERATION (AS SHIPPED)

REMOVE HERE

LARGE BLADE (1)

LARGE BLADE (2)

SIDE RETURN OPERATION

SMALL BLADE (1)

SMALL BLADE (2)

SMALL BLADE (3)

INSTALL HERE
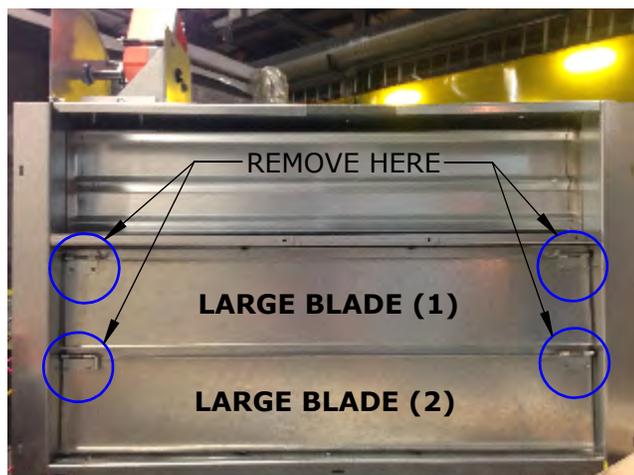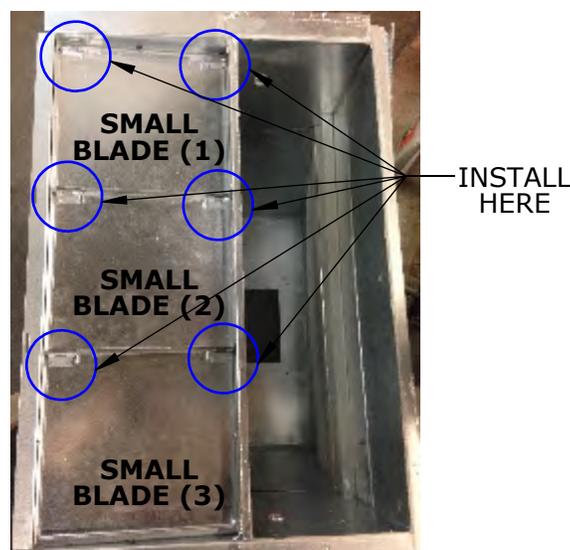
MORE BLADES MAY BE USED DEPENDING ON ECONOMIZER SIZE

STEP 5: WIRING HARNESS

- IN ECONOMIZER SECTION OF THE RTU LOCATE FACTORY WIRING HARNESS "PL-6" REMOVE FACTORY HARNESS JUMPER LABELED "PL6-R".

- (NOTE: SAVE JUMPER "PL6-R" FOR FUTURE USE IF ECONOMIZER NEEDS TO BE BYPASSED)

- SET ECONOMIZER LOOSELY IN CORNER OF UNIT SO THAT PLUG FROM ECONOMIZER REACHES UNIT HARNESS. CONNECT CAMBRIDGEPORT ECONOMIZER WIRING HARNESS TO THE UNIT WIRING HARNESS "PL-6".

PL6-R

PL6

PL6

PL6-R

FROM ECONO

PL6

PAGE 10

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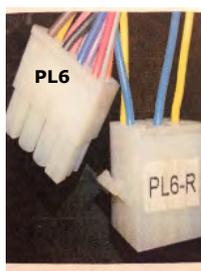
STEP 5B: CHECK ACTUATOR DRIVE DIRECTION

LOCATE WINDOW ON SIDE OF ACTUATOR BRACKET WHICH IS MOUNTED ON TOP OF DAMPER BLADE ASSEMBLY.

ENSURE BLACK SWITCH IS LOCATED IN THE COUNTERCLOCKWISE (POINTED UP) POSITION AS SHOWN HERE. IF SWITCH IS CLOCKWISE THEN FLIP SWITCH TO BE IN CCW POSITION.

WARNING: IF SWITCH IS NOT IN THE CORRECT POSITION THE ACTUATOR WILL DRIVE IN THE WRONG DIRECTION. CORRECT OPERATION BELOW: (10V DC = O/A FULL OPEN / 2V DC = O/A FULL CLOSED

STEP 6: ECONOMIZER INSTALL

INSTALL ECONOMIZER IN BOTTOM LEFT HAND SIDE OF UNIT AS SHOWN BELOW. ALLOW FLANGE ON PERIMETER OF ECONOMIZER TO REST OVER FLANGE IN UNIT.

MAKE SURE ECONOMIZER IS SQUARE TO WITHIN REQUIRED TOLERANCES(SEE BELOW). ATTACH ECONOMIZER TO UNIT USING (3) SCREWS ON LEFT HAND SIDE AND (2) SCREWS ALONG BOTTOM EDGE(SCREWS PROVIDED BY CAMBRIDGEPORT).

WARNING: PRE-DRILLED HOLES MAY NOT ALWAYS LINE UP WITH HOLES IN UNIT. KEEPING THE ECONOMIZER SQUARE IS OF UTMOST IMPORTANCE. DO NOT FORCE SCREWS INTO PRE-DRILLED HOLES AND COMPROMISE THE ECONOMIZERS POSITION. IF NECESSARY DRILL NEW HOLES.

ECONOMIZER MUST BE SQUARE TO PREVENT DAMAGE, DAMPER BINDING, AND ACHIEVE LEAKAGE REQUIREMENTS

SQUARENESS TOLERANCE:

STD LOW LEAK	+/- 1/16"	(D1 = D2 +/- 1/8")
ULTRA LOW LEAK	+/- 1/32"	(D1 = D2 +/-1/16")

ISO VIEW

FRONT VIEW

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CARRIER 3-12.5 TON UNIT

BLOCK OFF
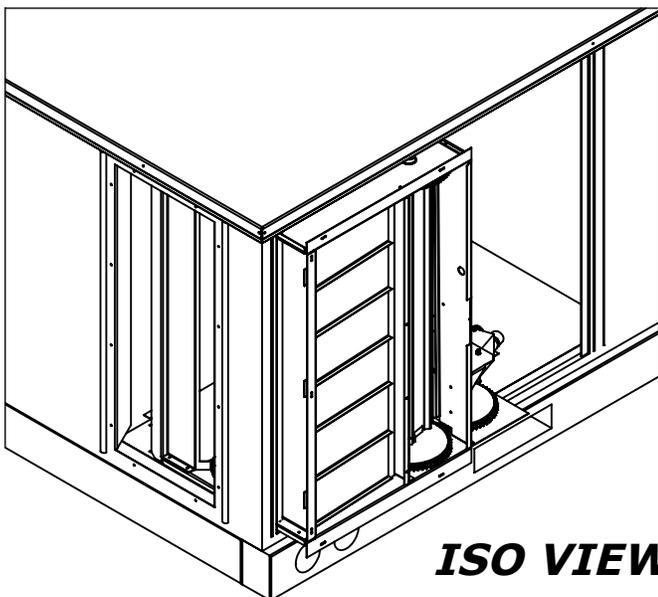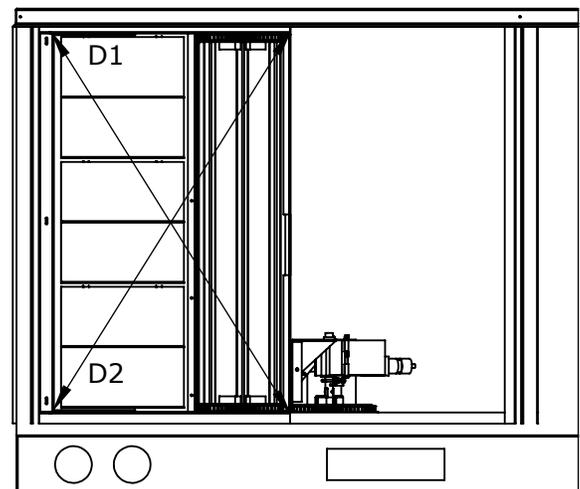
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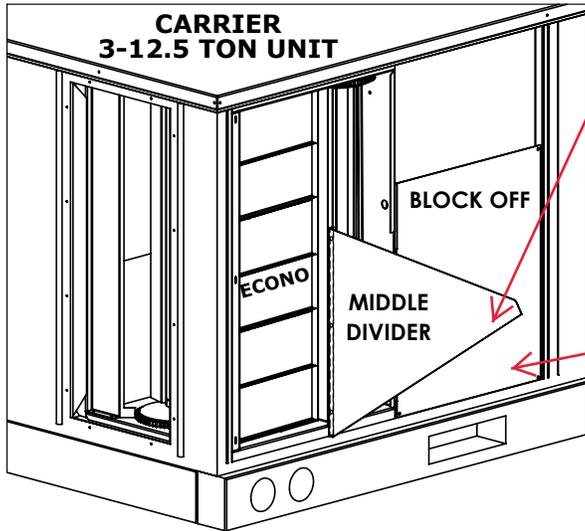
MIDDLE DIVIDER

STEP 8: MIDDLE DIVIDER

INSTALL MIDDLE DIVIDER FOR HOOD DIRECTLY TO FLANGE IN CENTER OF ECONOMIZER AS SHOWN. PART NUMBER WILL VARY BASED ON UNIT SIZE:
3-6 TON PART#1177901
7.5-12.5 TON PART#1175040
12.5 H.E. & 15 TON PART# 1183893

STEP 8 (B): BLOCK OFF PANEL

FIND APPROPRIATE BLOCK OFF PANEL AND INSTALL OVER OPEN AREA TO THE RIGHT OF MIDDLE DIVIDER AS SHOWN. 3-6 TON PART#1104295
7.5-12.5 TON STD PART#1113945
(SEE BELOW FOR 12.5 H.E. & 15 TON)

BLOCK OFF PANELS FOR 12.5 H.E.& 15 TON UNITS

ARRANGE FIVE (5) PANELS TO THE RIGHT OF THE ECONOMIZER AS SHOWN BELOW:

UNIT FILTER ACCESS PANEL WILL COVER THIS SECTION. CONVERTIBLE ECONOMIZER HAS A SLIGHT CAPACITY REDUCTION DUE TO THIS PANEL.

CARRIER 12.5 [HIGH EFF] & 15 TON UNIT

ECONO

9-7/8" X 23-1/8" [QTY2] -PART# 1147672

7" X 32-3/8" -   PART# 1147671

6-3/8" X 14"   -   PART#1147670

14" X 17-1/2" -   PART#1147673
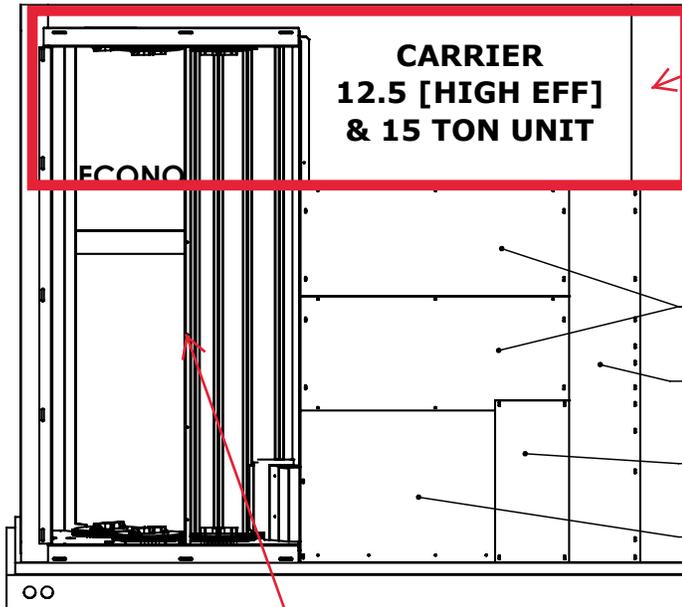
MIDDLE DIVIDER LOCATION

STEP 9: SAFING

IF OPERATING A 12.5 [HIGH EFF] OR 15 TON UNIT SAFING MUST BE INSTALLED IN SIDE RETURN AIR OPENING FOR PROPER AIRFLOW.

PART#1147487

ASSEMBLE SAFING AS SHOWN WITH CAS PROVIDED TEK SCREWS. USE TWO SCREWS PER CORNER AND SLIDE ASSEMBLY INTO SIDE RETURN OPENING IN UNIT.

PART#1147485

PART# 1147486

CARRIER 12.5 [HIGH EFF],15 TON UNIT

PART# 1147484
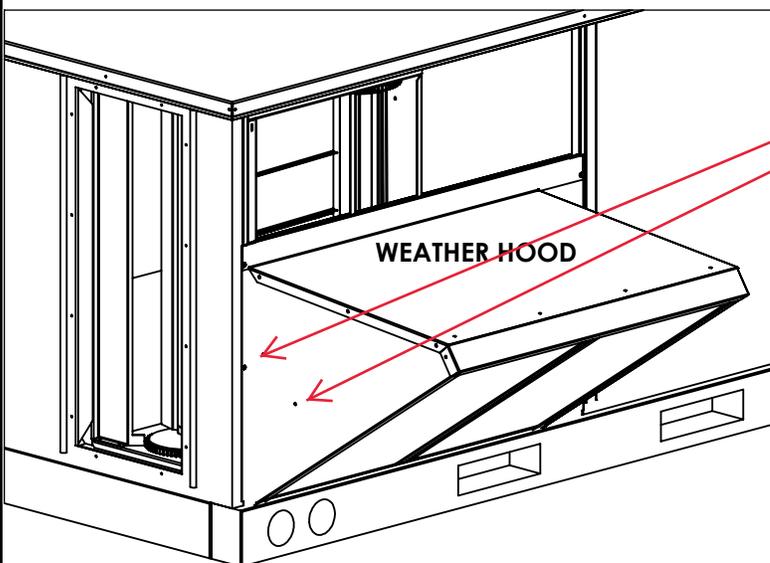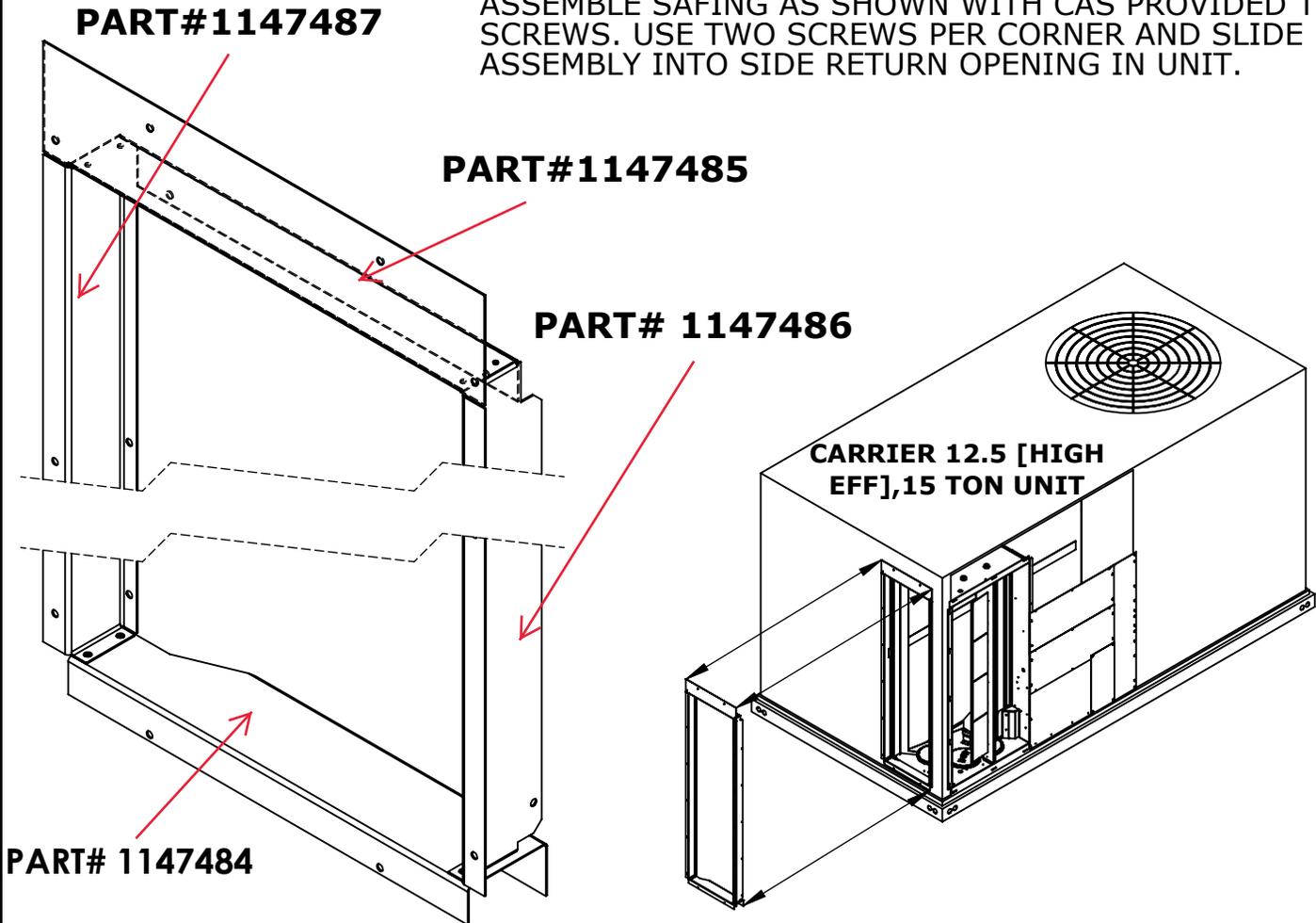
STEP 10: WEATHER HOOD
IMPORTANT
REMOVE 2 SCREWS ON EACH SIDE OF THE ECONOMIZER TO REMOVE THE HORIZONTAL DIVIDER BAFFLE. DISCARD THIS BAFFLE AS IT IS ONLY USED FOR DOWNSHOT APPLICATIONS.

WEATHER HOOD

INSTALL WEATHER HOOD SO THAT THE VERTICAL FLANGES SIT IN GROOVES ON THE RTU. HOOD WILL SIT OVER DIVIDER INSTALLED IN STEP 8. SECURE WITH SCREWS REMOVED FROM BLOCK OFF PANEL IN STEP 1.

PAGE 13

i. LOOSEN [4/5] SCREWS AND REMOVE FILTER CAP.

ii.PUT FILTERS TOGETHER AND CAP TOP/BOTTOM WITH FILTER CLIPS.

iii.   SLIDE ADJOINED FILTERS DOWN FILTER TRACKS LOCATED ON EITHER SIDE OF WEATHER HOOD.

iv.   SLIDE FILTER CAP UNDER HOOD ROOF BUT ENSURE SIDE FLANGES CAP OVER OUTSIDE OF WALLS (SEE "ASSEMBLED VIEW").

v.SLIDE FILTER CAP UP AS FAR AS POSSIBLE AND REATTACH AT [4/5] LOCATIONS.

vi.   VERIFY FILTERS ARE SECURE AND ALL PARTS ARE ASSEMBLED CORRECTLY.

FILTER CAP

FILTERS

FILTER CLIPS

NOTE HOW FILTER CAP SLIDES UNDER TOP OF HOOD
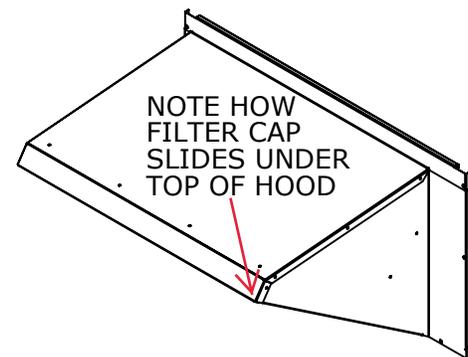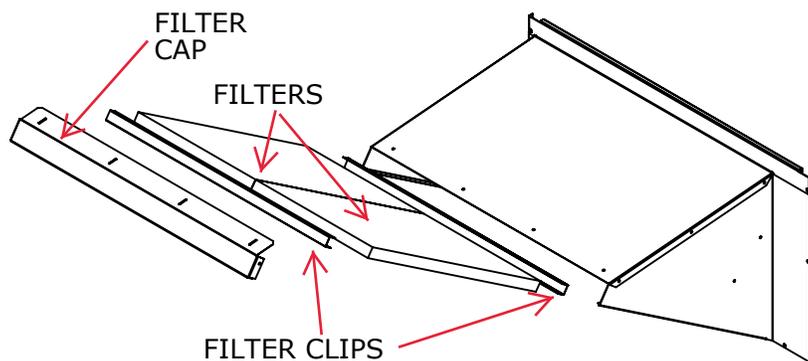
ASSEMBLED VIEW

STEP 12: FILTER ACCESS PANEL AND WIRING

REINSTALL FILTER ACCESS PANEL (REMOVED FROM STEP 1) ON TOP OF WEATHERHOOD.

FOLLOW INSTRUCTIONS FOR BELIMO WIRING AND SETUP ON PAGE [15].
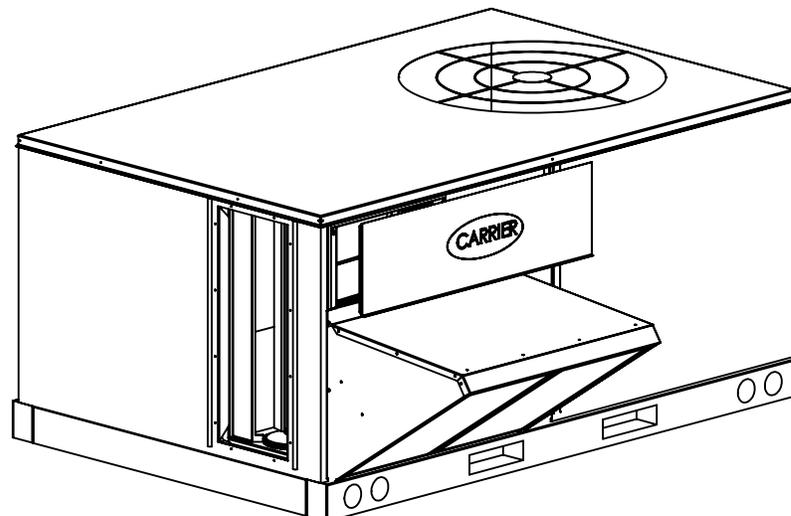
BELIMO ZIP CONTROLLER

WIRING INSTRUCTIONS

NOTE: 2 STAGE THERMOSTAT RECOMMENDED. IF USING SINGLE STAGE T-STAT MUST ADJUST CHANGEOVER TEMP FOR PROPER OPERATION.
ENERGY SAVINGS WILL BE REDUCED BY USING A SINGLE STAGE T-STAT ALSO MAY NO LONGER BE CODE COMPLIANT

LOOK HERE BEFORE CONTROLLER INSTALL !

IF YOUR RTU DOES NOT HAVE THIS BLUE CTB BOARD IN THE ELECTRICAL PANEL YOU WILL NEED TO CONFIRM IF YOU HAVE A RETROFIT ECONOMIZER BEFORE MOVING ON. SEE PARTS TABLE ON FRONT INSIDE COVER AND MATCH TO ECONOMIZER LABEL.
IF YOU HAVE THIS CTB BOARD IN UNIT ELECTRICAL PANEL CONTINUE TO NEXT PAGE.

NO CTB: IT'S OK!

(AFTER REFERENCING PART TABLE ON INSIDE COVER SEE BELOW)
IF YOU HAVE A RETROFIT ECONOMIZER PLUG ECONOMIZER HARNESS INTO PL6 UNIT HARNESS IN FILTER SECTION; THEN CONTINUE TO PAGE 19 FOR SETUP.
IF YOU HAVE A STANDARD ECONOMIZER CONTINUE TO PAGE 25 FOR RE-WIRE INSTRUCTIONS

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STEP 1: MOUNT CONTROLLER

MOUNT BELIMO ZIP CONTROLLER INSIDE ELECTRICAL PANEL OF THE RTU USING SUPPLIED #10 SELF-TAPPING SCREWS.

CENTRAL TERMINAL BOARD (CTB)

ZIP MODULE
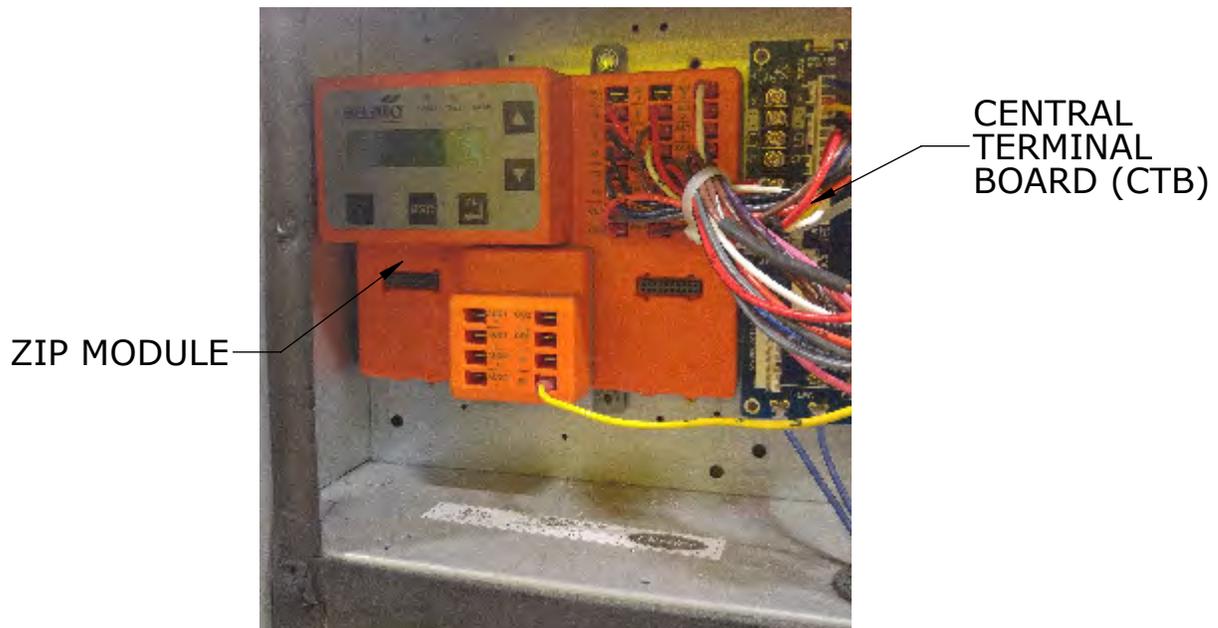
STEP 2: HARNESS

DISCONNECT FACTORY INSTALLED ECONOMIZER HARNESS FROM THE CENTRAL TERMINAL BOARD (CTB). CONNECT THE 10 PIN (7 WIRE) HARNESS FROM THE ZIP CONTROLLER TO THE CTB. ATTACH AT SAME LOCATION THAT PREVIOUS HARNESS WAS DISCONNECTED.

IMPORTANT: NOTE ORIENTATION OF NEW HARNESS!!!!!

BLUE

RED
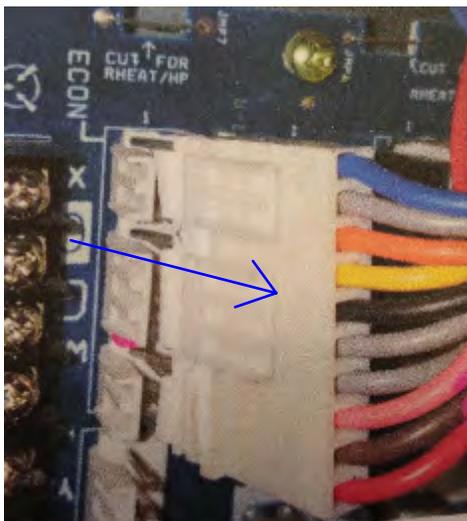
DISCONNECT FACTORY INSTALLED ECONOMIZER HARNESS

CONNECT 10-PIN 7-WIRE HARNESS FROM ZIP MODULE IN ORIENTATION SHOWN

STEP 3: HARNESS

CONNECT THE 10-PIN (10-WIRE) HARNESS FROM ZIP CONTROLLER TO THE FACTORY ECONOMIZER HARNESS THAT WAS DISCONNECTED FROM CTB IN BEGINNING OF STEP 2.

NOTE ORIENTATION OF PLUGS!!!

RED

FROM ZIP
CONTROLLER

BLUE

FROM UNIT
(REMOVED IN STEP 2)
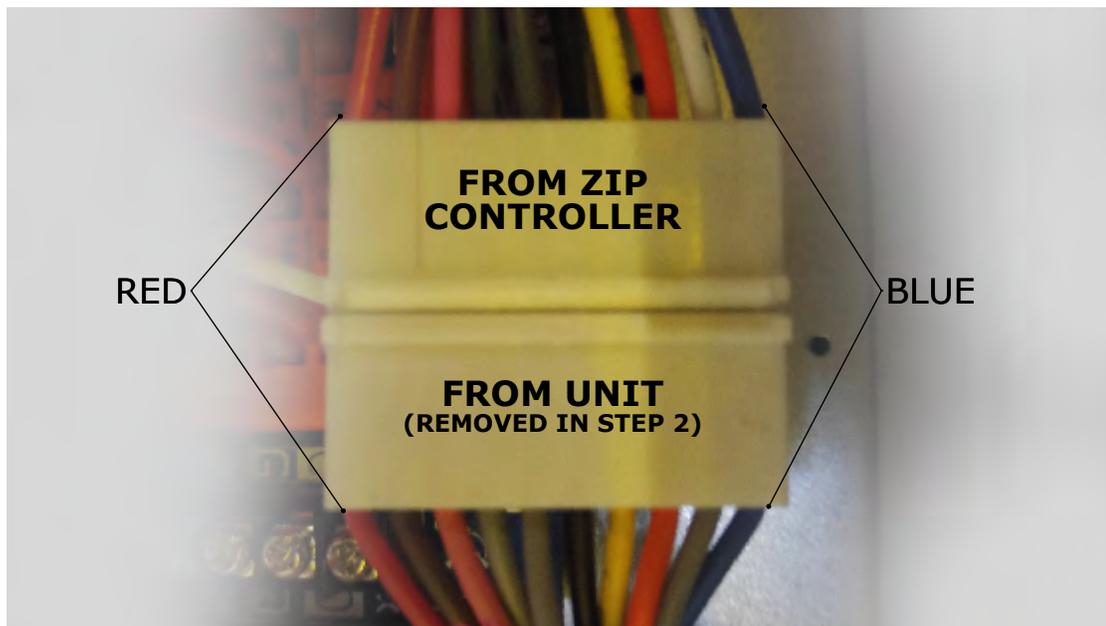
STEP 4: WHITE WIRE

CONNECT END OF WHITE WIRE LABELED "W1" HANGING FROM ZIP MODULE TO "W1" TERMINAL ON CTB.

NOTE: 10-PIN PLUG INSTALLED IN STEP 2 NOT SHOWN FOR CLARITY

CENTRAL TERMINAL BOARD (CTB)

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STEP 5: SENSOR WIRING

LOCATE 4 LONG WIRES RUNNING FROM ZIP MODULE THAT ARE ZIP TIED TOGETHER. (ORANGE SAT-, BROWN SAT+, PURPLE OAT+, PINK OAT-). RUN ALL WIRES THROUGH AHU WALL KNOCKOUT.

CONTROL
PANELS
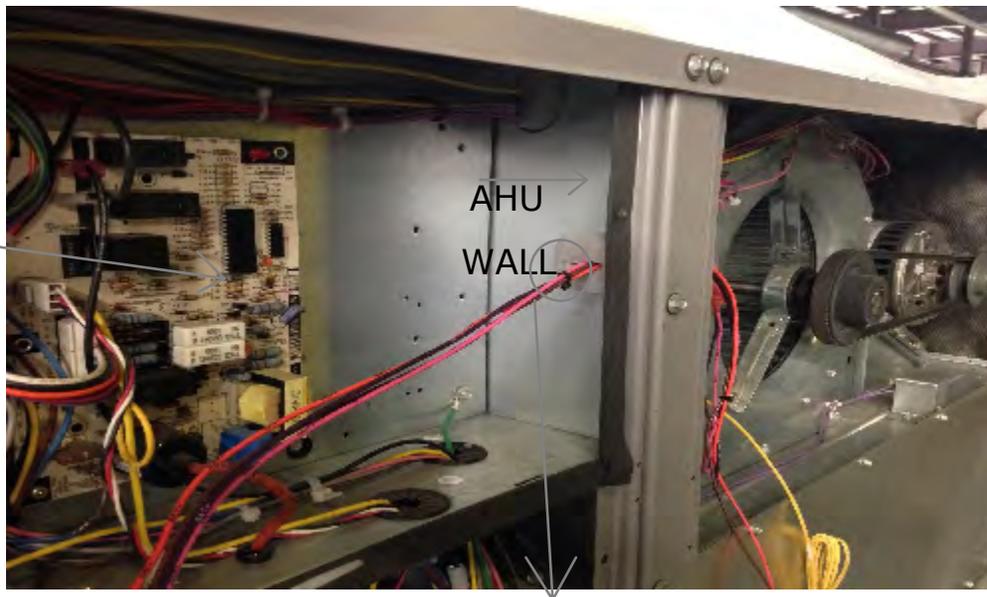
AHU
WALL
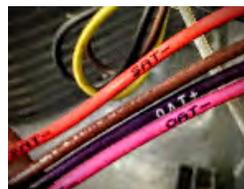
WIRE BUNDLE

STEP 6: SENSOR WIRING CONNECTIONS

INSTALL SUPPLY AIR SENSOR, (FOUND IN HARDWARE BAG) INTO PRE DRILLED HOLE ON FAN HOUSING. ATTACH SENSOR TO HOUSING USING 2 PROVIDED SCREWS

ATTACH 4 LONG WIRES FROM CONTROLLER THAT WERE PULLED INTO THE FAN SECTION IN THE PREVIOUS STEP: AS SHOWN BELOW

FAN SECTION OF UNIT

ATTACH PURPLE(OAT+)
ATTACH PINK (OAT-)
TO EXISTING PURPLE & PINK WIRES
IN FAN SECTION WIRING BUNDLE

ATTACH BROWN (SAT+)
ATTACH ORANGE (SAT-)
TO SUPPLY AIR SENSOR
(POLARITY INSENSITIVE)

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SETUP IS REQUIRED FOR ECONOMIZER OPERATION

STEP 7: BELIMO ZIP CONTROLLER SETUP

ENTER YOUR ZIP CODE TO AUTOMATICALLY SET YOUR CHANGEOVER SET POINT BASED ON ASHRAE RECOMMENDATIONS

PRESS OK

PRESS OK

PRESS "OK" AND FIRST NUMBER SHOULD START TO FLASH. USE UP/DN TO CHANGE NUMBER PRESS "OK" TO SELECT NUMBER

MAKE SURE ZIP CODE IS NOT FLASHING. IF IT IS, PRESS OK ONE MORE TIME TO MAKE NUMBERS SOLID. NOW PRESS ESC ONCE

PRESS THE DOWN ARROW UNTIL YOU GET TO THE VENT MIN POS MENU. NOW PRESS OK AND THE % WILL BEGING TO FLASH. USE UP ARROW AND SET YOUR MIN. O/A % THEN PRESS OK

YOU SHOULD SEE A SETUP COMPLETE MESSAGE AT THIS POINT. THEN DAMPER SCALING. IF YOU DID NOT SEE SETUP COMPLETE THE CONTROL IS NOT READY FOR OPERATION AND SOMETHING ELSE IS HOLDING YOU OUT. PLEASE CONTACT CAMBRIDGEPORT FOR MORE INFO OR SEE BELOW.

POSSIBLE ISSUES PREVENTING SETUP COMPLETION

1) DO YOU HAVE A CO2 SENSOR OR POWER EXHAUST THAT NEEDS TO BE SET UP
2) IS A PRESSURE SWITCH OR OTHER SAFETY ON YOUR COMPRESSOR OPEN
3) IF YOU HAVE A HEAT PUMP ADDITIONAL SET UP IS REQUIRED
4) YOU MUST HAVE A COMPRESSOR, A SUPPLY AIR SENSOR, AND AN OUTSIDE AIR SENSOR INSTALLED

STEP 8 (FOR DUAL ENTHALPY APPLICATIONS ONLY!)

IF YOU DID NOT PURCHASE A SECOND ENTHALPY SENSOR FOR THE RETURN AIR SKIP THIS STEP!
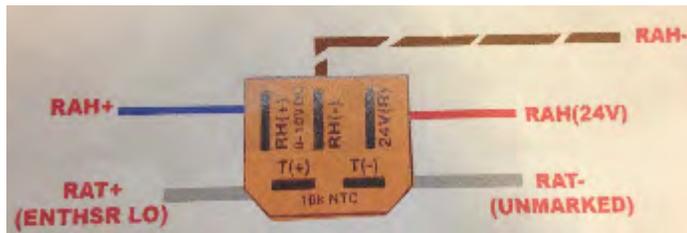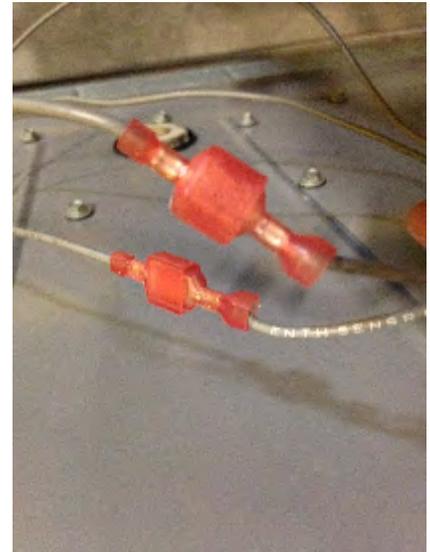
DISCONNECT TWO GREY WIRES IN FILTER SECTION OF THE RTU. THESE WIRES ARE LOCATED IN THE FACTORY WIRING BUNDLE ("PL-6"). ONE IS LABELED ENTH SENSR"AND THE OTHER IS UNLABELED. ONCE REMOVED CONNECT FEMALE ENDS TO R/A SENSOR AS SHOWN ABOVE

STEP 9: ADDITIONAL SETUP (IF REQUIRED)

A)POWER EXHAUST SETUP

LOCATE YELLOW WIRE LABELED "EX" AND BLACK COMMON WIRE FROM ECONOMIZER WIRING HARNESS. CONNECT BOTH WIRES TO POWER EXHAUST CONTACTOR COIL.

IN THE SETTINGS MENU SCROLL DOWN TO THE DEVICES 1 MENU AND PRESS OK. NEXT SCROLL DOWN TO EXHAUST FAN AND PRESS OK. NOW SET EXHAUST FAN TO INSTALLED USING DN ARROW. THEN PRESS OK. LASTLY PRESS ESC TO GET BACK TO SETTINGS.

IN THE SETTINGS MENU SCROLL DOWN TO EX FAN ON POS AND SET THE PERCENTAGE OF O/A THE POWER EXHAUST WILL COME ON AT

B) HEAT PUMP SETUP

NOTE: AFTER SETTING MINIMUM DAMPER POSITION ALARM LIGHT WILL BE ON

RETURN TO SETTINGS MENU
SCROLL UP TO "HEAT PUMP OP"
PRESS "OK"
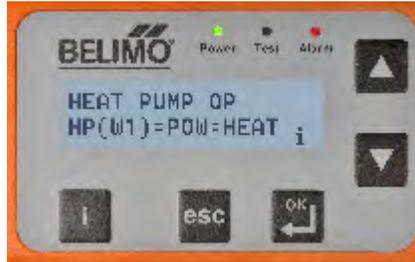
USING "UP" AND "DN" ARROWS
SET EITHER [B],[O], OR [W1]
PRESS "OK"

PRESS "DN" ONCE TO "NO
COMPRESSOR DETECTED"
SCREEN. PRESS "OK"

CHOOSE APPROPRIATE
COMPRESSOR QTY AND
SELECT "OK"

C) CO2 (DCV) SETUP
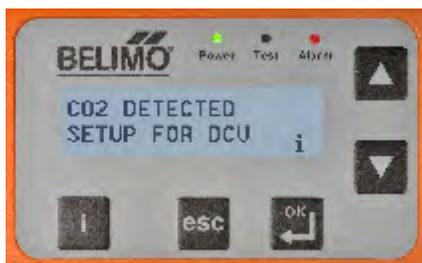
ENTER SETTINGS MENU
UNIT WILL DETECT CO2
SENSOR. SELECT "OK"

SET MINIMUM O/A %
WHEN CO2 LEVELS
ARE BELOW
SETPOINT (EX. 5%)

SET CO2 SETPOINT FOR THE
SPACE (EX. 1000 PPM)

**OPERATION: OUTSIDE AIR DAMPER WILL
MODULATE BETWEEN DCV MIN (MINIMUM)
AND VENT MIN(MAXIMUM) TO KEEP SPACE
CO2 LEVELS BELOW SETPOINT**

GO BACK TO VENT MIN POS FROM EARLIER IN THE
SETUP. THIS WILL BE YOUR O/A MAX % WHEN CO2
LEVELS ARE ABOVE SET POINT (EX. 45%)

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D) 2-SPEED FAN ADDITION

IF A 2-SPEED FAN/VFD IS BEING USED:

RETURN TO "SETTINGS" MAIN MENU SCREEN

SCROLL "UP"/"DN" TO ARRIVE AT "2 SPEED FAN"

PRESS "OK"

PRESS "OK" AGAIN AND SELECT "UP"/"DN" FOLLOWED BY "OK"
TO TURN 2 SPEED FAN SETTINGS ON

<u>I) LOW SPEED VENT MIN</u>

SCROLL "DN" TO "LOW SP VENT MIN" SCREEN AND PRESS "OK" TO ENTER LOW SPEED
VENT MINIMUM POSITION. THIS VALUE WILL BE GREATER THAN THE VENT MINIMUM
POS, HOWEVER EQUAL THE SAME AIRFLOW RATE VALUE.

<u>II) LOW SPEED DCV MIN (C02 SENSOR INSTALLED)</u>

SCROLL "DN" TO "LOW SP DCV MIN POS". PRESS "OK" AND ENTER LOW SPEED DCV
MINIMUM POSITION. THIS POSITION WILL BE GREATER THAN DCV MIN POS, HOWEVER
EQUAL THE SAME MEASURED AIRFLOW RATE VALUE.

<u>III) LOW EXHAUST FAN POSITION (POWER EXHAUST INSTALLED)</u>

SCROLL "DN" TO "LOW EXH FAN POS". PRESS "OK" AND ENTER LOW EXHAUST FAN ON
POSITION. THIS POSITION WILL BE GREATER THAN EXHAUST FAN ON POS, HOWEVER
EQUAL THE SAME AIRFLOW RATE VALUE.

**THESE VALUES SHOULD BE SET TO PROVIDE THE SAME AIRFLOW OF OUTSIDE
AIR (OA) AND EXHAUST AS WHEN FAN IS OPERATING AT FULL SPEED. DUE TO
LESS PRESSURE GENERATED BY THE FAN, THIS VALUE IS TYPICALLY A HIGHER
PERCENTAGE OPEN VALUE.**

SERVICE AND COMMISSIONING MUST BE PERFORMED AFTER INITIAL ECONOMIZER SET-UP IS COMPLETED. THIS ACCEPTANCE TEST IS MANDATED TO VALIDATE ECONOMIZER FUNCTIONALITY AND COMPONENT WARRANTY

IMPORTANT
UNIT INDOOR FAN MUST BE RUNNING DURING THIS TEST TO PREVENT COMPRESSOR DAMAGE! EITHER JUMP OUT FAN AT UNIT TERMINAL STRIP OR SET FAN TO "ON" VIA THERMOSTAT
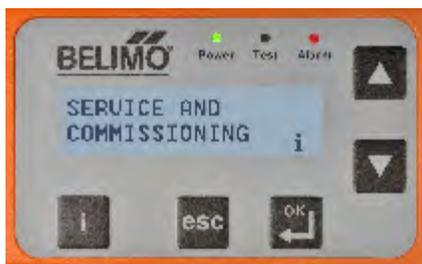
PRESS DN TILL AT THIS SCREEN AND PRESS "OK"

PRESS DN AT MANUAL MODE TO GET TO THIS SCREEN

PRESS "OK" HERE THEN "OK" AGAIN TO START

FOLLOW PROMPTS TO COMPLETE TEST...YOU MUST CONFIRM AS PROMPTED BY PRESSING "OK" WHEN:

1) THE ECONOMIZER DAMPER FULLY OPENS
2) DAMPER STAYS OPEN AND 1ST STAGE COMPRESSOR STARTS AND RUNS IN INTEGRATED MODE
3) DAMPER FULLY CLOSES
4) DAMPER GOES TO MINIMUM
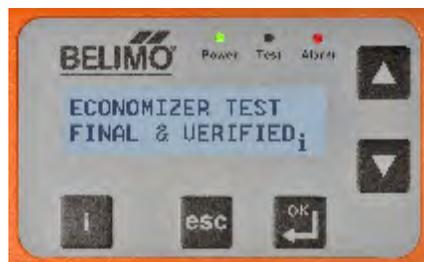
PRESS "OK"

PRESS "OK"

CAS PART #9800238
STANDARD 7-WIRE HARNESS
DETAIL 1

TO W1 ON UNIT CTB — WHITE WIRE

Act 1 Act 2 Act 3
R R Act 5
C C SAT +
G W1 SAT -
Y1 RAT + OAT +
Y2 RAT - OAT -
CC1 RAH + OAH +
CC2 RAH - OAH -

SAT +
SAT -
PLUG INTO SUPPLY AIR SENSOR MOUNTED IN FAN HOUSING

OAT +
OAT -
PLUG INTO OUTSIDE AIR SENSOR WIRES SUPPLIED ON FACTORY HARNESS IN UNIT FAN COMPARTMENT

REMOVE FACTORY SUPPLIED PLUG FROM ECON SLOT ON UNIT CTB AND REPLACE WITH THIS PLUG

10
9
8
7
6
5
4
3
2
1
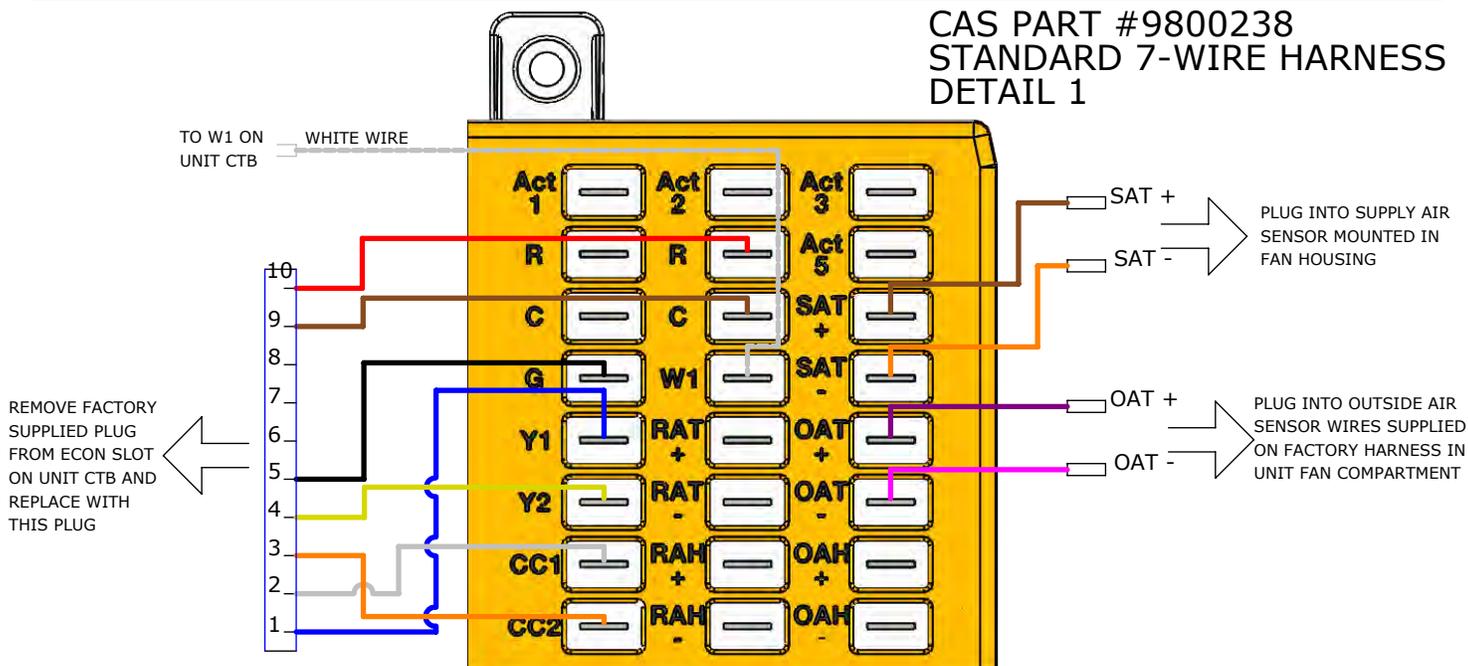
CAS PART #9800238
STANDARD 10-WIRE HARNESS
DETAIL 2

WHITE WIRE

BLUE

Test Alarm

Act 1 Act 2 Act 3
R R Act 5
C C SAT +
G W1 SAT -
Y1 RAT + OAT +
Y2 RAT - OAT -
CC1 RAH + OAH +
CC2 RAH - OAH -

AUX1 + CO2 +
AUX1 - CO2 -
AUX2 + IF
AUX2 - EF

ALM ALM

10
9
8
7
6
5
4
3
2
1

PLUG INTO FACTORY SUPPLIED HARNESS THAT WAS REMOVED FROM ECON SLOT ON UNIT CTB

NOTE THAT THE ORIENTATION OF THE PLUGS MATCH WIRE COLORS

RED

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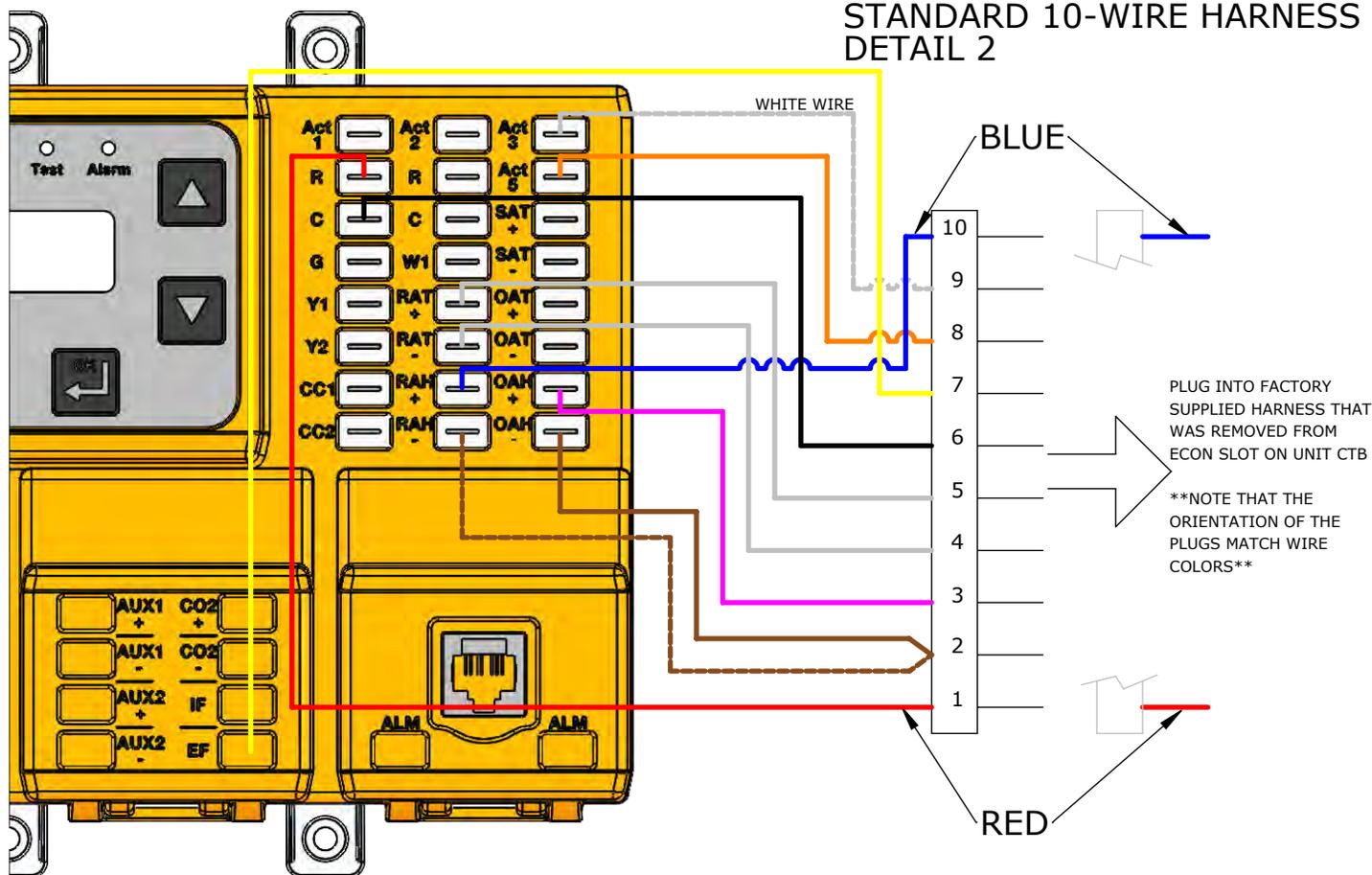
- **TWO 10-PIN HARNESSES PROVIDED WITH ZIP CONTROL WILL NOT BE USED IN THIS APPLICATION**
- **ZIP CONTROL MUST BE MOUNTED IN ECONOMIZER SECTION FOR THIS APPLICATION**
- **IF CAS PART #9800296 (SEPARATE RETROFIT HARNESS) WAS ORDERED BY DISTRIBUTOR SEE PAGE 26 FOR WIRING DIAGRAM**

REMOVE ALL WIRES FROM THE BELIMO ZIP CONTROL.
LOCATE WIRING HARNESS INCLUDED WITH ECONOMIZER (12-PIN CONNECTOR).
WORK WITH ECONOMIZER HARNESS (<u>NOT UNIT HARNESS!</u>)

WHEN CUTTING WIRES DO NOT
CUT FLUSH WITH PLUG. LEAVE 3-4"
OF WIRE EXTENDING FROM PLUG

<u>MODIFICATIONS TO STANDARD HARNESS</u>

1. CUT AND CAP OFF TWO RED WIRES AND ATTACH THIRD TO EITHER "R" TERMINAL ON ZIP CONTROLLER
2. ATTACH BLUE WIRE TO "Y1"
3. CUT AND CAP OFF ONE BLACK WIRE AND ATTACH SECOND TO "G"
4. CUT AND CAP OFF BROWN WIRE AND ATTACH BROWN/WHITE WIRE TO EITHER "C" TERMINAL ON ZIP CONTROLLER
5. ATTACH WHITE WIRE TO "CC1"
6. ATTACH PURPLE WIRE TO "SAT-"
7. ATTACH PINK/WHITE WIRE TO "SAT+"
8. ATTACH YELLOW WIRE TO "Y2"
9. ATTACH ORANGE WIRE TO "CC2"
10. N/A
11. N/A
12. CUT AND CAP OFF PINK WIRE
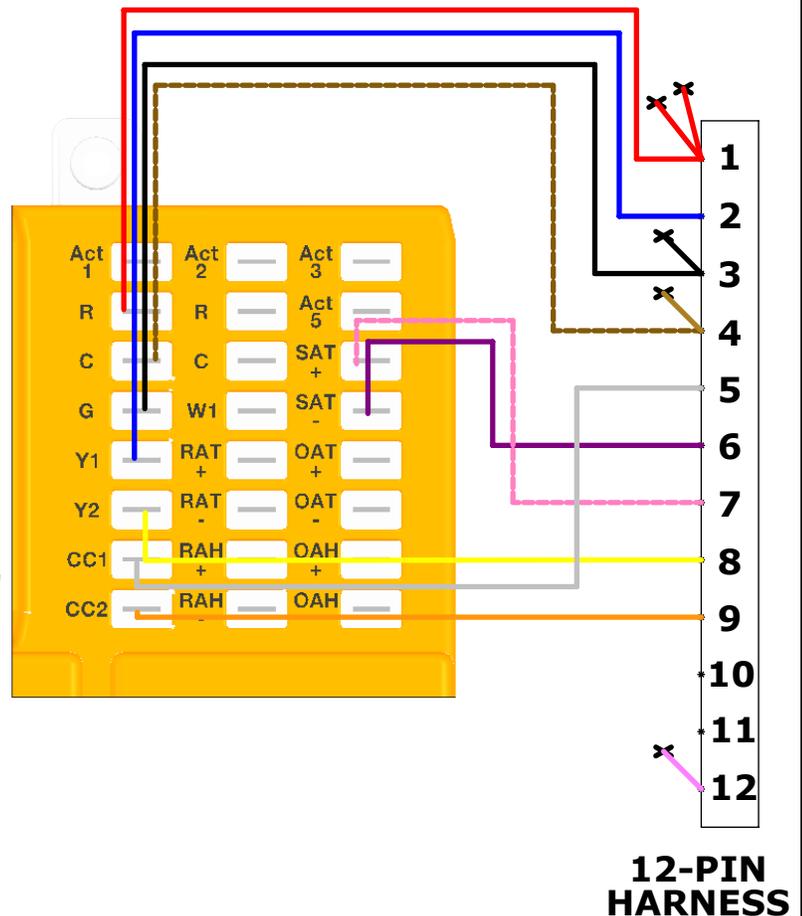
12-PIN HARNESS

CONNECT 12-PIN ECONOMIZER HARNESS TO UNIT HARNESS HANGING TO THE LEFT OF THE UNITS FILTERS. (MAKE SURE RED WIRES LINE UP FOR ORIENTATION OF HARNESS)

WIRE ENTHALPY SENSOR AND ACTUATOR AS SHOWN ON PAGE 27

REMOVE ALL WIRES FROM THE BELIMO ZIP CONTROL.

REMOVE ALL WIRES FROM ACTUATOR AND ENTHALPY SENSOR.

THE (2) 10 PIN PLUGS, (1) 12 PIN PLUG, AND 60" LONG HARNESS <u>ARE NOT REQUIRED</u> AND WILL BE REPLACED AS INDICATED BELOW.

CAS PART NUMBER 9800296 RETROFIT HARNESS
(SOLD SEPARATELY)
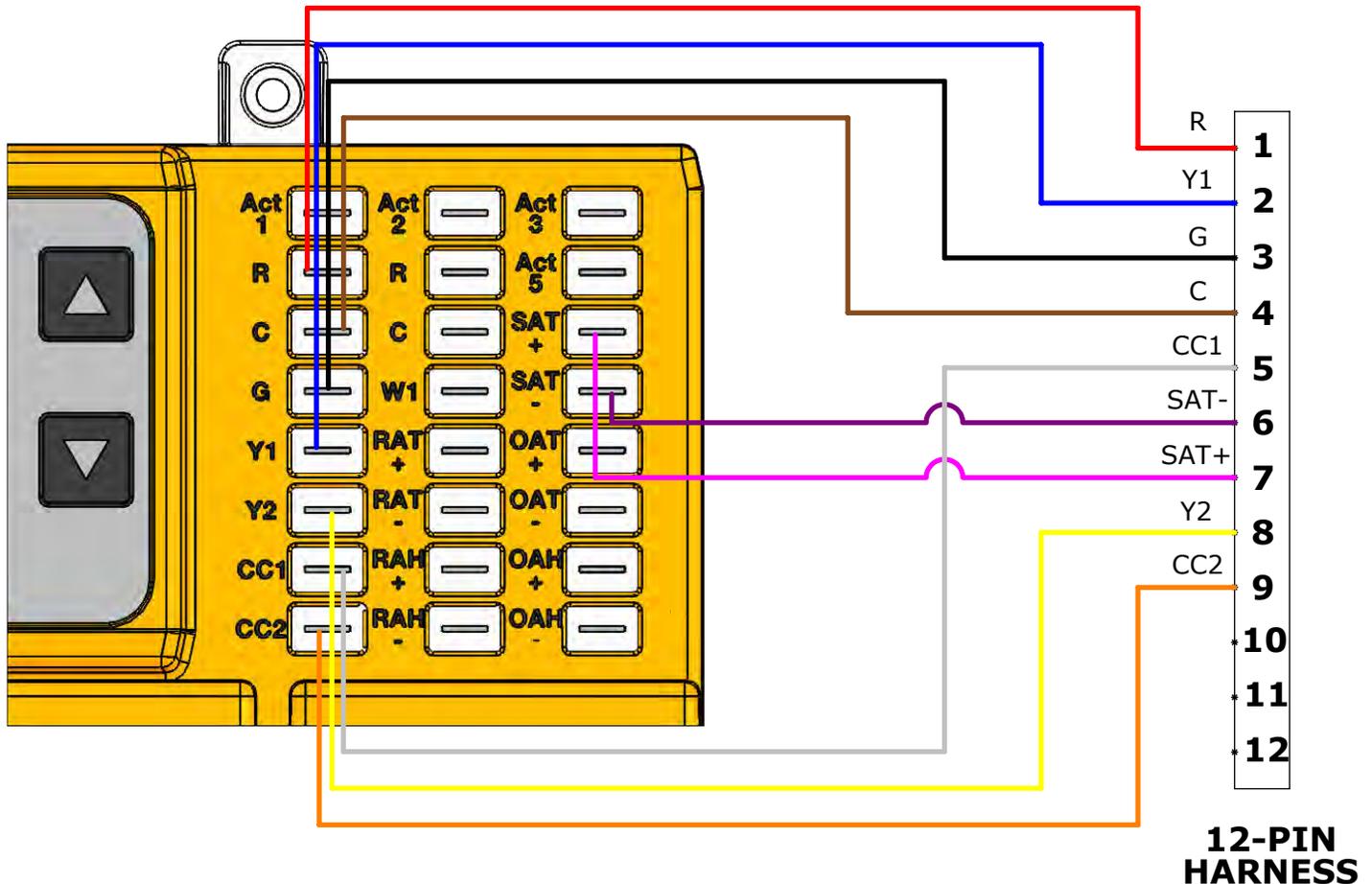
12-PIN HARNESS

CONNECT 12-PIN ECONOMIZER HARNESS TO UNIT PL-6 HARNESS (SEE PG 5/10) HANGING TO THE LEFT OF THE UNITS FILTERS. (MAKE SURE RED WIRES LINE UP FOR ORIENTATION OF HARNESS)

WIRE ENTHALPY SENSOR AND ACTUATOR AS SHOWN ON PAGE 27

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ACTUATOR AND ENTHALPY SENSOR WIRING ON ALL UNITS WITHOUT CTB

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ACT 1 — 1 - COMMON
ACT 2 — 2 + HOT
ACT 3 — 3 Y INPUT 2-10V
ACT 5 — 5 U OUTPUT 2-10V

ACTUATOR

WHITE WIRE CONNECT TO "W1" ON TERMINAL STRIP

OAT + — T+
OAT - — T-
OAH + — RH+
OAH - — RH-
R — 24V (R)

OUTSIDE AIR ENTHALPY
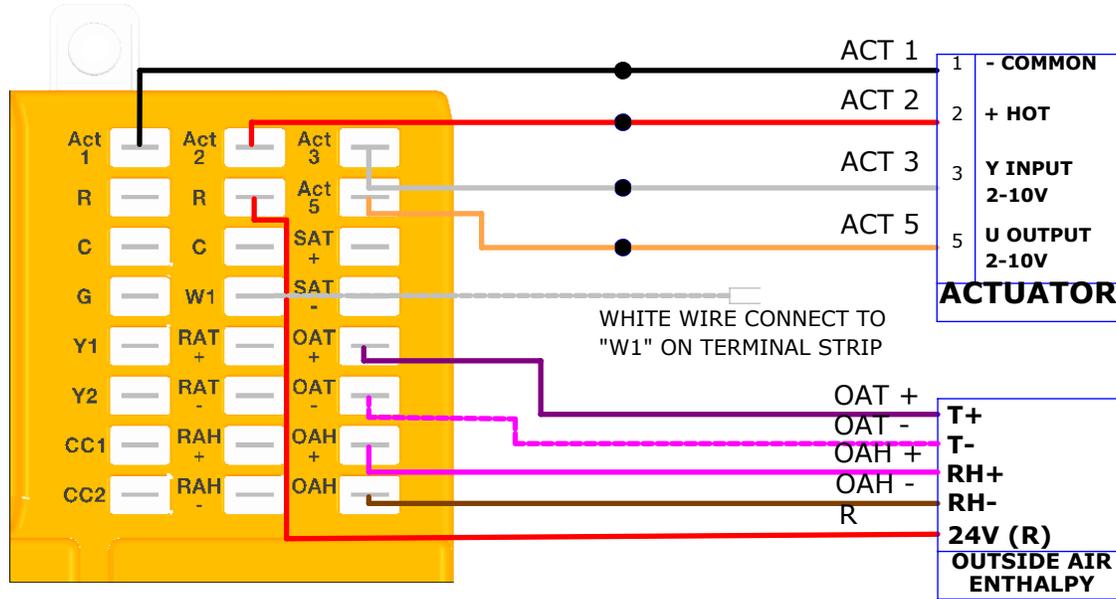
A.) MOUNT THE BELIMO ZIP CONTROLLER TO THE TOP SHELF OF THE ECONOMIZER. ENSURE THAT THE CONTROL AND THE WIRES ARE NOT INTERFERING WITH THE ECONOMIZER OPERATION.

B.) CONNECT WHITE WIRE FROM "W1" TERMINAL ON LOW VOLTAGE STRIP IN UNIT ELECTRICAL PANEL TO "W1" TERMINAL ON THE ZIP CONTROL

C.) DRILL HOLE IN FAN HOUSING FOR THE SUPPLY AIR SENSOR. MAKE SURE SENSOR DOES NOT HIT FAN WHEEL. (SEE PICTURE)

D.) CONNECT SUPPLY AIR SENSOR TO THE PINK AND PURPLE WIRES HANGING IN THE FAN SECTION (POLARITY INSENSITIVE) WHERE THE OLD MIXED AIR SENSOR WAS CONNECTED. YOU MAY NEED TO USE WIRE NUTS... INSTALL SENSOR IN PREVIOUSLY DRILLED HOLE AND SECURE WITH TWO SCREWS

IF NECESSARY CONNECT ENDS OF TWO SIMILAR WIRE CONNECTIONS WITH WIRE NUT

HOLE IN FAN SECTION FOR SA SENSOR
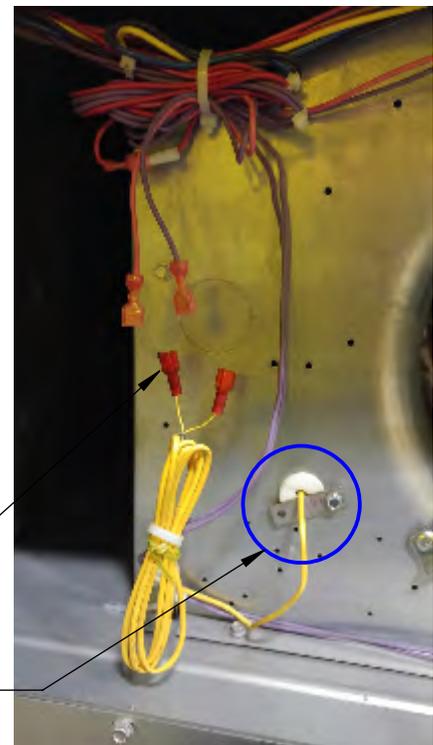
RETURN TO PAGE 19 FOR BELIMO ZIP CONTROLLER SETUP

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Sequence of Operation

States

Virgin State

The ZIP Economizer comes shipped from the factory in this state. "Setup Incomplete" will be displayed. No control will occur until setup is completed.

Automatic State – all of the following strategies and operational modes are available in this state.

A minimum of two pieces of information (in level 2 Settings menu) must be entered before the ZIP Economizer will go into Automatic State:

- The appropriate ZIP code must be entered.
- The minimum damper position setpoint (Vent Min Pos) percentage must be entered.

When in Automatic State, the G input terminal is used to monitor a remote occupancy contact, time clock and/or indoor fan signal. When the G terminal is energized, the ZIP Economizer will operate in Occupied (damper will move to the proper ventilation position). Otherwise, the ZIP Economizer will operate in Unoccupied.

Strategies

Compressor Protection and Energy Savings

DXLL (Supply Air Low Temperature Protection in Mechanical Cooling)

This strategy is activated automatically when in Mechanical Cooling Mode depending on supply air temperature. Timers, temperature dead bands and SAT Y2 Limit setting all interact with this strategy.

SAT < 45°F	All compressor stages disabled.
45 °F ≤ SAT < 47°F	Compressor stages may or may not be enabled based on whether or not SAT is rising or falling.
SAT ≥ 47°F and SAT Y2 Limit=Off	Both compressor stages enabled.
47°F ≤ SAT < 56.5°F and SAT Y2 Limit=On	1st stage compressor enabled. 2nd stage compressor disabled.
SAT ≥ 56.5°F	Both compressor stages enabled.

SAT Y2 Limit

This strategy inhibits the 2nd stage compressor from coming on prematurely based on SAT temperature and time.

- IF Y2 is energized

  AND Compressor 1 has been running for less than 4 minutes

  AND Supply Air Temp is less than or equal to its required setpoint + 1.5° (56.5°F)

  THEN Compressor 2 will not be allowed to come on

LCLO (Low Ambient Compressor Lockout)

This strategy inhibits compressor operation at low outdoor air temperatures.

- IF OAT falls below the low limit (50°F)

  AND not in Heat Pump Mode

  THEN Compressor 1 and Compressor 2 will be disabled.

- IF OAT rises 2°F above the low limit (52°F)

  OR in Heat Pump Mode

  THEN Compressor 1 and Compressor 2 will be enabled.

Minimum On and Minimum Off Time

This strategy prevents the compressors from "short-cycling".

- IF any Compressor is energized

  THEN run it at least 180 seconds EXCEPT when entering Brownout Mode when compressors will be shut off immediately.

- IF any Compressor is de-energized

  THEN keep it off for at least 180 seconds

Not Simultaneous ON/Not Simultaneous OFF

On RTUs with 2 compressors this strategy is used to prevent both compressors from coming on at the same instant to keep electrical demand down.

- Compressors 1, 2 are kept from switching on together by a 10 second time delay.
- If SAT Y2 Limit is set to "On" compressor 2 is delayed by 240 seconds to evaluate if the single compressor already operating can bring SAT less than or equal to setpoint +1.5 °F (56.5°F).
- Compressors 1, 2 are kept from switching off together by a 5 second time delay EXCEPT when entering Brownout when compressors will be shut off immediately.

Brownout Protection

Input power (24 VAC) is monitored.

- IF input voltage drops to 75%

  AND it stays below there for 30 seconds

  THEN Brownout will be enabled.

- IF input voltage rises to 85%

  AND it stays there for 300 seconds

  THEN Brownout will be disabled.

Under Brownout conditions the current operating mode will be maintained EXCEPT Mechanical Cooling and Integrated Cooling (where compressors are utilized).

Instead of Mechanical Cooling it will go to Ventilation, DCV or Unoccupied. Instead of Integrated Cooling it will go to Free Cooling.

This strategy prevents compressor operation during brownout conditions. Compressors will be turned off immediately (bypassing minimum on/off timers).

Random On Delay after Power Up

After a power blackout or any power restore, compressors will go through a random time delay before allowing them to operate. This random timer is between 30-180 seconds. This helps the electrical network to come back up without excessive demand from multiple RTUs and compressors coming back on after the blackout.

Freeze Protection

See Freeze Protection Mode of Operation below.

High Limit Changeover

(Four possibilities depending on installed sensors)

Note: Economizing is enabled based on one of the following and becomes active in Free Cooling and Integrated Cooling.

Single Dry Bulb Changeover

- If only an OAT sensor is connected, it will be analyzed against the reference Outdoor Air changeover temperature value (based on entered ZIP code).
  - IF OAT is 2°F below the reference value

    THEN economizing will be enabled.
  - IF OAT is above the reference value

    THEN economizing will be disabled.

Differential Dry Bulb Changeover

- Must have OAT and RAT sensors connected. OAT and RAT will be analyzed against each other and the OAT will be analyzed against the reference differential temperature high limit (based on entered ZIP code).
  - IF OAT is 2-8°F below the RAT (Value Climate Zone Dependent)

    AND OAT is 2°F below the reference differential temp high limit DTHL

    THEN economizing will be enabled.
  - IF OAT is greater than or equal to 0-6°F below the RAT (Value Climate Zone Dependent)

    OR the OAT is greater than the reference differential temp high limit DTHL

    THEN economizing will be disabled.

Single Enthalpy Changeover

- Must have OAH (RH) and OAT sensors connected. Outdoor air enthalpy (Outdoor Enth) will be calculated. They will be analyzed against the reference values as follows:
  - IF Outdoor Enth is 2 btu/lb less than the reference enthalpy high limit (default is 28 btu/lb − 2 btu/lb = 26 btu/lb)

    AND OAT is 2°F below the reference temperature high limit ETHL (based on entered ZIP code)

    THEN economizing will be enabled.
  - IF Outdoor Enth is greater than reference enthalpy high limit (default is 28 btu/lb)

    OR OAT is greater than the reference temperature high limit ETHL (based on entered ZIP code)

    THEN economizing will be disabled.

Differential Enthalpy Changeover

- Must have OAH, OAT, RAH and RAT sensors connected. Outdoor Air Enthalpy and Return Air Enthalpy will be calculated.
  - IF Outdoor Enth is 2.5 btu/lb less than Return Air Enth

    AND Outdoor Enth is 2 btu/lb less than the reference differential enthalpy high limit DEHL (30 btu/lb)

    AND OAT is 2°F below the reference differential temperature high limit DTHL (based on entered ZIP code)

    THEN economizing will be enabled.

  - If Outdoor Air Enthalpy is 1 btu/lb less than Return Air Enthalpy

    OR Outdoor Air Enthalpy is greater than reference enthalpy high limit DEHL (30 btu/lb)

    OR OAT is greater than reference differential temperature high limit (based on entered ZIP code)

    THEN economizing will be disabled.

Operational Modes

Free Cooling

- Outdoor air ambient conditions are analyzed by one of the 4 changeover strategies above (Single or Differential Dry Bulb; Single or Differential Enthalpy) and has been deemed suitable for "free" cooling.
- Y1 is energized indicating a call for stage 1 cooling.
- Y2 is de-energized.
- W1 is de-energized.
- G input could be energized or de-energized (occupied or unoccupied state).
- Compressor 1 is off[2].
- Compressor 2 is off[2].
- Fan Speed could be energized (low speed, when OAT is below 50°F) or de-energized (high speed) for indoor fan[1].
- Exhaust Fan could be running or not based on % damper open position[1].
- Damper Pos output is modulated between the respective current minimum damper position setpoint and 100% open to attempt to maintain SAT setpoint (55°F). When OAT is at 55°F the damper will be fully open to outside air. As outdoor air continues to rise above 55°F, SAT will rise with it.

Integrated Cooling

- Outdoor air ambient conditions are analyzed by one of the four changeover strategies above (Single or Differential Dry Bulb; Single or Differential Enthalpy) and has been deemed suitable for "free" cooling.
- Y1 is energized indicating a call for stage 1 cooling.
- Y2 is energized indicating a call for stage 2 cooling.
- W1 is de-energized.
- G input could be energized or de-energized (occupied or unoccupied state).
- Compressor 1 is on[2].
- Compressor 2 is off[2].
- Fan Speed is de-energized (indoor fan is operating on high speed)[1].
- Exhaust Fan is on[1].
- Damper Pos output is fixed at 100% (fully open to outdoor air).

Note: Outdoor Damper must be fully open for 60 seconds before mechanical cooling will be enabled.

Mechanical Cooling

- Outdoor air ambient conditions are analyzed by one of the 4 changeover strategies above (Single or Differential Dry Bulb; Single or Differential Enthalpy) and has been deemed NOT suitable for "free" cooling.

- Y1 is energized indicating a call for stage 1 cooling.

- Y2 may or may not be energized depending on thermostat call for stage 2 cooling.

- W1 is de-energized.

- G input could be energized or de-energized (occupied or unoccupied state).

- Compressor 1 is on[2].

- Compressor 2 may or may not be on based on thermostat call for stage 2 cooling[2].

- Fan Speed may or may not be energized (indoor fan is operating on high or low speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions[1].

- Exhaust Fan is off[1].

- Damper Pos output is at Vent Min Pos if indoor fan is on high speed. Output is at Low SP Vent Min if indoor fan is on low speed.

DCV[1]

- Outdoor air may or may not be suitable "for free cooling"; however still utilizing fresh air for cooling

- Y1 may or may not be energized depending on thermostat call for stage 1 cooling.

- Y2 may or may not be energized depending on thermostat call for stage 2 cooling.

- W1 may or may not be energized depending on thermostat call for heating.

- G input is energized indicating occupied state.

- Compressor 1 may or may not be on depending on thermostat call for stage 1 cooling[2].

- Compressor 2 may or may not be on depending on thermostat call for stage 2 cooling[2].

- Fan Speed may or may not be energized (indoor fan is operating on high or low speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions[1].

- Exhaust Fan is off[1].

- Damper Pos – Minimum outdoor damper position will be modulated based on CO_2 levels. If indoor fan is on high speed and CO_2 levels are high, minimum damper position will be at Vent Min Pos; if CO_2 levels are low, minimum damper position will be at DCV Min Pos. As CO_2 levels fluctuate, minimum damper position will modulate between these 2 minimum settings. If indoor fan is on low speed, the two minimum damper settings reference will change to Low SP Vent Min and Low SP DCV Min respectively.

Possible Co-existing Modes of Operation[3]:
Mechanical Cooling, Heating.

Ventilation

- Outdoor air may or may not be suitable "for free cooling".

- Y1 is de-energized.

- Y2 is de-energized.

- W1 is de-energized.

- G input is energized indicating occupied state of operation.

- Compressor 1 is off[2].

- Compressor 2 is off[2].

- Fan Speed will be energized (indoor fan is operating on low speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions[1].

- Exhaust Fan is off[1].

- Damper Pos output is at Low SP Vent Min[1].

Possible Co-existing Modes of Operation[3]: DCV, Heating.

Heating

- Outdoor air may or may not be suitable "for free cooling".

- Y1 is off (unless RTU is a heat pump).

- Y2 is off (unless RTU is a heat pump).

- W1 is energized.

- G input may or may not be energized (occupied or unoccupied state).

- Compressor 1 is de-energized (unless Heat Pump Op in Settings menu is turned on)[2].

- Compressor 2 is de-energized (unless Heat Pump Op in Settings menu is turned on)[2].

- Fan Speed will be de-energized (indoor fan is operating on high speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions[1].

- Exhaust Fan is off[1].

- Damper Pos output is at Vent Min Pos or damper in DCV position. See DCV mode[1].

Unoccupied

- Outdoor air may or may not be suitable "for free cooling".

- Y1 may or may not be energized depending on thermostat call for stage 1 cooling.

- Y2 may or may not be energized depending on thermostat call for stage 2 cooling.

- W1 may or may not be energized depending on thermostat call for stage 1 heating.

- G input is de-energized (unoccupied state).

- Compressor 1 may or may not be on depending on thermostat call for stage 1 cooling[2].

- Compressor 2 may or may not be on depending on thermostat call for stage 2 cooling[2].

- Fan Speed may or may not be energized (indoor fan is operating on high or low speed or not at all). See Indoor 2 Speed Fan sequence under Energy Module Option Functions[1].

- Exhaust Fan is off[1].

- Damper Pos output is closed to Outdoor Air.

Possible Co-existing Modes of Operation[3]: Free Cooling, Integrated Cooling, Mechanical Cooling, Heating, or Purge.

Freeze Protection

- Outdoor air is suitable "for free cooling".

- Y1 may or may not be energized depending on thermostat call for stage 1 cooling.

- Y2 may or may not be energized depending on thermostat call for stage 2 cooling.

- W1 may or may not be energized depending on thermostat call for stage 1 heating.

- G input is energized indicating occupied state of operation.

- Compressor 1 is de-energized[2].

- Compressor 2 is de-energized[2].

- Fan Speed may or may not be energized (indoor fan is operating on high or low speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions[1].

- Exhaust Fan is off[1].

- Damper Pos output is modulated from minimum to closed to maintain discharge air setpoint.

Possible Modes of Operation[3]: Heating , Free Cooling and Ventilation.

Energy Module Option Functions[1]

Purge[1]

(Purge Control in Settings Menu must be turned on to enable and 24 VAC applied to AUX1)

- Outdoor air may or may not be suitable "for free cooling".

- Y1 may or may not be energized depending on thermostat call for stage 1 cooling.

- Y2 may or may not be energized depending on thermostat call for stage 2 cooling.

- W1 may or may not be energized depending on thermostat call for stage 1 heating.

- G input may or may not be energized (occupied or unoccupied state).

- Compressor 1 may or may not be energized depending on thermostat call for stage 1 cooling[2].

- Compressor 2 may or may not be energized depending on thermostat call for stage 2 cooling[2].

- Fan Speed may or may not be energized (indoor fan is operating on high or low speed). See Indoor 2 Speed Fan sequence under Energy Module Option Functions[1].

- Exhaust Fan is off[1].

- Damper Pos output goes to value set in Purge Dmp Set.

Possible Co-existing Modes of Operation[3]:
Mechanical Cooling, Heating.

Damper Override

- IF Remote Dmp Cntrl is turned on (enabled) in Settings menu

  AND G powered

  THEN Damper Pos will go to the value of the signal input (0-10 VDC) at AUX2.

Note: If outdoor air is suitable for "free cooling" and damper is override to closed position, there will be no cooling.

Indoor 2 Speed Fan

Thermostat Signal	Economizing Available	OAT	Energy Module Fan Relay	Fan Speed	ZIP Econ / RTU Mode
G, Y1, not Y2	No	N/A	Closed	Low	1 Stage DX
G, Y1, not Y2	Yes	>50ºF	Open	High	Economizing
G, Y1, not Y2	Yes	<50ºF	Closed	Low	Economizing
G, Y1, Y2	No	N/A	Open	High	2 Stage DX
G, Y1, Y2	Yes	N/A	Open	High	Integrated Economizer
G, W1	No	N/A	Open	High	Heating
G, W1	Yes	N/A	Open	High	Heating
G, not Y1, not W1	No	N/A	Closed	Low	Ventilation
G, not Y1, not W1	Yes	N/A	Closed	Low	Ventilation
not G, not Y1, not W1	No	N/A	Open	Off	Unoccupied[3]
not G, not Y1, not W1	Yes	N/A	Open	Off	Unoccupied

When indoor fan is on high speed, the high speed fan minimum damper position setpoints Vent Min Pos and DCV Min Pos will be referenced as the minimums for damper control.

When indoor fan is on low speed, the low speed fan minimum damper position setpoints Low Sp Vent Min and Low Sp DCV Min will be referenced as the minimums for damper control.

Note: Indoor fan speed will operate according to the above table whether in Occupied or Unoccupied.

Note: If RTU equipped with fan speed switching relays from the factory, an Energy Module is not required to set up 2 Speed Fan. See 2 Speed Fan Op in settings menu for more information.

Exhaust Fan

(Operates only in Free Cooling and Integrated Cooling.)

Note: In theory, if Exh Fan On Pos/Low Exh Fan Pos for damper % is set very low, then Exhaust Fan could also run in other modes (Ventilation, Mechanical, DCV).

- Control of the exhaust fan is damper position dependent. Damper setpoint for enable/disable of the exhaust fan is Indoor Fan Speed dependent (High Speed Damper Setpoint = Exh Fan On Pos; Low Speed Damper Setpoint = Low Exh Fan Pos).

    - IF Damper Pos is 10% greater than Exh Fan On Pos/ Low Exh Fan Pos

      OR Damper Pos is 100% open

      THEN Exhaust Fan will be energized.

    - IF Damper Pos is 10% less than Exh Fan On Pos/ Low Exh Fan Pos

      OR Damper Pos is less than 5% open

      THEN Exhaust Fan will be de-energized.

Example: If Exh Fan On Pos is set at 45%, when damper opens to 55%, exhaust fan will turn on. When damper closes to 35%, exhaust fan will turn off.

Service and Comissioning

Manual Mode

This menu is available after Setup has been completed. This is selected in Level 2 menu Service and Commissioning. This supports the commissioning phase allowing all connected RTU components (except for the room thermostat) to be tested by manually commanding them through the keypad interface. **To prevent RTU safety lockout and possible equipment damage, ensure the RTU indoor fan is running!** Return to Automatic will occur automatically between 1-8 hours (adjustable) unless Return to Automatic is selected.

Note: Damper will move at high speed.

Note: Compressors, exhaust fan[1] and indoor 2 speed fan[1] minimum on or minimum off time does NOT apply in this test state. They will be turned on and off immediately based on the entered command. Also, exhaust fan[1] will not be turned on automatically based on damper position in this mode, but it can be manually commanded.

Damper Scaling

If there was a mechanical failure or adjustment that prevented proper damper scaling from virgin to automatic, it can be rescaled. "Damper scaling starts in 10secs" and will countdown to 0. A message will scroll saying "Damper scaling for better operation if obstruction is present rescale damper in commissioning menu". (For detailed instructions on this – please see the section "Service and Commissioning" below. This will open damper to 100% (re-scale control signal if needed). (Note: failure to identify obstructions or improper setup of damper assembly may result in an improper scaling and operation of the damper.)

Once scaling is complete, a message will appear saying "Damper scaling successful". The ZIP will then show "maximum at 80° = 100%" That message will show maximum rotation of the damper. This process ensures the damper is always operating and displayed from 0-100%.

Acceptance Test (Four possible options)

This menu is available after Setup has been completed. This complies with the California Title 24 Mechanical Testing and has four tests. **To prevent RTU safety lockout and possible equipment damage, ensure the RTU indoor fan is running!**

Economizer Test (NA7.5.4)

- This is an automatic functional and verification test that moves the damper 100% open/100% closed/and minimum position and switches on CC1 and EF[1] (if available). It leads one through the test step by step in accordance with California Title 24 test form.

    Note: 1 minute minimum on time; 1 minute minimum off time for compressor applies in this test to prevent damage from short cycling. Exhaust fan[1] does turn on based on damper position in this test.

Note: Damper will move at high speed.

Ventilation Test (NA7.5.1.2)

- This is a manual test that allows adjustment to the damper minimum position (Vent Min Pos) in the Settings menu for verification of ventilation rates.

    Note: Damper minimum position must be commanded to get damper to go to minimum position in this mode!

Example: Prior to going into this test, let's say Vent Min Pos is set for 20%. After going into this test you still must go into Settings/Vent Min Pos and change the value by at least 1%, then you can change back to 20%. If you don't create a change of value for Vent Min Pos the damper will not move off fully closed position in this test. The new Vent Min Pos setting you enter will be stored and used when you return to automatic.

RTU Test (NA7.5.2)

- This is a manual test used to test the following signals from the thermostat to the RTU:

    - G powered (Occupied) – damper is at minimum position (Vent Min Pos); otherwise the damper goes closed to outdoor air (Unoccupied).

    - Y1 powered – CC1 is energized; otherwise CC1 is de-energized.

    - Y2 powered – CC2 is energized; otherwise CC2 is de-energized.

      Note: 1 minute minimum on time; 1 minute minimum off time applies in this test mode to prevent damage from short cycling compressors.

    - W1 powered – Heating is enabled.

DCV[1] Test (NA7.5.5)[6]

- This is a manual test used for the following:

    - CO_2 input will be used to modulate minimum damper position between DCV Min Pos and Vent Min Pos as CO_2 levels vary below and above (respectively) the CO_2 Setpoint.

All of the above tests can be aborted by selecting Return to Automatic in the Level 2 menu.

End of Sequences

[1] Only available with Energy Module Option. If no Energy Module exists associated menu options will not be displayed.

[2] Subject to Compressor Protection Strategies as noted earlier.

[3] The following modes listed below take display priority on the ZIP MMI when co-existing with this mode.

[4] This could possibly happen if W1 and Y1 are energized together calling for heating and cooling at the same time (provided that RTU is not configured as a Heat Pump.) An alarm will be generated.

[5] Minimum on/off times must be observed before compressor will be commanded.

[6] "G" must be energized to run test.

Required "Settings" Parameters for All Configurations

Note: you may enter parameters in any order - eg: Vent min Pos before ZIP Code - If the RTU is a heat pump or uses a 2 speed indoor fan, these paramaters should be enabled first, otherwise the logic may go to Setup Complete prematurely.

1. ZIP Code US or Canada (sets the free cooling changeover high limit and temperature units F/C)

   a. When the Zip Code submenu is displayed enter "OK" to begin "US" Zip Code parameterization. If "Canada" Postal Code is desired press the up/down arrow to access.

      i. Press OK to access digit 1 (flashing) then use the up/down arrow to parameterize; enter OK when complete. Repeat until all digits are complete. If a mistake is made press "esc" and repeat from beginning

         ```
         US
         89436
         ```

      ii. When all Zip Code or Postal Code digits are entered press "esc" to move up a level then press the up/down arrow to access next settings parameter.

2. Vent Min Pos (Outdoor Air Damper Ventilation Minimum Position)

   a. When the "Vent Min Pos" submenu is displayed press "OK" to parameterize (flashing).

      ```
      Vent Min Pos
      __%              i
      ```

   b. Use the up/down arrow to parameterize, press "OK" when complete. The actuator will immediately drive the damper to the minimum position.

3. Additional Parameters may require setting. The ZIP Economizer will auto-detect added Devices such as a CO2 sensor etc. When the ZIP Economizer detects a new device, it will prompt the user in the Status level; navigate to Settings and parameterize blank fields. If the devices are connected upon first start up their settings will require parameterization then.

4. When all parameters have been set, the ZIP Economizer will show "Setup Complete" if there are still parameters to set, there will be no action. You can verify by pushing esc until status level is reached and it will display "Setup Incomplete". If this is the case, re-enter settings menu and use up down arrows to find the parameter with blank fields and parameterize as described above.

Setup Complete - Initializing Automatic Mode

1. When all entries have been completed, the ZIP Economizer will switch to Status display and show "Setup Complete", and will immediately show a "Damper scaling starts in 10secs" and will countdown to 0 (**be aware, at 0 the damper will start to move at high speed**) . A message will scroll saying "Damper scaling for better operation if obstruction is present rescale damper in commissioning menu". (For detailed instructions on this – please see the section "Service and Commissioning" below. This will open damper to 100% (re-scale control signal if needed). (Note: failure to identify obstructions or improper setup of damper assembly may result in an improper scaling and operation of the damper.)

Once scaling is complete, a message will appear saying "Damper scaling successful". The ZIP will then show "maximum at 80° = 100%" That message will show maximum rotation of the damper. This process ensures the damper is always operating and displayed from 0-100%.

2. Once the message has appeared, the actuator immediately closes the damper and a countdown begins, until the unit starts to operate in Automatic Mode **(be aware, when countdown complete, the RTU will respond to thermostat calls which may enable mechanical cooling).**

Service and Commissioning (Acceptance Test & Manual Mode)

The ZIP Economizer has built in commissioning processes found in Acceptance Test.

1. **Economizer Test.** Use "Economizer Test" to verify RTU Integrated Economizer operation. Navigate to the "Service and Commissioning" menu, press "OK"; press the down arrow to access "Acceptance Test". Press OK again when "Economizer Test" appears. Press "OK" again to confirm running test. Follow prompts during test. This test will open damper to 100%, enable power exhaust fan (if connected), enable 1st stage of Mechanical Cooling, reverse this process and then drive to Vent Min Position. When used with a Belimo actuator, the actuator will speed up to reduce test time.

2. **Manual Mode** is used to override outputs after entering a "Timeout" duration.

3. **Damper Scaling.** The test will re-scale the control signal range to maximum resolution (0-100%) over the calibrated (reduced) angle. When using a Belimo actuator, the actuator will speed up to reduce test time.

Note: Failure to identify obstructions or improper setup of damper assembly may result in an improper scaling and operation of the damper.)

Note: Additional testing can be found on page 36 of this document.

Demand Control Ventilation Setup

Before Getting Started

ECON-ZIP-EM and CO_2 sensor can be added during or after initial set up.

1. A CO_2 sensor is needed with the following characteristics:

    a. Output that is 0-10 VDC

    b. Range of 0-2000ppm

2. Attach the Energy Module ECON-ZIP-EM to the ZIP Economizer ECON-ZIP-BASE.

Wiring CO_2 Sensor to ZIP Economizer

1. Wire CO_2 sensor 0-10 VDC output to ECON-ZIP-EM CO_2 sensor input.

1	Not Used
2	Not Used
3	Relay Norm Open
4	Relay Common
5	Relay Norm Closed
6	4-20mA Output
7	Signal Ground
8	0-10V Output
1	AC+ / C+
2	AC- / GND

Example CO_2 Sensor Diagram

2. Wire CO_2 sensor power.

    Note: If RTU transformer VA is sufficient R/C terminals may be used on ZIP Economizer.

1	Not Used
2	Not Used
3	Relay Norm Open
4	Relay Common
5	Relay Norm Closed
6	4-20mA Output
7	Signal Ground
8	0-10V Output
1	AC+ / C+
2	AC- / GND

Example CO_2 Sensor Diagram

3. Setting PPM range (only required if sensor is configurable for other ranges).

Type of Output	Ventilation Rate (cfm/Person)	Analog Output	CO₂ Control Range (ppm)
Proportional	Any	0-10V	0-2000

4. Power RTU and enter Settings Menu.

    Note: When the CO_2 sensor is powered and 0-10 VDC is available at CO2+ and CO2, the ZIP Economizer will recognize the CO_2 presence and the prompt to set up CO_2 settings.

5. Setting DCV settings.

    a. With single speed indoor fan, only 2 DCV settings are required.

        i. DCV Min Pos – This is the minimum occupied or zero occupancy ventilation rate expressed in damper percent open (Title 24 2013 section 120.1(b)2; ASHRAE 62.1 Section 6.2.7).

        ii. CO_2 PPM Set Pnt – This is the CO_2 concentration that is desired in the space (Title 24 2013 section 120.1(c)4. prescribed as 600ppm plus outdoor air CO_2 concentration assumed to be 400ppm = a set point of 1000ppm).

Operation

The ZIP Economizer logic will control the outside air damper position based on space CO_2 dilution needs. If the CO_2 value is low, the damper shall remain at DCV Min Pos when not in free cooling. When the CO_2 concentration rises above the CO_2 PPM Set Pnt (as the space becomes more populated), then the damper will start to modulate towards Vent Min Pos to maintain level at CO_2 PPM set Pnt. When the CO_2 concentration drops in the space (the space population decreases) the damper will start to modulate back towards DCV Min Pos.

⚠ **WARNING** *Live Electrical Components!*

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.