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INTEGRATED MODULAR CONTROL (IMC)

GUIDE TO THE INTEGRATED MODULAR CONTROL USED IN L□ SERIES 3 THROUGH 30 TON UNITS

TABLE OF CONTENTS

GENERAL

The integrated modular control system (IMC) is a series of control boards designed to indicate unit operation, increase reliability, and make troubleshooting easier. The IMC provides programmable control parameters (such as varying compressor on/off intervals) and will communicate with personal computers. As in standard installations, a thermostat is required for system operation.

The main control, or A55 (M1) board, is the common control board used in all □L□ series units. Add–on boards are connected to the main board to □build□ control variations depending on type and capacity of unit. An A56 (EM1) economizer add–on board connects to the M1 board when an optional economizer is installed in the unit.

See table 1 to determine which IMC control boards are provided in each unit. Figure 1 identifies unit model number. Figure 2 shows the location of add–on boards in relation to the main control board. Figure 3 shows the IMC board location in each unit.

INTEGRATED MODULAR CONTROL (IMC) FEATURES

- Indicates thermostat demand
- Makes troubleshooting easier
- Increases unit and component reliability
- Provides consistent central control location
- Provides adjustable control parameters
- Interfaces with personal computers

TABLE 1
IMC BOARDS BY UNIT

BOX SIZE	UNIT	A55 M1	A57 C1	A59 C2	A60 E1	A58 G1	A61 HP1	A56 EM1
A	LGA/LCA036, 042, 048, 060, 072 (3, 3–1/2, 4, 5, & 6 TON)	M1						OPT
A+	LHA088 (7.5 TON)	M1						OPT
	LGA/LCA088 & 100 (7.5 & 8.5 TON)	M1	C1					OPT
B	LGA/LCA102, 120, & 150 (8.5, 10, & 12.5 TON)	M1	C1					OPT
	LHA090 & 120 (7.5 & 10 TON)	M1					HP1	OPT
C	LGA156, 180, 210, 240, 300S (15, 18.5, 20, & 25 TON)	M1	C1	C2		G1		OPT
	LCA156, 180, 210, 240, & 300S (15, 18.5, 20, & 25 TON)	M1	C1	C2	OPT			OPT
	LHA180 & 240 (15 & 20 TON)	M1			OPT		HP1	OPT
D	LGA300H & 360 (25 & 30 TON)	M1	C1	C2		G1		OPT
	LCA300H & 360 (25 & 30 TON)	M1	C1	C2	OPT			OPT

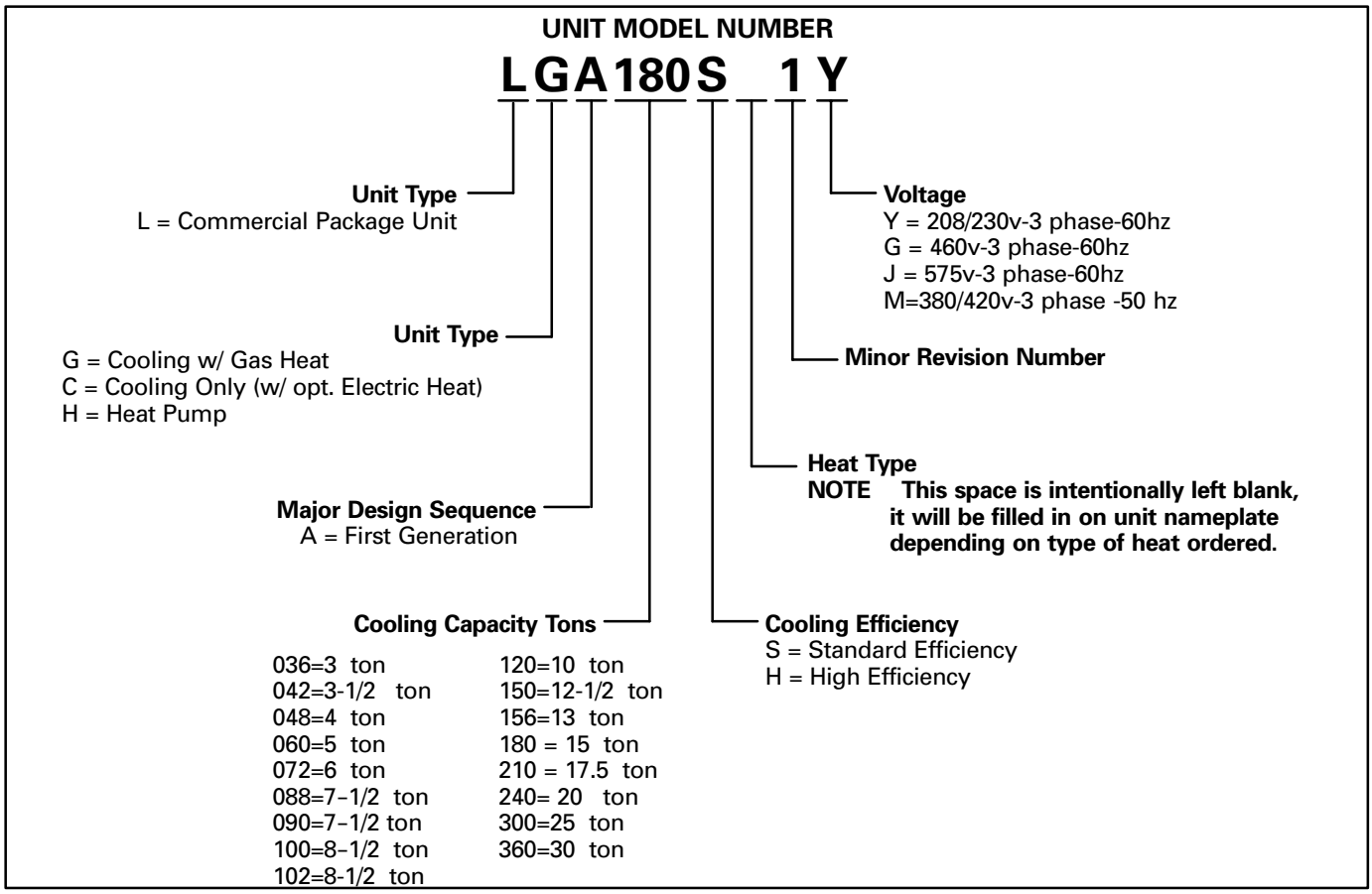


FIGURE 1

IMC AND ADD-ON BOARD LOCATION AND OPERATION

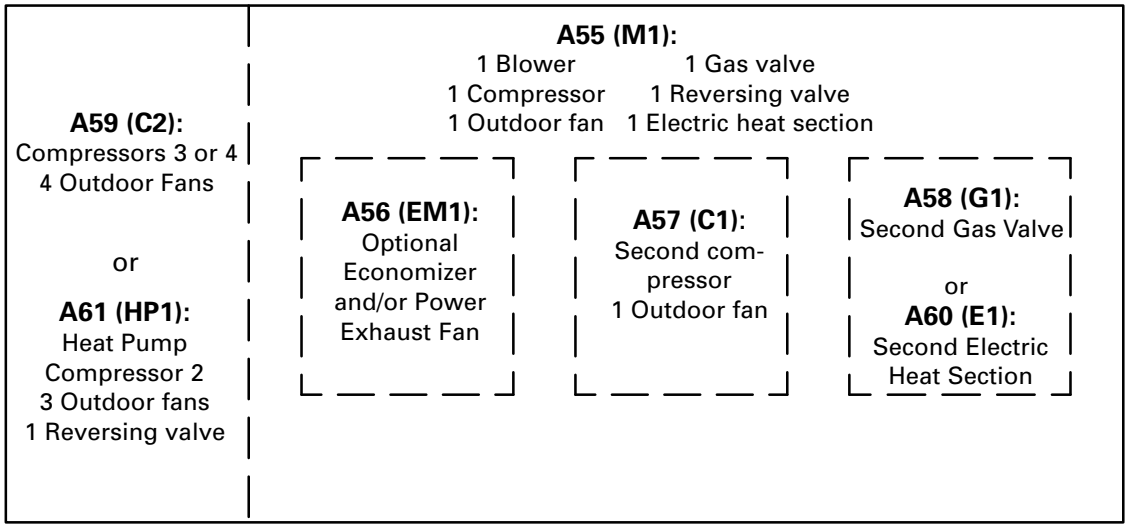


FIGURE 2

A55 (M1) MAIN CONTROL PANEL LOCATION BY UNIT

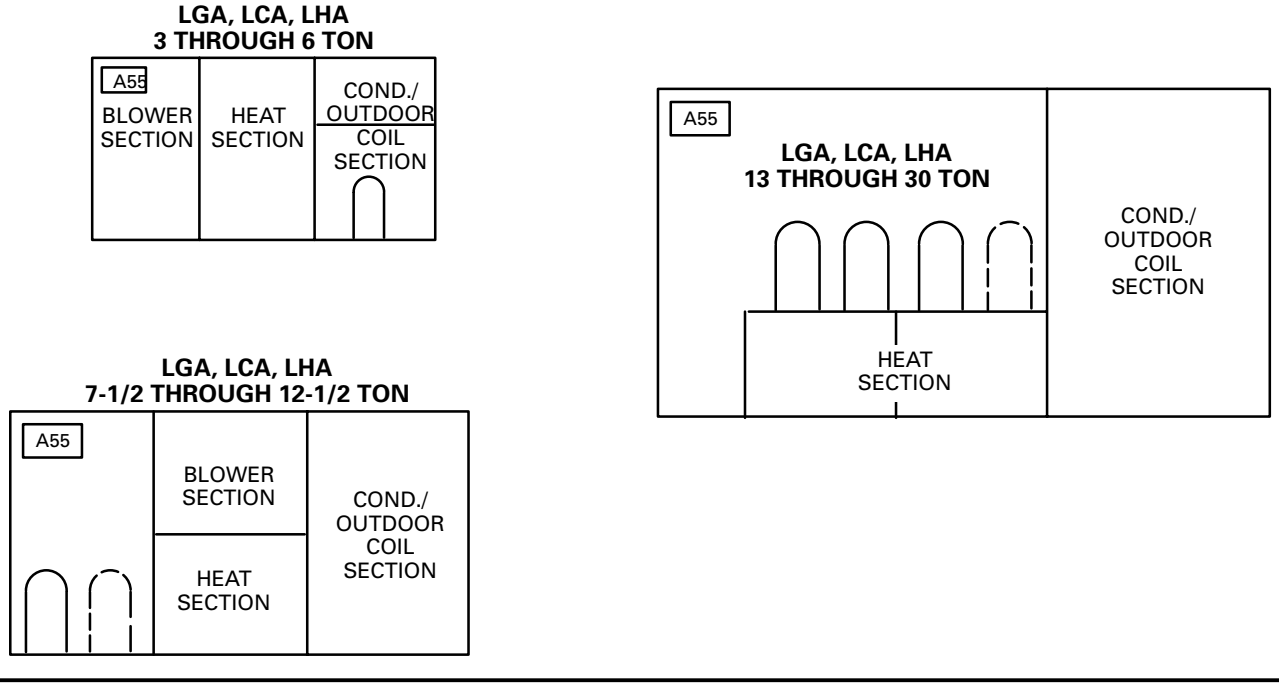


FIGURE 3

IMC BOARD COMPONENTS

LED READOUT

On unit power-up the A55 M1 board LED readout will display 8.8.8.8, within seconds, the 8.8.8.8 readout will flash several times and turn off. Error codes are the only readings that will be displayed without DIP switch changes. See Diagnostics section.

RESETTING THE CONTROL

Reset the IMC control with the pushbutton located to the right of the LED readout. Hold down the pushbutton for at least three seconds to reset the IMC control. The LED readout will display 8.8.8.8, flash several times, and turn off.

HEARTBEAT LED

Each control board has a green flashing heartbeat LED. The heartbeat LED will flash indicating normal operation. See table 2 for an explanation of heartbeat LED operation.

TABLE 2
HEARTBEAT LED OPERATION

HEARTBEAT LED STATUS	A55 (M1) BOARD	ADD-ON BOARDS
FLASHING	NORMAL OPERATION	NORMAL OPERATION
*FLICKERING	NA	CHECK ELECTRICAL CONNECTIONS
STEADY OFF	NO VOLTAGE TO M1 BOARD; SEE FIGURE 4	NO VOLTAGE TO M1 BOARD; SEE FIGURE 4
STEADY ON	DEFECTIVE BOARD (REPLACE)	DEFECTIVE BOARD (REPLACE)

*A FLICKERING LED WILL FLASH SIGNIFICANTLY FASTER THAN THE A55 HEARTBEAT LED.

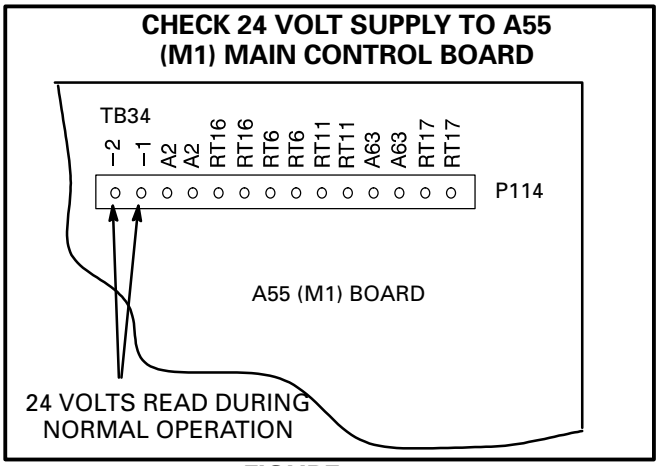


FIGURE 4

THERMOSTAT INPUT INDICATING LEDS

Thermostat input indicating LEDs are located on the M1 board above P117 connector. **LEDS indicate a thermostat demand only**. See figure 5.

THERMOSTAT INPUT INDICATING LEDS

G – Blower on

W1 – First stage heat

W2 – Second stage heat

Y1 – First stage cool

Y2 – Second stage cool

OCP – Occupied

NOTE – LEDs are energized by 24 vac thermostat inputs only.

FIGURE 5

DIP SWITCH SETTINGS

Make sure DIP switches are set as shown in figures 6, 7, and 8. DIP switch settings are particular to each type of unit and must be set correctly for proper unit operation. Economizer is optional. Set A56 (EM1) economizer board DIP switches as shown in economizer section.

IMPORTANT – Check DIP switches BEFORE applying power unit. The IMC checks switch position on power-up and after a reset.

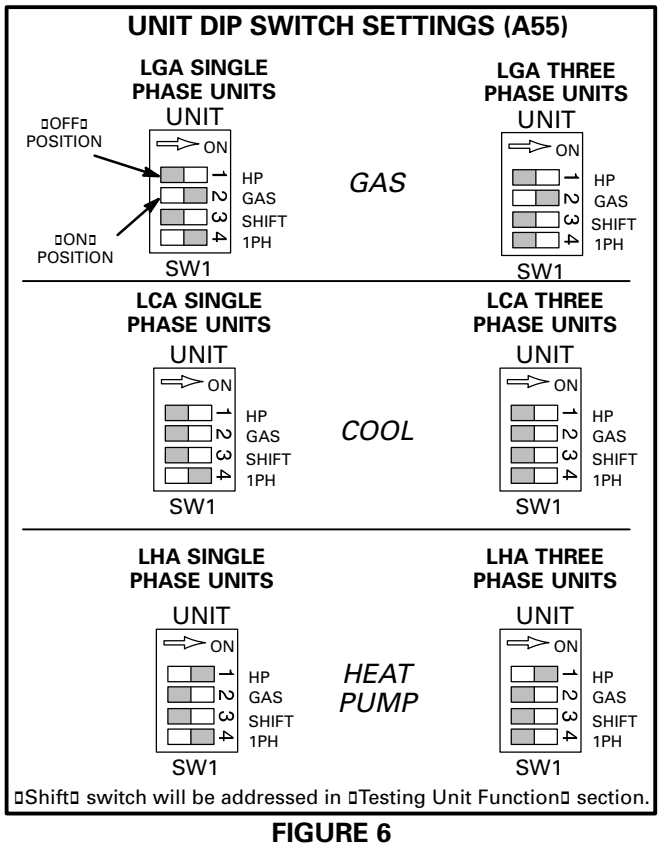


FIGURE 6

LANDSCAPE OF BOARD

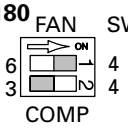
DIP SWITCH SETTINGS – Continued

A59 (C2) DIP SWITCH SETTINGS

(C AND D BOX NON–HEAT PUMP UNITS ONLY)

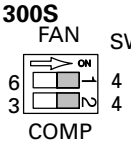
LGA/LCA156 & 180

FOUR FANS
THREE COMPRESSORS



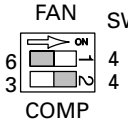
LGA/LCA210, 240, 300S

FOUR FANS
FOUR COMPRESSORS



LGA/LCA300H

SIX FANS
FOUR COMPRESSORS



LGA/LCA360

SIX FANS
THREE COMPRESSORS

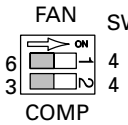


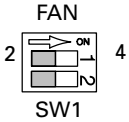
FIGURE 7

A61 (HP1) DIP SWITCH SETTINGS

(B AND C BOX HEAT PUMP UNITS ONLY;
NO HEAT PUMPS IN D BOX SIZE)

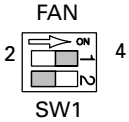
LHA090 & 120

TWO FANS



LHA180 & 240

FOUR FANS



Switch #2 is not used.

FIGURE 8

PUSHBUTTON

The pushbutton has various functions depending on DIP switch settings. The pushbutton is used to toggle through display readouts and turn outputs off and on.

By–Passing Delays

With DIP switches in normal operation setting, a short push of the pushbutton will bypass timers (such as compressor minimum run, blower delay, and compressor minimum–off). Delays are bypassed to energize unit functions immediately (or de-energize) for start-up and troubleshooting purposes.

NOTE – Each unit contains various delays and control components. Not all units will have the same components. See unit wiring schematic for applicable timers and delays.

Example:

If the unit contains a blower delay, the delay will keep the blower from immediately starting. A short push of the pushbutton will bypass this delay and the blower will operate.

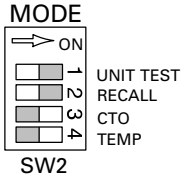
In the same manner, if the unit has a compressor minimum run delay, a short push of the pushbutton will bypass the delay and the compressor(s) will de–energize.

CHECK SOFTWARE VERSION

Use the MODE DIP switch to check the A55 (M1) software version. See figure 9.

CHECK A55 MAIN BOARD SOFTWARE VERSION

Set the MODE DIP "UNIT TEST" and "RECALL" switches #1 and #2 to "ON"



Readout will display software version

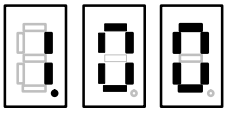


FIGURE 9

VERIFY IMC BOARD FUNCTIONS

On initial unit start–up identify the following IMC board functions:

IMPORTANT – Before applying power, make sure MODE DIP switches, and UNIT SHIFT switch are off. At least one UNIT ADDRESS switch should be on.

1– **Heartbeat LED on each board will flash.**

2– **LED readout will flash 8.8.8 and turn off.**

3– **Thermostat input indicating LEDs will appropriately turn on.**

Consider the IMC an input and output junction point; thermostat inputs at P110 result in an output to unit components (see 24VAC BO signal types in Input and Output tables). If the heartbeat LED is not flashing, see table 2 for heartbeat operation. If the LED readout contains a code, refer to the Diagnostics section to troubleshoot. If the thermostat input indicating lights are not responding appropriately, check the thermostat.

UNIT OPERATION

Voltage may be applied to test major unit components by using the IMC testing function, or by using jumper wires on TB1.

UNIT START–UP WITH IMC BOARD

Use Testing Unit Function section to simulate thermostat inputs. If outdoor fans, blowers, reversing valves, or the service relay do not respond appropriately, delays or low ambient temperatures may be preventing operation. In that case, use Testing Unit Function section to create an output from the IMC to test specific components.

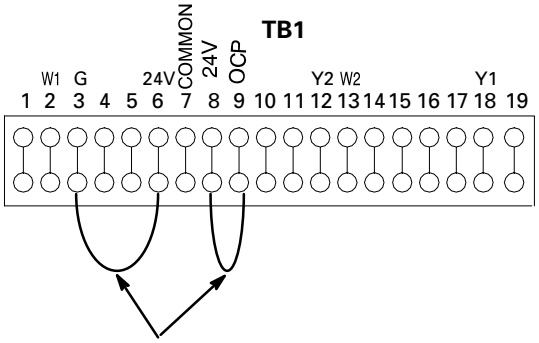
UNIT START–UP WITH TB1 JUMPERS

Use figure 10 to check unit operation.

Delays or low ambient temperatures may prevent outdoor fan, blower, reversing valve, or the service relay operation. Use Testing Unit Function section to create an output from the IMC to test specific components.

TB1 UNIT CHECK–OUT

NOTE – Applies only to units using electro–mechanical thermostats; refer to manufacturer's information when using electronic thermostats or direct digital controls (DDC).



1–Disconnect power or turn thermostat (or electronic temperature control device) off.

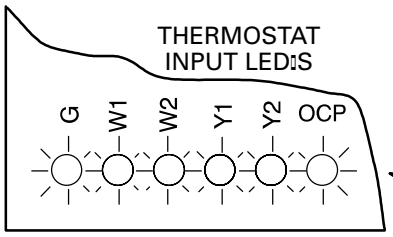
2–Jumper terminals 6 (24V) to 3 (G) to maintain blower operation throughout checkout.

3–Jumper terminals 8 & 9 to maintain occupied mode.

4–Jumper terminals as shown below to cycle unit.

NOTE – When a jumper is removed, a delay may keep a component functioning. A short press on the IMC pushbutton will reset the delay.

JUMPER TERMINAL	UNIT FUNCTION
6–18 (Y1)	FIRST–STAGE COOLING
6–12 (Y2)	SECOND–STAGE COOLING
6– 2 (W1)	FIRST–STAGE HEATING
6–13 (W2)	SECOND–STAGE HEATING



APPROPRIATE THERMOSTAT INPUT INDICATING LED ON IMC (LOWER LEFT CORNER) WILL ENERGIZE AS EACH JUMPER IS INSTALLED

FIGURE 10

IMC CONTROL ERROR CODES

When an error occurs, the A55 M1 board will display an error code which corresponds to control function. See table 3 and figure 11. Error codes are stored and can be recalled later.

CONTROL ERROR CODE READOUT EXAMPLE

ERROR CODE □12□ INDICATES S4 HIGH PRESSURE SWITCH IS OPEN

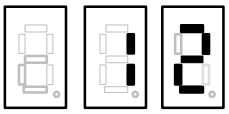
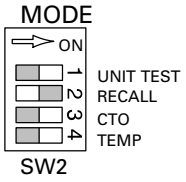


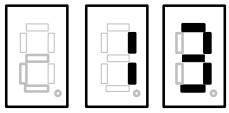
FIGURE 11

To read stored error codes set MODE DIP □RECALL□ switch #2 to □ON□. See figure 12.

DIP SWITCH ERROR CODE RECALL SETTING



STORED ERROR CODE EXAMPLE:



ERROR CODE READOUT □13□ INDICATES S4 HIGH PRESSURE SWITCH HAS OPENED THREE TIMES (DEFAULT) AND COMPRESSOR ONE HAS BEEN DE-ENERGIZED (SEE UNIT DIAGRAM; K1 COMPRESSOR 1 CONTACTOR IS IN S4 LEG).

FIGURE 12

The most recent error code will be displayed first. If no codes are stored, a zero will be displayed. Stored codes are displayed in reverse order with each short push of the pushbutton. When the code no longer changes, the last code has been reached. To read the error codes again, turn the MODE DIP □RECALL□ switch #2 off and back on. The most recent error code will again be displayed (with later codes stored in reverse).

Example:

1–Set MODE DIP □RECALL□ switch #2 to □ON□. See figure 12.

2–Read display and refer to Control Error Code tables.

ERASE STORED ERROR CODES

To erase stored error codes the MODE DIP □RECALL□ switch must be on. Hold down the pushbutton until a zero is displayed. A zero indicates that no error codes are stored.

RESET LOCKOUT CONDITIONS

The IMC Error Code table 3 will indicate an error condition (such as a high pressure switch tripping). If an error results in a lock–out condition, two successive short pushes of the pushbutton will reset counters, lockout conditions, and timers.

Example:

Error code 13 indicates that the first-stage high pressure switch has opened three times (default) and the control has de-energized the compressor. A double push on the pushbutton will restart the compressor.

SERVICE LIGHT OUTPUT

The IMC board provides a 24 VAC output to monitor specific error conditions. An asterisk in the error code table (Table 3) indicates an error condition which energizes the service light output.

To activate the service light, connect the thermostat (or other alarm or monitoring device) service light terminal to unit TB1 terminal 19. See plug P113–3 in inputs and outputs table. Also see relay output (9) in □Testing Unit Function□ section.

Turn on MODE DIP □RECALL□ switch #2 or hold down the pushbutton for three seconds (with MODE DIP switches in off position) to de–activate the service relay output.

TABLE 3
IMC ERROR CODES

ERROR #	PROBLEM
1	Power loss for two cycles. This may indicate that the unit power is □dirty□ or is of low quality.
2	ECTO access error. This may indicate a problem with the ECTO memory chip. ECTO parameters may not be changeable.
3*	Reserved.
4*+	A17 input indicates smoke alarm. Action taken is defined by ECTO 5.01. Default action de-energizes unit.
5*+	S52 (Air Flow Switch) This indicates no blower air 16 seconds after blower demand.
6*	S27 (Dirty Filter Switch) This indicates a dirty filter.
7	Reserved.
8	Reserved.
9*	Reserved.
10*+	24 VAC power loss at TB35-1 on M1 board. P111 pin 11.
11*+	24 VAC power loss at TB34-1 on M1 board. P113 pin 1.
12	S4 (High Press. 1) is open.
13*	S4 (High Press. 1) opened 3 (default) times during a demand. The number of times is defined in ECTO 1.12 or 4.12. Compressor 1 is locked off.
14	S7 (High Press. 2) is open.
15*	S7 (High Press. 2) opened 3 (default) time during a demand. The number of times is defined in ECTO 1.12 or 4.12. Compressor 2 is locked off.
16	S28 (High Press. 3) is open.
17*	S28 (High Press. 3) opened 3 (default) time during a demand. The number of times is defined in ECTO 1.12 or 4.12. Compressor 3 is locked off.
18	S96 (High Press. 4) is open.
19*	S96 (High Press. 4) opened 3 (default) time during a demand. The number of times is defined in ECTO 1.12 or 4.12. Compressor 4 is locked off.
20+	A42 input is open. P110-9. This is an optional 24VAC input.
21*+	A42 input has opened 3 (default) times during a demand. ECTO 5.08.
22	S87 (Low Press. 1) is open.
23*	S87 (Low Press. 1) has opened 3 (default) times during a demand. The number of times is defined in ECTO 1.13 or 4.13. Compressor 1 is locked off.
24	S88 (Low Press. 2) is open.
25*	S88 (Low Press. 2) has opened 3 (default) times during a demand. The number of times is defined in ECTO 1.13 or 4.13. Compressor 2 is locked off.
26	S98 (Low Press. 3) is open.
27*	S98 (Low Press. 3) has opened 3 (default) times during a demand. The number of times is defined in ECTO 1.13 or 4.13. Compressor 3 is locked off.
28	S97 (Low Press. 4) is open.
29*	S97 (Low Press. 4) has opened 3 (default) times during a demand. The number of times is defined in ECTO 1.13 or 4.13. Compressor 4 is locked off.
30	Reserved.
31	Reserved.
32	S49 (Freeze stat 1) is open.
33*	S49 (Freeze stat 1) has opened 3 (default) times during a demand. The number of times is defined in ECTO 4.05.

*Service relay contacts are energized.

+Unit is de-energized.

TABLE 3
IMC ERROR CODES (CONTINUED)

ERROR #	PROBLEM
34	S50 (Freeze stat 2) is open.
35*	S50 (Freeze stat 2) has opened 3 (default) times during a demand. The number of times is defined in ECTO 4.05.
36	S53 (Freeze stat 3) is open.
37*	S53 (Freeze stat 3) has opened 3 (default) times during a demand. The number of times is defined in ECTO 4.05.
38*	S95 (Freeze stat 4) is open.
39*	S95 (Freeze stat 4) has opened 3 (default) times during a demand. The number of times is defined in ECTO 4.05.
40	Reserved.
41	Reserved.
42	Reserved.
43	Reserved.
44*+	Gas valve 1 is energized but no demand. (GV1). Check gas control and wiring.
45*+	Gas valve 2 is energized but no demand. (GV3). Check gas control and wiring.
46*	No 24VAC relay power on A60 E1 board, K9–5 input. (A60)
47*	No 24VAC relay power on A58 G1 board, TB35–1 input. (A58)
48*	No 24VAC relay power on A61 HP1 board, TB34–1 input. (A61)
49*	No 24VAC relay power on A59 C2 board, TB35–1 input. (A59)
50	Gas Unit: S10 (Primary Limit1) is open.
51*	Gas Unit: S10 (Primary Limit1) has opened 3 (default) times during a demand ECTO 3.05. Electric Unit: Strip Heat jumper is open.
52	Gas Unit: S21 (Secondary Limit1) is open.
53*	Gas Unit: S21 (Secondary Limit 1) has opened 3 (default) times during a demand ECTO 3.05. Electric Unit: Strip Heat jumper is open.
54	Gas Unit: S47 (Roll Out switch1) is open. Electric Unit: S15 (El. Ht. Limit) is open.
55*	Gas Unit: S47 (Roll Out Switch1) opened 1 (default) time during a demand. ECTO 3.09. Electric Unit: S15 (El. Ht. Limit) has opened 1 (default) times during a demand.
56	Gas Unit: S18 (Combustion Air Proof Switch 1) is open. Electric Unit: S63 (El. Ht. Limit) is open
57*	Gas Unit: S18 (Combustion Air Proof Switch 1) has opened 3 (default) times during a demand. ECTO 3.08. Electric Unit: S63 (El. Ht. Limit) has opened 3 (default) times during a demand. ECTO 2.05.
58	Gas valve 1 not energized two minutes after thermostat demand. Check gas supply, ignition control, and wiring. (GV1)
59*	Gas valve 1 not energized 3 (default) times (2 minutes after a demand). Check gas supply, ignition control and wiring. ECTO 3.10. (GV1)
60	S99 (Primary Limit 2) is open.
61*	S99 (Primary Limit 2) has opened 3 (default) times during a demand. ECTO 3.05.
62	S100 (Secondary Limit 2) is open.
63*	S100 (Secondary Limit 2) has opened 3 (defaults) times during a demand. ECTO 3.05.
64	S69 (Roll Out Switch 2) is open.
65*	S69 (Roll Out Switch 2) has opened 1 (default) times during a demand. ECTO 3.09.
66	S45 (Combustion Air Proof Switch 2) is open.
67*	S45 (Combustion Air Proof Switch2) has opened 3 (default) times during a demand. ECTO 3.08.
68	Gas valve 2 not energized two minutes after demand. Check gas supply, ignition control, and wiring (GV3).

*Service relay contacts are energized.

+Unit is de-energized.

TABLE 3
IMC ERROR CODES (CONTINUED)

ERROR #	PROBLEM
69*	Gas valve 2 not energized 3 (default) times (2 minutes after demand). Check gas supply, ignition control and wiring. ECTO 3.10. (GV3).
70	Reserved.
71	Reserved.
72	Reserved.
73	Reserved.
74*	Reserved.
75*	RT17, Outdoor Temp. Sensor Problem. Check wiring and sensor.
76*	A63, IAQ Sensor Problem. Check wiring and sensor.
77*	RT6 Discharge (Supply) Air Temp. Sensor problem. Check wiring and sensor.
78*	RT16 Return Air Temp. Sensor problem. Check wiring and sensor.
79*	A major communication problem between the main board and add–on boards has occurred; the main control has locked out all add–on boards. Reset control to restore.
80	A communication problem between the main board and add–on board has occurred, so the main board has reset the communication.
81	Reserved.
82	Main board reset has occurred. This code is also recorded at power up. This code only appears in error recall mode. This indicates a power outage.
83*+	IMC configuration error. The add–on boards plugged into the main control don□t agree with the UNIT DIP switch settings. I.E. Switch is set for gas, but main board detects an electric heat board.
84*+	An add–on board did not respond when polled by main control during system power–up. Add–on board with problem will have flickering heartbeat.
85+	M1 address (unit address DIP switch SW3) has changed during unit operation. Return DIP switch to original setting, change to factory setting (#2 on), or reset control.
86*+	Thermostat input conflict. Simultaneous heat and cool demands. Check thermostat wiring.
87+	UNIT (equipment type) DIP switch has changed while unit is energized. Check UNIT DIP switch setting.
88	This may indicate a problem with the ECTO chip. Unit will operate at factory ECTO settings.
89	No address is set on unit address DIP switch SW3. Any one switch on SW3 must be in □on□ position. SW3 is factory set with switch #2 in on position.
90	Reserved.
91	Reserved.
92	Reserved.
93	Reserved.
94	Reserved.
95	ECTO parameter has been changed by the pushbutton. For information only.
96–126	Reserved.
127	Error buffer overflow. This means multiple errors occurred and some were not stored.
128–255	Reserved.

*Service relay contacts are energized.

+Unit is de-energized.

COMPRESSOR MINIMUM RUN TIME (Three phase units only)

Each compressor stage has a minimum run time of four minutes (ECTO 1.11, 4.11).

COMPRESSOR OFF DELAY (Single phase units only)

Compressors have a five minute (default) compressor off delay. (ECTO 1.10, 4.10).

BLOWER ON DELAY

On gas units, the blower is delayed 42 seconds (default) after the gas valve is energized. There is no blower delay on cooling and heat pump units (ECTO 1.02, 2.02, 3.02, 4.02).

BURNER CONTROL – LGA Units

Primary or Secondary Limits (S10, S21, S99, S100)

If primary or secondary limits open during heating, the IMC will de–energize the gas valve and energize the blower.

If primary or secondary limits open three times (default) during a thermostat cycle, the service alarm output will turn on.

Roll–Out Switch (S47, S69)

If roll–out switch opens, the gas valve will be de–energized and a manual reset is required to restart.

Combustion Air Switch (S18, S45)

If the combustion air switch opens during heating the gas valve is de–energized. If the combustion air switch opens 3 (default) times, the service alarm output will turn on.

Gas Valve Sense

If the gas valve is not energized 2 minutes after a heating demand, the IMC will de–energize all outputs and turn on the service output.

The IMC will also de–energize all outputs and turn on the service output if the gas valve is energized without a heating demand.

GAS VALVE DELAYS

The IMC has a 29 second (default) delay between first and second stages. A timed off delay (101 seconds default) will prevent gas heat operation until 101 seconds has passed from the previous cycle. (ECTO 3.06, 3.07).

AIR FLOW SWITCH (S52–Optional)

The air flow switch closes during normal unit operation. If air flow is interrupted 16 seconds after blower demand, S52 opens and the IMC de–energizes the compressor, gas valves, electric heat, and closes economizer damper. The service alarm output will turn on.

DIRTY FILTER SWITCH (S27–Optional)

The dirty filter switch is open during normal unit operation. A dirty filter will close S27 and the IMC will display and store the error code and turn on the service alarm output.

SMOKE DETECTOR (A17–Optional)

If smoke detector senses smoke, normally opened contacts close. The IMC turns off the unit and closes the economizer dampers. Variations in damper position and power exhaust and blower operation may be changed (ECTO 5.01).

SAFETY SWITCH INPUT (S42–OPTIONAL) A55 Software Version 1.03 and Higher Only

The IMC has a 24 volt optional input (P110–9) which may be used for additional safety switches (such as a blower overload or loss of phase protector). Wire the safety switch in series with the input. When the input is de–energized, the IMC will turn off all outputs and display error code #20 (ECTO 5.08). For normal operation, the input must be energized with 24VAC.

LOSS OF POWER DETECTION (Single phase units only)

The IMC will turn off compressors for five minutes (default) if a loss of power is detected for two cycles. This indicates a problem with supply voltage; waiting four minutes allows pressures to equalize ensuring start–up. (ECTO 5.07).

THERMOSTAT BOUNCE DELAY

The IMC will ignore room thermostat inputs for three seconds to prevent sporadic cycling.

WARM-UP MODE
(During occupied time period)

Many building codes require a percentage of fresh outdoor air when a conditioned space is occupied. A 24 vac input at unit TB1 terminal 9 (A55 or M1 board P110-2) energizes the "occupied" (usually daytime) time period. A field-provided and -installed thermostat or energy management system provides the input.

The first 30 minutes (default) of the **first** heating demand of the occupied time period is called the "warm-up mode". During the warm-up mode the IMC keeps economizer dampers closed to conserve energy. (ECTO 1.01, 2.01, 3.01).

The warm-up mode may be bypassed by pressing the pushbutton a short push.

HEAT PUMP WARM-UP MODE

The default IMC setting allows supplemental heat to be used during warm-up mode. Supplemental heat may be locked out during warm-up mode for energy savings in three different ways. See the Electronic Configure to Order Control Parameters section to lock out supplemental heat during warm-up. ECTO 1.17.

COOL-DOWN MODE
(During occupied time period)

To conserve energy, the IMC ignores Y2 and the economizer opens the first 30 minutes (default) **OR** one cooling cycle (whichever happens first) when the occupied time period starts. The cool-down mode applies only when outdoor air is suitable for free cooling. ECTO 4.01.

The cool-down mode may be bypassed by pressing the pushbutton a short push.

UNOCCUPPIED OR NIGHT SETBACK MODE

The unoccupied time period occurs when there is no input at A55 (M1) board P110-2 or unit TB1 terminal 9.

During the unoccupied time period **continuous blower is not allowed** and dampers do not operate at minimum position (no minimum ventilations requirements during unoccupied period).

ELECTRIC HEAT OPERATION-LCA UNITS

Electric Heat Operation

W1 thermostat demand energizes first-stage electric heat (K15 and K17). W2 thermostat demand energizes second-stage electric heat (K16 and K18). When W1 and W2 thermostat demands are simultaneous, a 13-second delay will occur between stage one and stage two (ECTO 2.06).

If an electric heat limit opens, electric heat is de-energized.

If an electric heat limit opens three times during a thermostat cycle, the service alarm output will turn on (ECTO 1.05 and 2.05).

HEAT PUMP OPERATION-LHA UNITS

W1 thermostat demand energizes compressor(s) for first-stage heating. W2 thermostat demand energizes supplemental electric heat via K15, K16, K17, and K18 electric heat contactors. K15 and K17 are energized immediately; K16 and K18 are energized after a 13-second delay (ECTO 1.06).

If an electric heat limit opens, electric heat is de-energized.

If an electric heat limit opens three times during a thermostat cycle, the service alarm output will turn on (ECTO 1.05).

Defrost Cycle

Defrost is initiated when the defrost temperature switch (S6 or S9) closes. Defrost terminates either when defrost pressure switch (S46 or S104) opens or when 15 minutes (default) has elapsed. (ECTO 1.16). The defrost cycle is **not** terminated when a thermostat demand ends. Only one defrost cycle is allowed for every 60 minutes (default) of run time. (ECTO 1.15,).

The first stage of supplemental electric heat is energized when defrost is initiated (default). In units with multiple refrigerant circuits, supplemental electric heat is energized with each defrost circuit. (ECTO 1.14).

NOTE - If ECTO 1.14 is set to "0", there will be no supplemental heat during defrost.

Economizer dampers close during a defrost cycle.

Supplemental Heat Lock Out

The IMC will not allow the delayed (K16 and K18) bank of electric heat to be energized if the outdoor temperature is above 30°F default (ECTO1.07).

The IMC will not allow any banks of electric heat to energize when outdoor air temperature is above 40°F default (ECTO 1.08).

Test Supplemental Electric Heat Operation

To test the operation of supplemental electric heat at outdoor temperatures above 40°F (default), turn on W2 input only (emergency heat). See "Testing Unit Function" section. Supplemental electric heat will be energized. To test supplemental heat with compressor operating, disconnect outdoor air temperature sensor RT17.

Thermostats With Emergency Heat Function

When ONLY the W2 thermostat input is energized, the IMC will lock–out compressor operation and energize only electric heat. Electric heat temperature lock–outs are also ignored.

STRIKE THREE CONTROL (LOW PRESSURE IGNORE)

Low pressure switches may trip during lower outdoor temperatures, especially with longer time periods between compressor cycling. Each compressor stage has the strike three control feature. The strike three control has three functions:

1– De-energizes the compressor for five minutes (default) if the low pressure switch trips (once the ignore time period is elapsed).

2– Ignores the low pressure switch for a specified period of time after thermostat demand.

3– Locks out the compressor stage if the low pressure switch trips three times within the same thermostat demand (once the ignore time period is elapse).

Low Pressure Switch Off

Once the ignore time period has passed, the low pressure switch will de-energize the compressor. The IMC control will prevent compressor operation for five minutes. See ECTO parameter 5.07 to change compressor off time interval.

Ignore Or Shunt Time Period

The specified time period varies according to compressor off time and the outdoor ambient temperature. See chart 1 for default times and temperatures and the electronic configure to order (ECTO) parameter used to adjust the ignore time period.

Control De-Energizes Unit

If the low pressure switch trips three times (default) during a thermostat demand, the IMC will lock out the compressor. The number of times required to de-energize the unit is adjustable. (ECTO 1.13, 4.13).

CHART 1
LOW PRESSURE IGNORE DEFAULT TIME PERIOD

		COMPRESSOR OFF TIME (ECTO 5.14)	
		SHORT <4 HRS.	LONG >= 4 HRS.
AMBIENT TEMPERATURE (ECTO 5.15)	COLD <70 DEG F	5 MINUTES (ECTO 5.13)	15 MINUTES (ECTO 5.11)
	HOT >= 70 DEG F	2 MINUTES (ECTO 5.12)	8 MINUTES (ECTO 5.10)

LOW AMBIENT FAN CYCLING

During low ambient conditions, various outdoor fans are cycled by liquid line pressure switches S11, S84, S85, and S94.

Various fans are de-energized by the IMC when ambient temperatures are below 55°F/13°C (TP2 default) and 40°F/4.4°C (TP1 default). See ECTO parameters 4.07 and 4.08.

Various fans in D box units have a 75-second delay from thermostat demand to start-up.

Compressors are de-energized by the IMC below 0°F/-18°C (default). See ECTO 4.09.

Determine fan cycling and compressor operation for each unit in figures 13 and 14.

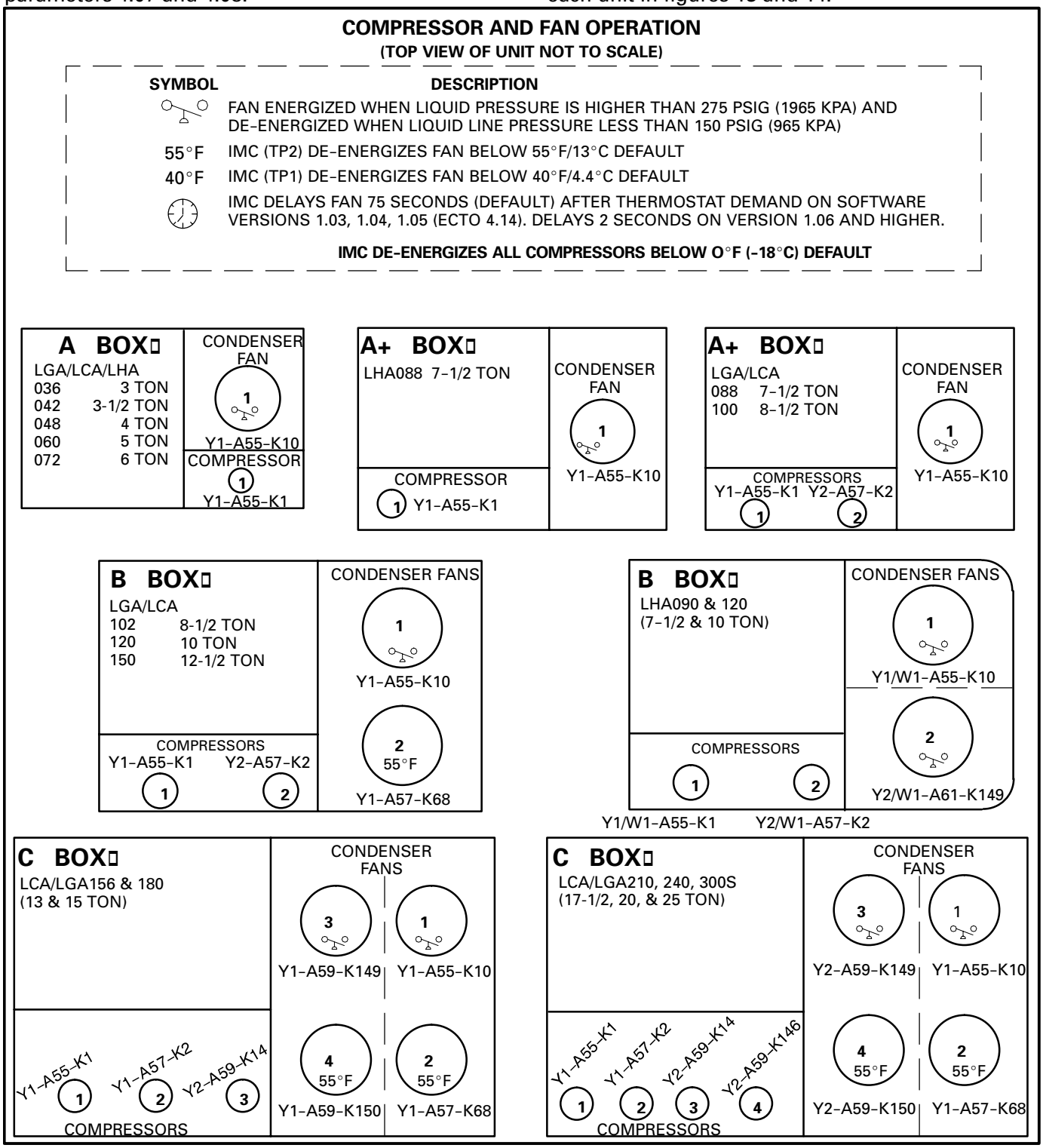
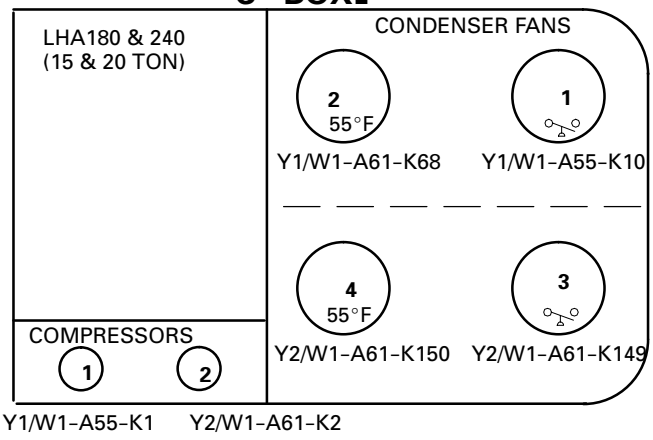


FIGURE 13

COMPRESSOR AND FAN OPERATION

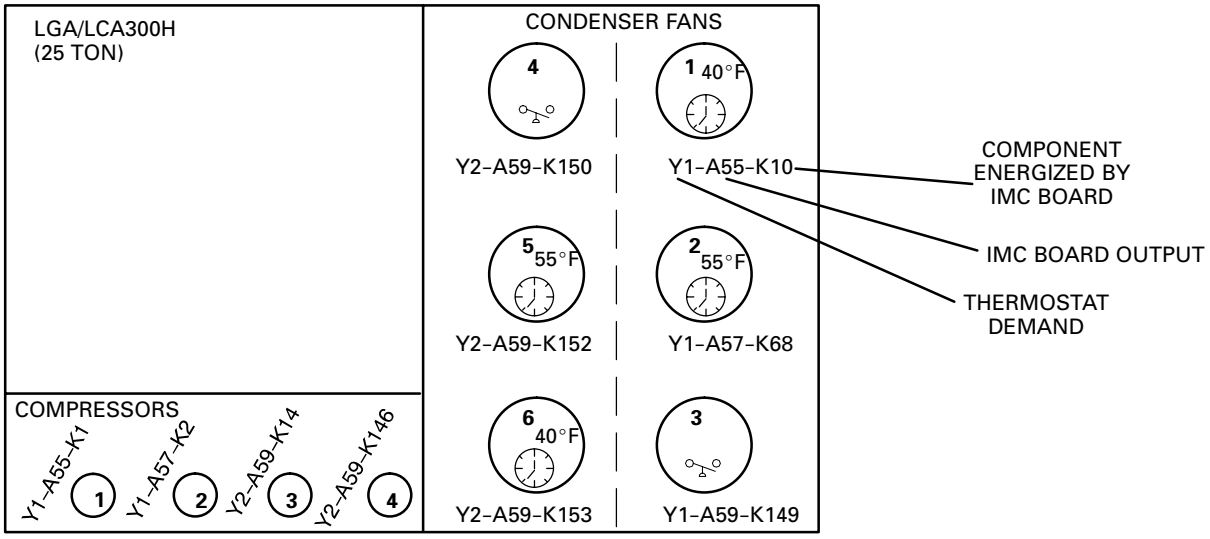
C BOX



SYMBOL	DESCRIPTION
	FAN ENERGIZED WHEN LIQUID PRESSURE IS HIGHER THAN 275 PSIG (1965 KPA) AND DE-ENERGIZED WHEN LIQUID LINE PRESSURE LESS THAN 150 PSIG (965 KPA)
55°F	IMC (TP2) DE-ENERGIZES FAN BELOW 55°F/13°C DEFAULT
40°F	IMC (TP1) DE-ENERGIZES FAN BELOW 40°F/4.4°C DEFAULT
	IMC DELAYS FAN 75 SECONDS (DEFAULT) AFTER THERMOSTAT DEMAND ON SOFTWARE VERSIONS 1.03, 1.04, 1.05 (ECTO 4.14). DELAYS 2 SECONDS ON VERSION 1.06 AND HIGHER.

IMC DE-ENERGIZES ALL COMPRESSORS BELOW O°F (-18°C) DEFAULT

D BOX



D BOX

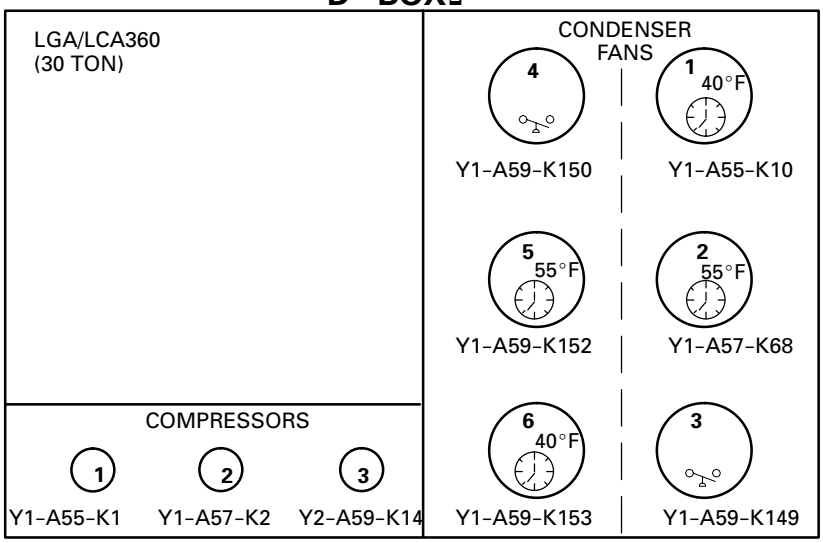


FIGURE 14

OPTIONAL ECONOMIZER

GENERAL

The A56 (EM1) economizer board controls economizer damper position to determine how much outdoor air is used for free cooling or for indoor air quality (IAQ) requirements. The A56 also controls the optional power exhaust fans.

HEARTBEAT LED

Flashing green LED indicates normal operation. See figure 15.

OUTDOOR AIR SUITABLE LED

A steady yellow LED indicates that outdoor air is suitable for free cooling. A flashing yellow OAS light indicates the IAQ sensor requires outdoor air. If the economizer is already operating, a flashing yellow OAS light indicates the IAQ sensor requires more outdoor air than is suitable for free cooling.

On software version 1.00, OAS LED is not used in global enthalpy mode. On software version 1.01 and higher, OAS LED is on if the global input is on.

DIP SWITCH SETTINGS

The economizer functions in one of four modes. The economizer board DIP switch setting for each mode is shown in figure 16. DIP switch is factory–set in the appropriate mode.

Sensors are factory–installed as needed for appropriate mode. When economizer is field–installed sensors are field–provided and installed.

ENTHALPY SETPOINT

ODE□ MODE ONLY

The recommended enthalpy setpoint is □A□. If the economizer is allowing air which is too warm or too humid to enter the system, the enthalpy control may be changed to a lower setting (B, C, or D). Table 4 shows the approximate enthalpy control temperature setpoints at 50% relative humidity.

Example:

At setting □A□, the enthalpy control will modulate dampers open when outdoor air is at 73° F and 50% relative humidity. If space temperatures are too warm, rotate the potentiometer to □B□. The enthalpy control will now modulate dampers open when outdoor air is 70°F and 50% relative humidity.

TABLE 4
ENTHALPY CONTROL SETPOINTS

CONTROL SETTING	ENTHALPY CONTROL SETPOINT AT 50% RELATIVE HUMIDITY APPROXIMATE °F (°C)
A	73 (23)
B	70 (21)
C	67 (19)
D	63 (17)

DIF□ MODE ONLY

When the enthalpy setpoint is in the □DIF□ position, the economizer board will compare outdoor air enthalpy to return air enthalpy. If outdoor air enthalpy is lower than return air enthalpy, dampers will allow use of outdoor air. If return air enthalpy is lower than outdoor air enthalpy, dampers will modulate to minimum position.

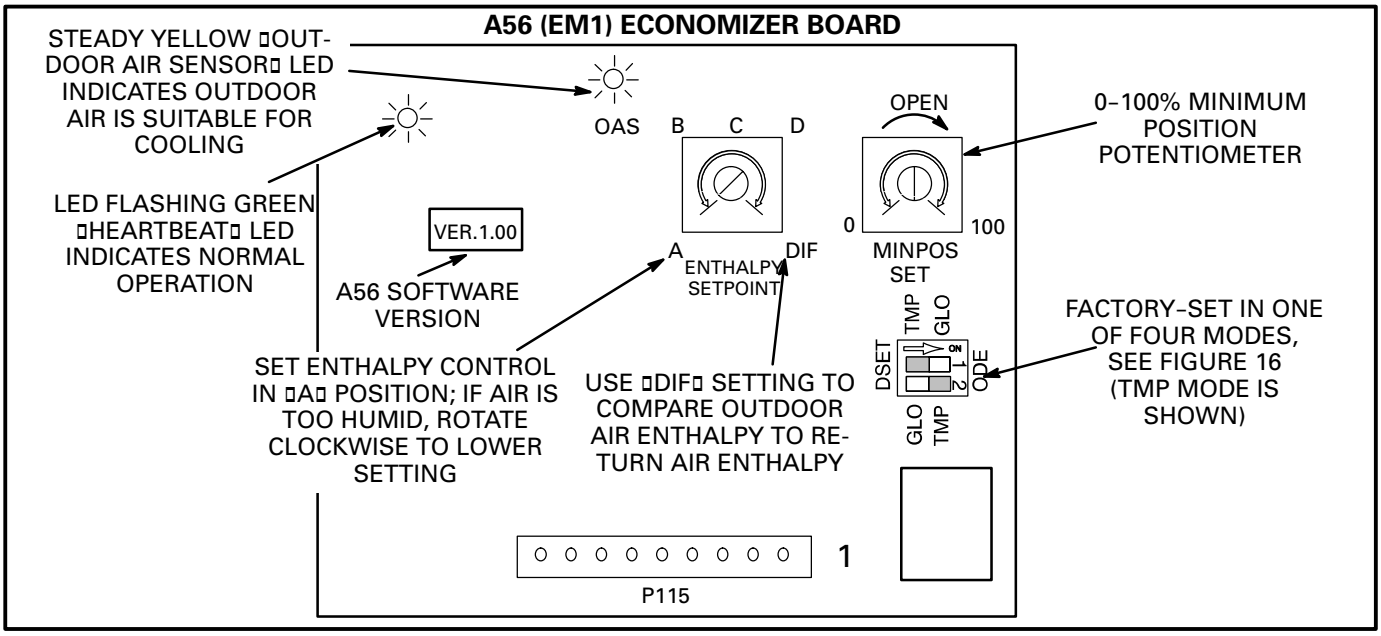


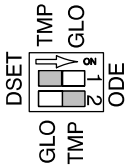
FIGURE 15

A56 (EM1) DIP SWITCH SETTINGS

NOTE–ALL ECONOMIZER MODES OF OPERATION, EXCEPT DSET, WILL MODULATE DAMPERS TO 55°F (13°C) SUPPLY AIR.

TMP (SENSIBLE TEMPERATURE)

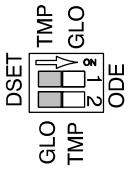
Switches set to read sensible temperature. A56 allows free cooling when outdoor air temperature is less than return air temperature. The enthalpy setpoint is ignored in this mode.



DSET (DAMPER SET)

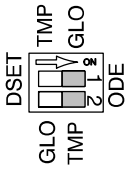
Switches set to make damper minimum position and humidity selections, to test damper motor and to set damper linkage.

NOTE – ▯Damper set▯ mode locks economizer into minimum position.



ODE (OUTDOOR ENTHALPY)

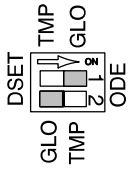
Switches set to read outdoor air enthalpy (temperature and humidity). Dampers open for free cooling if outdoor air is less than the A56 (EM1) board setpoint.



GLO (GLOBAL)

Switches set to read global enthalpy. Multiple unit installations use only one enthalpy sensor to determine outdoor air suitability (rather than one enthalpy sensor per unit). This setting is also used for motorized outdoor air damper applications.

NOTE – Used with Energy Management Systems and global enthalpy sensor.



DIF (DIFFERENTIAL ENTHALPY)

DIP switch setting the same as ▯ODE▯. Enthalpy setpoint set to ▯DIF▯. Switches set for differential enthalpy or return air sensor enthalpy compared to outdoor air enthalpy. Dampers open for free cooling when outdoor air enthalpy is lower than return air enthalpy.

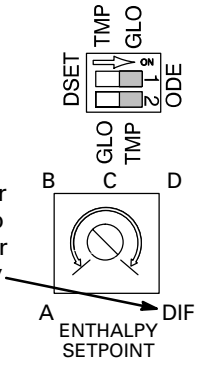


FIGURE 16

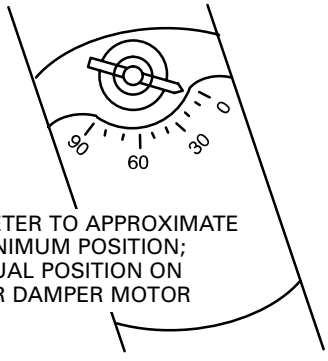
DAMPER MINIMUM POSITION POTENTIOMETER

Set economizer DIP switch to ▯DSET▯ position as shown in figure 16.

Rotate MIN POS SET potentiometer to approximate desired damper position.

Check indicator on damper motor to determine actual damper position. Adjust potentiometer until damper motor reads desired position. See figure 17.

ECONOMIZER DAMPER MINIMUM POSITION
(NOTE: MOTOR ROTATES SLOWLY)



SET POTENTIOMETER TO APPROXIMATE DAMPER MINIMUM POSITION; CHECK ACTUAL POSITION ON ECONOMIZER DAMPER MOTOR

FIGURE 17

EXHAUST FAN OPERATION

Optional power exhaust fan is controlled by an A56 (EM1) board output (see K65 on unit ▯B▯ schematics). Refer to P115–3 in inputs and outputs section. Power exhaust fans are energized when economizer dampers reach 50% (default). ECTO 5.09.

ECONOMIZER OPERATION

See table 5 for economizer operation with a standard two–stage thermostat

Table 6 shows economizer operation with an energy management system which uses a global sensor.

Both tables show the occupied and unoccupied time period. The occupied time period is determined by the thermostat or energy management system.

NOTE – Use indicating lights on A55 (M1) main board to determine thermostat demand.

MOTORIZED OUTDOOR AIR DAMPER

Set damper position according to ▯Damper Minimum Position Potentiometer▯ section. For normal operation, make sure the economizer board DIP switch is set to ▯GLO▯ position as shown in figure 16.

TABLE 5
ECONOMIZER OPERATION
Standard Two-Stage Thermostat

OUTDOOR AIR IS **NOT SUITABLE** FOR FREE COOLING--OAS LED ▯OFF▯

THERMOSTAT DEMAND	DAMPER POSITION **UNOCCUPIED**	DAMPER POSITION **OCCUPIED**	MECHANICAL COOLING
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Y1	CLOSED	MINIMUM	STAGE 1
Y2	CLOSED	MINIMUM	STAGES 1 AND 2

OUTDOOR AIR IS **SUITABLE** FOR FREE COOLING--OAS LED ▯ON▯

THERMOSTAT DEMAND	DAMPER POSITION **UNOCCUPIED**	DAMPER POSITION **OCCUPIED**	MECHANICAL COOLING
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Y1	MODULATING	MODULATING	NO
Y2	MODULATING (1)	MODULATING (1, 2)	STAGES 1 AND 2

NOTE – Modulating dampers adjust to control supply air (RT6) to 55°F (13°C).

(1) -- A56 Software version 1.00: The damper will stay in the previous position unless the economizer was off. If the previous state of the economizer was off, the damper will go to minimum position.

(2) -- The IMC board goes into a ▯cool down▯ or ▯warm-up▯ mode when the occupied time period starts. See ▯Main Control Operations▯ section.

TABLE 6
ECONOMIZER OPERATION WITH GLOBAL SENSING
Energy Management System

GLOBAL INPUT **OFF--**OAS LED ▯OFF▯

THERMOSTAT DEMAND	DAMPER POSITION **UNOCCUPIED**	DAMPER POSITION **OCCUPIED**	MECHANICAL COOLING
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Y1	CLOSED	MINIMUM	STAGE 1
Y2	CLOSED	MINIMUM	STAGES 1 AND 2

GLOBAL INPUT **ON--**OAS LED ▯ON▯ (3)

THERMOSTAT DEMAND	DAMPER POSITION **UNOCCUPIED**	DAMPER POSITION **OCCUPIED**	MECHANICAL COOLING
OFF	MODULATING	MODULATING	NO
G	MODULATING	MODULATING	NO
Y1	MODULATING (1)	MODULATING (1)	STAGE 1
Y2	MODULATING (1, 2)	MODULATING (1, 2)	STAGES 1 AND 2

NOTE – Modulating dampers adjust to control supply air (RT6) to 55°F (13°C).

(1) -- A56 Software version 1.00: The damper will stay in the previous position unless the economizer was off. If the previous state of the economizer was off, the damper will go to minimum position.

(2) -- The IMC board goes into a ▯cool down▯ or ▯warm-up▯ mode when the occupied time period starts. See ▯Main Control Operations▯ section.

(3)-- THE OAS LED does not function in global mode on A56 (EM1) software version 1.00.

ECONOMIZER CHECKOUT

The following checkout procedures are completed with unit energized. Confirm proper operation of the heartbeat LED on the A56 (EM1) economizer control board. See ▯IMC Board Components▯ section.

Steps 3, 4, 5, and 6 checkout the operating modes; checkout only the mode that applies to the unit being worked on. Use ▯DSET▯ Operation checkout only when step 1 refers to it.

CAUTION–Power exhaust dampers will be functional. To prevent operation of gravity exhaust dampers, disconnect power to unit and then PED jack/plug P/J18.

STEP 1
A56 ECONOMIZER BOARD OUTPUT VOLTAGE

1– Set the A56 DIP switch to DSET.

2– Adjust the MIN POS SET potentiometer (on A56 board) to the 0% position (fully counterclockwise). The motor will slowly modulate to the closed position.

3– Adjust the MIN POS SET potentiometer to the 100% position (fully clockwise). The motor will slowly modulate to the fully opened position.

4– If the motor does not respond, go to step 2. If the motor does respond properly, go to the appropriate mode of operation checkout.

STEP 2
DSET▯ OPERATION

1– Disconnect J115 from P115 on A56 EM1 board.

2– Set the DIP switch to the ▯DSET▯ position.

3– Adjust the MIN POS SET potentiometer to the 0% position (fully counterclockwise).

4– Measure the voltage on P115 between pin 2 (VOT) and pin 1 (TB34–2) **using pin 1 as common.** Voltage should read approximately 2 volts DC on EM1 (A56) software version 1.02 and higher; voltage should read approximately zero on EM1 (A56) software version 1.00 and 1.01.

5– Adjust the MIN POS SET potentiometer to the 100% position (fully clockwise).

NOTE – Allow approximately 30 seconds for voltage to react.

6– Measure the voltage between P115 pin 2 and 1 **with pin 1 as common.**
Voltage should read approximately 10 volts **DC**.

Connect J115 to P115 and measure the same terminals again. This confirms that output voltage is correct at the board and the connector.

If the voltage changes more than .5VDC, there may be a wiring or motor problem.

If voltage at the damper motor is correct, check continuity in wiring between the control board and the damper motor.

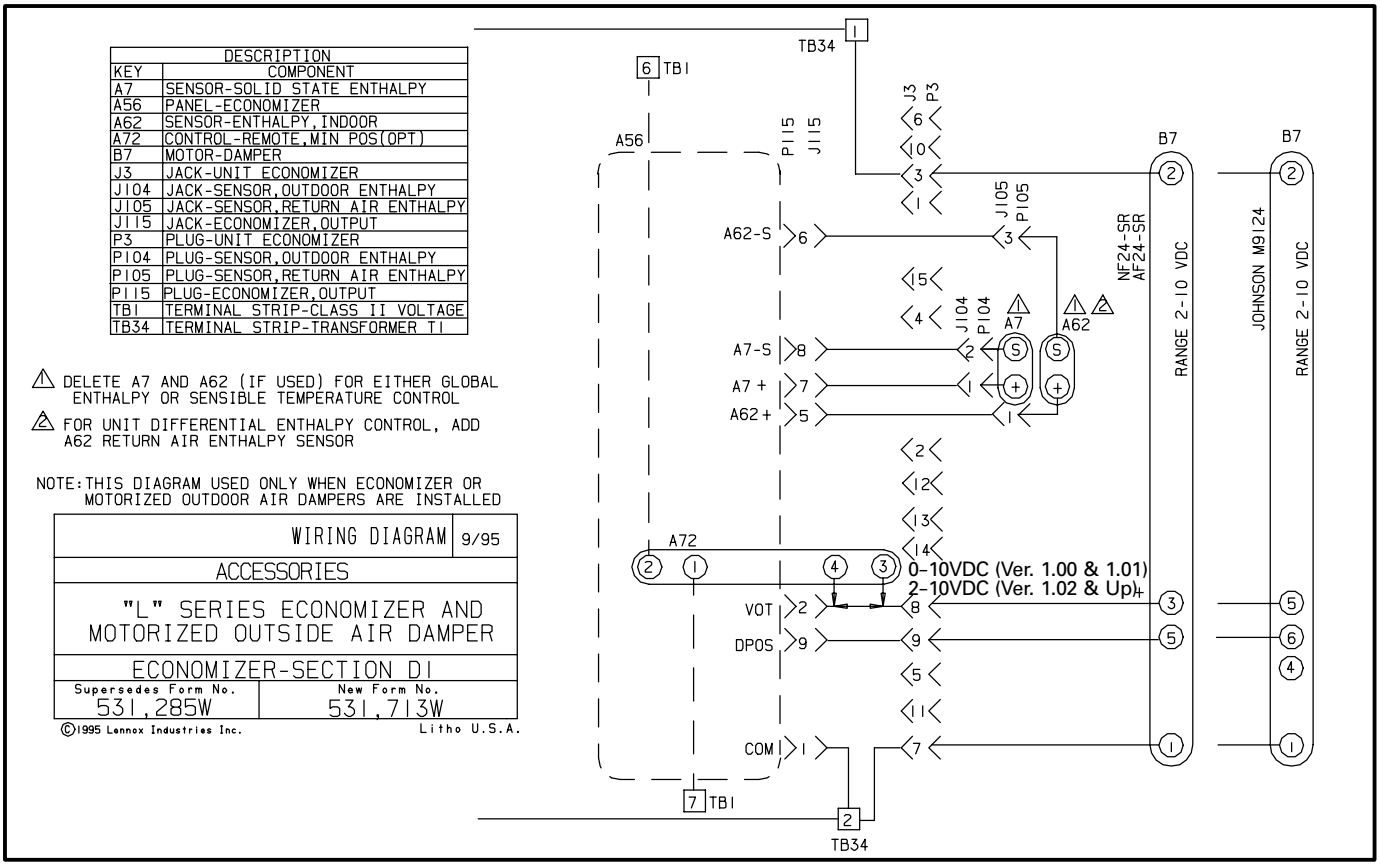


FIGURE 18

STEP 3
ODE□ MODE OF OPERATION

In the ODE mode, dampers open for free cooling when the outdoor enthalpy is less than the enthalpy setpoint; dampers will modulate supply air temperature (RT6) to 55°F (13°C).

1- Set the A56 DIP switch to ODE mode.

2- To simulate low outdoor enthalpy, set the enthalpy setpoint to □B.□ Disconnect A7 outdoor enthalpy sensor jack/plugs J/P104. Connect a 200 ohm resistor across plug J104–1 and J104–2. J104 is located in the filter access area.

3- After a few seconds delay, the yellow OAS LED on the A56 board should turn on.

4- If the OAS LED does not turn on, check all connections and wiring between J104 and the control.

STEP 4
DIF□ MODE OF OPERATION

In the DIF mode, dampers open for free cooling when the outdoor air enthalpy is lower than the return air enthalpy; dampers will modulate supply air temperature (RT6) to 55°F (13°C).

1- Set the A56 DIP switch to ODE.

2- Set the enthalpy setpoint potentiometer to DIF.

3- Use two resistors to simulate outdoor air enthalpy suitable.

a)-Disconnect J/P105 A62 return air enthalpy sensor jack/plug. Place a 750 ohm resistor between J105–1 and J105–3. J/P105 is located in the filter access area.

b)-Disconnect A7 outdoor enthalpy sensor jack/plugs J/P104. Connect a 100 ohm resistor across J104–1 and J104–2.

4- After a few seconds delay, the yellow OAS LED will turn on.

5- If the OAS LED does not turn on, check all connections and wiring between J104 and A56, and between J105 and A56.

STEP 5
TMP□ MODE OF OPERATION

In the TMP mode, the damper opens for free cooling when the outdoor air temperature is less than the return air temperature; dampers will modulate supply air temperature (RT6) to 55°F (13°C).

Refer to the □Displaying Sensor Inputs□ section to read return air (RT16) and outdoor air (RT17) temperatures. If outdoor air is not cooler than return air, simulate a colder outdoor air temperature with a resistor. Select a resistor value that corresponds to a temperature less than the return air temperature. See table 7.

TABLE 7

TEMPERATURE °F (°C)	SIZE RESISTOR
30 (–1)	34,566
40 (4)	26,106
50 (10)	19,904
60 (16)	15,313
70 (21)	11,884
80 (27)	9,298
90 (32)	7,332
100 (38)	5,826

1- RT17 is located on the right wall of the control/compressor section on LGA and LCA units. RT17 is located on the right front corner mullion of LHA units. Disconnect 1/4□ quick connect terminals on wires leading from sensor.

2- Jumper RT17 wires leading back to control with the appropriate resistor.

2- After a few seconds delay, the yellow OAS LED on the A56 board should turn on.

3- If the OAS LED does not turn on, check all connections and wiring between RT17 and the A55 main control board, and RT16 and the main control board.

STEP 6
GLO□ MODE OF OPERATION

In the GLO mode, dampers open for free cooling when the global input is energized; dampers will modulate supply air temperature (RT6) to 55°F (13°C).

NOTE – The global input turns on the blower.

1– Set the A56 DIP switch to GLO.

2– Connect a jumper between TB1–6 (24vac) and TB1–1 (global). The blower will be energized and the damper will slowly open if supply air temperature (RT6) is less than 55°F (13°C).

NOTE – On software version 1.00, OAS LED is not used in global enthalpy mode. On software versions 1.01 and higher, OAS LED is on if the globlal input is on.

3– Disconnect 24vac to TB1–1. The blower will turn off and the damper will close.

4– If the damper does not actuate check all connections and wiring between J115 and J3.

STEP 7
ENTHALPY SENSOR OPERATION (A7 AND A62)

1– Connect a DC ampmeter as shown in figures 19 and/or 20.

2– The reading will be between 4 and 20 ma. depending on outdoor temperature and humidity. Refer to table 8 to approximate reading.

3– If the meter reads zero, check sensor wiring harness for continuity and/or check polarity of sensor wiring.

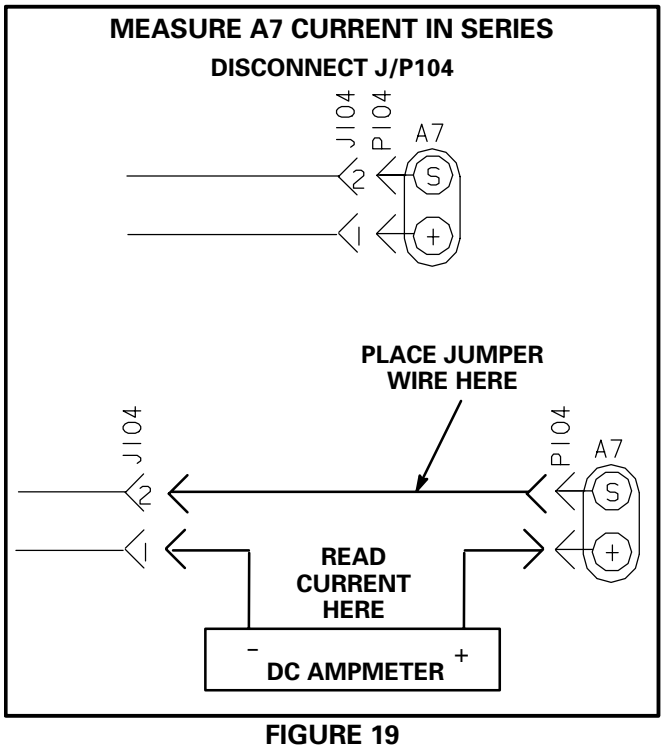


FIGURE 19

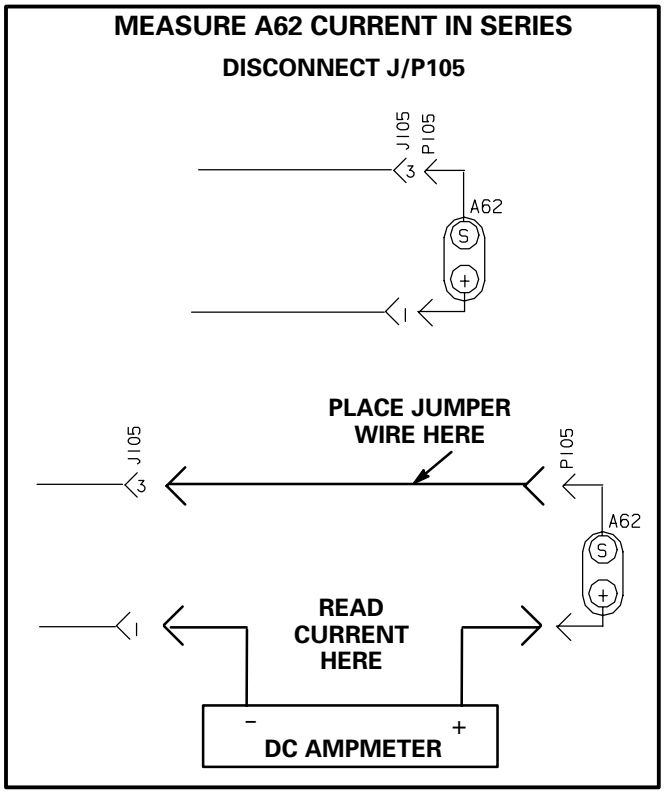
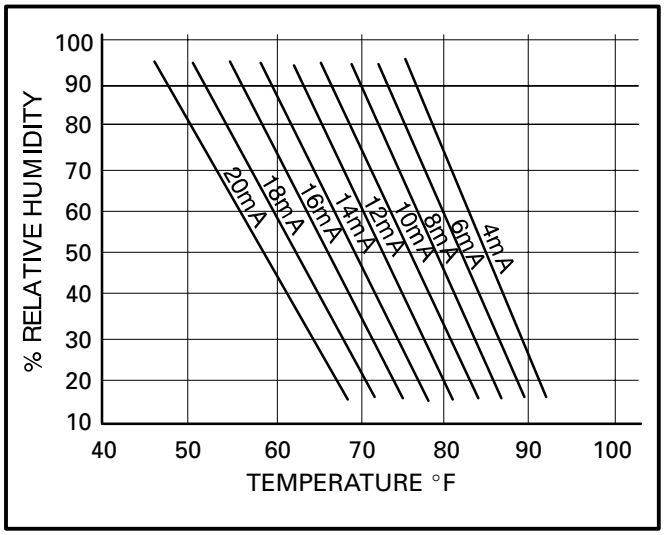


FIGURE 20

TABLE 8
ENTHALPY SENSOR OUTPUT CURRENT
HONEYWELL C7400



IAQ SENSOR

General

A field–provided and installed indoor air quality sensor can be used with the modulating economizer to control CO_2 levels in the conditioned space. The CO_2 level in a space is an indicator of the number of people occupying a room. As the CO_2 level rises (indicating the occupancy of a room has increased), economizer dampers modulate open – regardless of outdoor air enthalpy. Likewise, as the CO_2 level falls (indicating the occupancy has decreased), economizer dampers modulate further closed.

Standard economizer installations have a minimum fresh air ventilation requirement based on maximum room occupancy. With standard economizer use, the amount of air required for maximum room occupancy is heated or cooled with each heating or cooling cycle. IAQ economizer installations use the maximum amount of required ventilation air only with maximum room occupancy; less outdoor air needs to be heated or cooled when fewer people are in the conditioned space.

If the economizer is operating in the free cooling mode and the IAQ control requires the damper to open further, the IAQ demand will override the free cooling demand. A flashing OAS LED on the A56, EM1 economizer board indicates an IAQ override condition.

The IAQ function is not energized during the unoccupied or night time period.

NOTE – The IAQ sensor may also be used with systems containing a motorized outdoor air damper.

Default Operation

The IMC has a 0–10VDC IAQ input for a standard 0–2000ppm CO_2 sensor. The economizer starts opening at a CO_2 level of 500 ppm (□start open□ setpoint) and reaches full open at a CO_2 level of 1000ppm (□full open□ setpoint). The damper opens to 100%. Determine damper travel position using the following formula. Use □Displaying Sensor Inputs□ section to read CO_2 ppm.

$$\% \text{ Damper Travel} = \frac{CO_2\text{ppm} - \text{Start Open ppm}}{5}$$

For example: at a CO_2 level of 750ppm, the damper will be approximately 50% open.

$$\% \text{ Damper Travel} = \frac{750 - 500}{5} = 50\%$$

ECTO Adjustments

Default IAQ economizer operation is based on common or average applications. Adjustments may be made to the IAQ ECTO parameters to alter operation or meet required specifications. Use the □ECTO Control Parameters□ section to change ECTO parameters 5.16 through 5.22.

Some applications require a different CO_2 setpoint range than default settings. Damper □start open□ (ECTO 5.17) and □full open□ (ECTO 5.18) CO_2 setpoints may be adjusted from 0 to 1992ppm. Use the following formula to determine damper travel.

NOTE – When changing CO_2 *setpoint range, start open□ setpoint should be less than full-open□ setpoint.*

$$\% \text{ Damper Travel} = \frac{CO_2\text{ppm} - \text{Start Open ppm}}{\left(\frac{\text{Full Open} - \text{Start Open}}{100}\right)}$$

For example: An application requires the dampers open at 800 CO_2 ppm and reach full open at 1200. If the CO_2 level in the space reads 1000 ppm, calculate the damper percent open as follows.

$$\begin{matrix}\% \\ \text{Damper} \\ \text{Travel}\end{matrix} = \frac{1000 - 800}{\left(\frac{1200 - 800}{100}\right)} = \frac{200}{\left(\begin{matrix}4\end{matrix}\right)} = 50\%$$

In applications requiring faster response to CO_2 levels, set the □full open□ (ECTO 5.18) setpoint higher than the □start open□ (ECTO 5.18) setpoint. The damper will drive to fully–opened position immediately.

IMC BOARD MANUAL OUTPUT TEST

The IMC board test outputs check for operation of the blower, outdoor fans, reversing valves, and service relay terminals.

Move the MODE DIP □UNIT TEST□ switch #1 to ON. See figure 21.

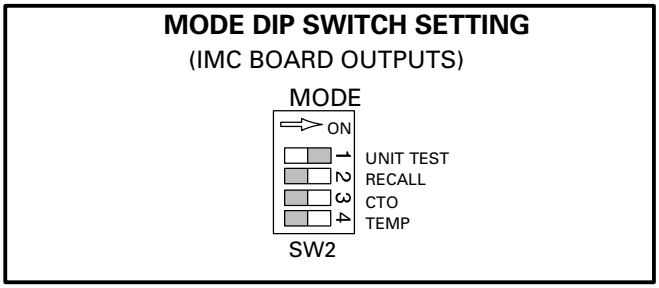


FIGURE 21

For a few seconds only a decimal point will be displayed. Then a □0□ will be displayed indicating an IMC board output. See figure 22.

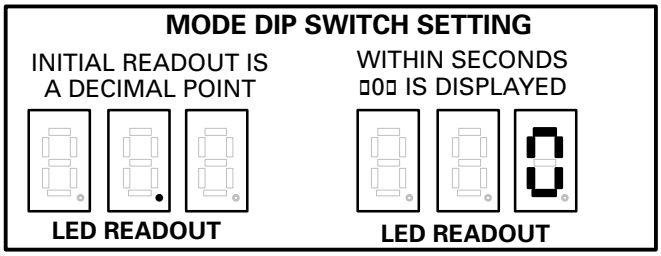


FIGURE 22

A single push on the pushbutton will toggle the readout upward from 0 to 9. Each readout indicates an output which will energize a unit function. See table 9 for type of output. Two pushes, or a double push, will toggle the output downward from 9 to 0.

TABLE 9
TESTING OUTPUTS

READOUT	OUTPUT ENERGIZED	OUTPUT	
0	.0	BLOWER	K3-A
1	.1	FAN 1	K10A
2	.2	FAN 2	K68
3	.3	FAN 3	K149
4	.4	FAN 4	K150
5	.5	FAN 5	K152
6	.6	FAN 6	K153
7	.7	REVERSING VALVE 1	L1
8	.8	REVERSING VALVE 2	L2
9	.9	SERVICE RELAY	(SR)

An output may be turned □ON□ by pressing down on the pushbutton until a decimal appears. The output may be turned □OFF□ by pressing down on the pushbutton until the decimal disappears. See figure 23.

Turning off the MODE DIP □UNIT TEST□ switch #1 resets the control.

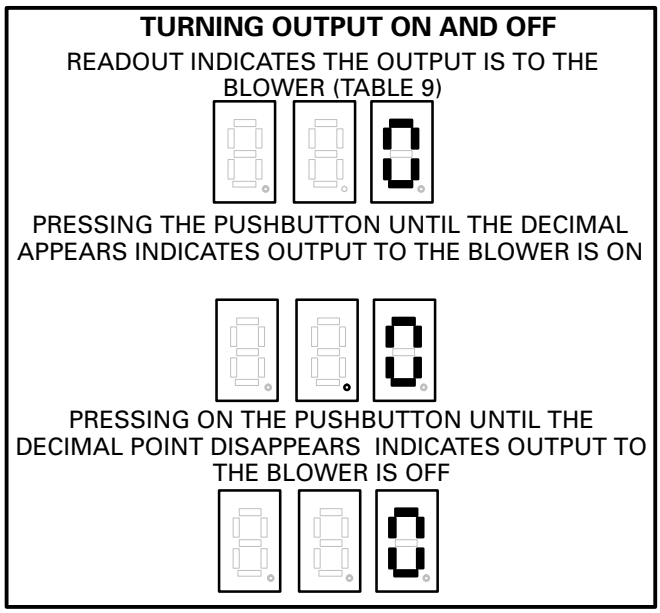


FIGURE 23

Example:

To check fan 3 operation (see figure 24):

1–Set MODE DIP switch #1 to □UNIT TEST□.

2–With a short press, toggle pushbutton until number 3 is indicated.

3–Press pushbutton until decimal appears; fan three will be energized.

4–Press pushbutton until decimal goes off; fan three will be de-energized.

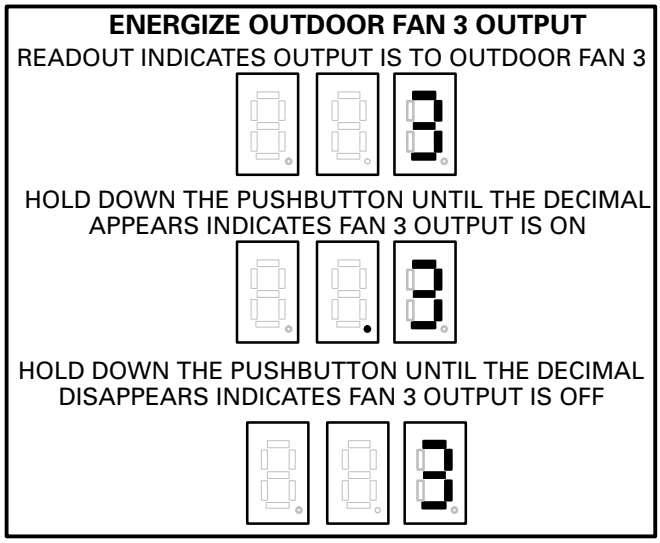


FIGURE 24

TEST

IMC BOARD THERMOSTAT SIMULATION TEST

The IMC board simulates thermostat inputs to check compressor and gas heat operation. In the test mode thermostat inputs are ignored by the IMC.

Move the UNIT DIP ▯SHIFT▯ switch #3 to ▯ON▯. Move the MODE DIP ▯UNIT TEST▯ switch #1 to ▯ON▯. See figure 25.

NOTE – UNIT DIP ▯SHIFT▯ switch #3 must be turned on before MODE DIP ▯UNIT TEST▯ switch #1.

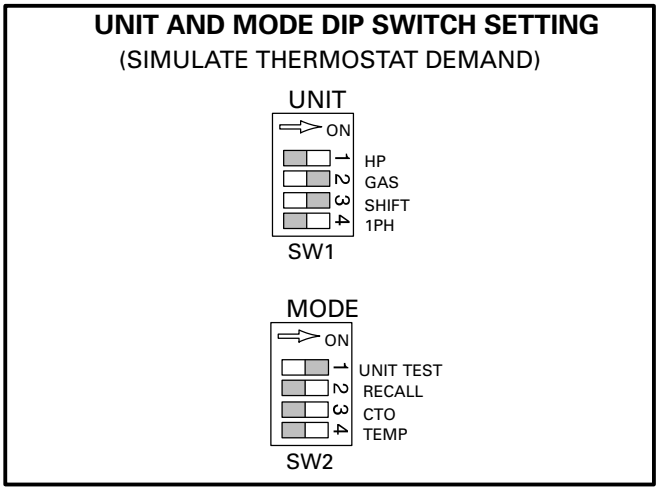


FIGURE 25

For a few seconds only a decimal point will be displayed. Then a ▯c01▯ will be displayed simulating a thermostat input.

A single push on the pushbutton will toggle the readout upward from ▯c01▯ to ▯S01▯, incrementally, as shown in table 10. A double push will toggle the readout downward from ▯S01▯ to ▯c01▯ incrementally.

TABLE 10
TESTING INPUTS

READ-OUT	INPUT ENER-GIZED	THERMO-STAT INPUT SIMULATION	FUNCTION
c01	c01.	Y1 & G	1ST STAGE COOLING
c10	c1.0	Y2 & G	1ST & 2ND STAGE COOLING
c11	c1.1.	Y1, Y2, & G	1ST & 2ND STAGE COOLING
h01	h01.	W1	1ST STAGE HEATING
h10	h1.0	W2	LGA/LCA – 1ST & 2ND STAGE HEATING
			LHA – EMERGENCY HEAT
h11	h1.1.	W1 & W2	1ST & 2ND STAGE HEATING
S01	S01.	SMOKE	UNIT OFF (DEFAULT)

An input may be turned ▯ON▯ by pressing down on the pushbutton until a decimal appears. The output may be turned ▯OFF▯ by pressing down on the pushbutton until the decimal disappears. See figure 26.

Delays, such as a minimum run time, may prevent an immediate response to an input. Return DIP switches to normal operation to bypass most delays (see ▯Pushbutton▯ in IMC Board Component section). Unit will be de-energized until next thermostat demand.

NOTE – On A55 software versions 1.03 and higher, the compressor minimum run delay is automatically bypassed during thermostat simulation test.

Example:

To check compressor operation:

1–Set UNIT DIP switch #3 to ▯SHIFT▯. Set MODE DIP switch #1 to ▯UNIT TEST▯.

2–With a short push, toggle pushbutton until ▯c11▯ is indicated.

3–Press pushbutton until decimal appears; all compressors will be energized.

NOTE – Units may have more than one compressor per stage of cooling. Refer to unit wiring schematic to determine which compressors are energized by first– and second–stage cooling demands.

Turning off the MODE DIP ▯UNIT TEST▯ switch #1 and UNIT DIP ▯SHIFT▯ switch #3 returns unit to normal operation and resets all delays except blower off delays used with compressor operation.

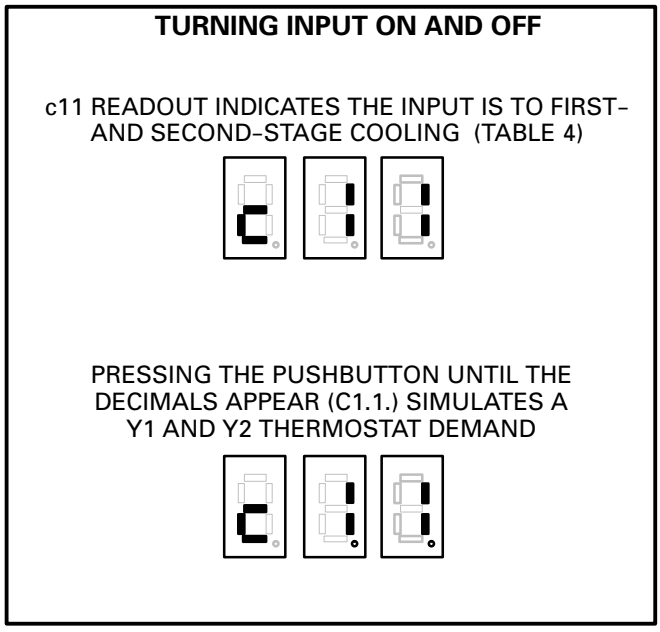


FIGURE 26

TEST

DISPLAYING SENSOR READINGS

Sensor temperature, IAQ sensor voltage, and economizer damper position may be read on the IMC board display.

Turn MODE DIP □TEMP□ switch #4 □ON□, as shown in figure 27, to read the outputs shown in table 11.

Display will alternately flash from readout to output.

A single push on the pushbutton will toggle the readout upward from .0 to .6, incrementally, as shown in table 12. A double push will toggle the readout downward from .6 to .0 incrementally.

DISPLAYING SENSOR INPUT DIP SWITCH SETTING

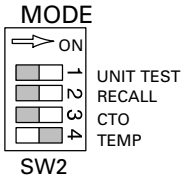


FIGURE 27

TABLE 11
READ SENSOR OUTPUT

READOUT	OUTPUT
.0	OUTDOOR AIR TEMPERATURE–°F (RT17)
.1	RETURN AIR TEMPERATURE–°F (RT16)
.2	SUPPLY AIR TEMPERATURE–°F (RT6)
.3	ROOM AIR TEMPERATURE–FUTURE USE (A2)
.4	IAQ SENSOR OUTPUT–COUNTS (A63)
.5	IAQ ECONOMIZER DAMPER POSITION–%
.6	ECONOMIZER DAMPER POSITION–%

TEMPERATURE SENSORS

RT6 monitors supply air temperature. RT16 monitors return air temperature. The main function of RT6 and RT16 is controlling the economizer. Both are also used for diagnostic purposes.

RT17 monitors outdoor air temperature. RT17 is used when controlling low ambient fan cycling, low ambient compressor lockout, strike three control, high ambient strip heat lockout, economizer control, and other control functions.

Outdoor, return, supply, and room air sensor temperatures are displayed to the nearest degree Fahrenheit (°F).

NOTE – RT6, RT16, and RT17 do not sense enthalpy□, or total heat content of air.

Outdoor, return air, and supply air sensors are factory–provided and installed. Room air sensors are field–provided and installed.

IAQ SENSOR OUTPUT VOLTAGE

IAQ sensors are field–provided and installed. Sensors interface with standard modulating economizers to bring in outdoor air when CO_2 levels are high. The IAQ input is compatible with IAQ sensors which have a 0–10VDC output and a CO_2 range of 0–2000ppm.

Toggle pushbutton to .4 to read IAQ sensor output. The display will read between 0 and 255. Divide the reading by 25.5 to calculate the IAQ sensor output voltage. Multiply the reading by 7.843 to calculate the sensor CO_2 ppm.

Example:

1–Set MODE DIP □TEMP□ switch #4 to □ON□.

2–Toggle pushbutton until .4 reading is alternately flashing with an output reading. Figure 28 shows an output reading of 100.

3–Divide output reading by 25.5 to get IAQ sensor output voltage. See figure 28.

IAQ SENSOR OUTPUT VOLTAGE EXAMPLE

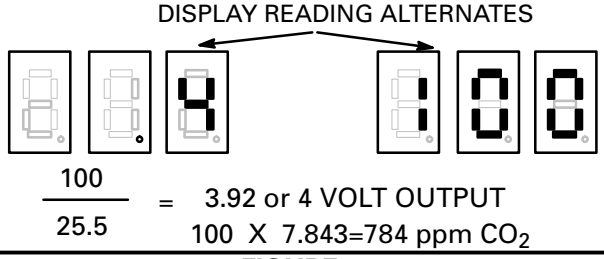


FIGURE 28

ECONOMIZER DAMPER POSITION

Readout .6 displays the damper motor feedback in percent open. The feedback range for the economizer motor is 2–10vdc. Units with EM1 (A56) economizer software versions 1.02 and later board will display a range of 20–100% (20% is damper closed). Units with the EM1 (A56) economizer software versions 1.00 and 1.01 will display a range of 0–100% (0% is damper closed). See table 12.

TABLE 12
DAMPER POSITION

READOUT	% OPEN	
	(VER. 1.00 & 1.01)	(VER. 1.02 AND UP)
0	0	0
10	0	10
20	0	20
30	13	30
40	25	40
50	38	50
60	50	60
70	63	70
80	75	80
90	88	90
100	100	100

TEST

ELECTRONIC CONFIGURE TO ORDER (ECTO) CONTROL PARAMETERS

Many IMC main control operations may be varied within a set range. Default settings are based on common or average applications; change ECTO settings only when custom applications, preferences or local building codes exist. Default, minimum, and maximum range settings are found in table 13.

READING CONTROL PARAMETERS

Control parameters can be viewed using the pushbutton and display. Set the MODE DIP ▯CTO▯ switch #3 to ▯ON▯ to read the parameter which corresponds to a control value. See figure 29.

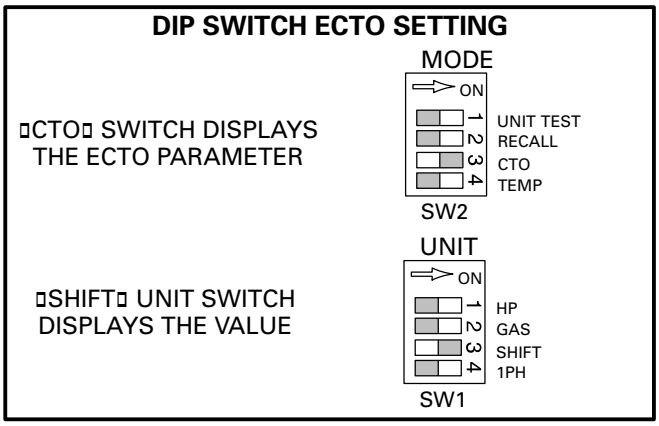


FIGURE 29

The parameters are set up in five different blocks or groups. The first digit of each parameter indicates the block as follows:

1–LHA Heating Parameters
2–LCA Heating Parameters
3–LGA Heating Parameters
4–Cooling Parameters
5–Miscellaneous Parameters

A short push will move the display to the next parameter. A double push will move the display to the previous parameter. A long push will move the reading to the next block.

An IMC board with DIP switches set for an LGA unit will skip LHA block 1 and LCA block 2 readouts. An IMC board with DIP switches set for an LCA unit will skip LHA block 1 and LGA block 3 readouts. An IMC board with DIP switches set for an LHA unit will skip LCA block 2 and LGA block 3 readouts.

CHANGING CONTROL VALUES

Control values may be adjusted using the pushbutton and display. Once the appropriate control parameter is displayed, turn on the UNIT DIP ▯SHIFT▯ switch #3 to read the current ECTO value. See figure 29.

A short push will display the next value. A double push will decrease the value by 10. A long push before returning to control parameters (turning off SHIFT switch) will return the value to the currently stored value. A long push will move the reading to the next block and store the new ECTO value. The value may also be stored by turning off the SHIFT and CTO DIP switches. The readout will turn off and all decimals will turn on when new ECTO parameters are stored. The control also resets at this time.

Control parameters are displayed in seconds, minutes, codes or number of counts. See table 14 to determine actual time or temperature span. Parameters may be calculated from counts using the following code calculations.

CODE A: SECONDS = 2.097 x COUNTS
CODE B: SECONDS = 4.194 x COUNTS
CODE C: SECONDS = 8.388 x COUNTS
CODE D: SECONDS = 33.554 x COUNTS
CODE E: SECONDS = 134.217 x COUNTS
CODE Y: TEMP. (F) = 131.56 – (.6360 x COUNTS)
CODE Z: TEMP. (F) = 40.0 + (COUNTS/5.1)

Change ECTO Summary:

1–Turn CTO switch on.

2–Pushbutton to desired parameter.
Short push advances parameter.
Long push advances block.

3–Read present ECTO value with SHIFT switch.

4–Change value with pushbutton.

5–Turn off SHIFT switch. For multiple changes repeat steps 2 through 5.

6–Turn off CTO and SHIFT switch.

Example:

Use the following steps to increase compressor minimum–off delay interval.

1–Set the MODE DIP ▯CTO▯ switch #3 to ▯ON▯.

2–With a long push on the pushbutton, move the control parameter to the cooling block; the display will read ▯4.01▯.

3–With short pushes of the pushbutton, toggle upward until the readout displays ▯4.10▯.

4–Set the UNIT DIP ▯SHIFT▯ switch #3 to ▯ON▯.

5–The display will read ▯143.▯. The ECTO Control Parameter Table (Table 13) shows a default of 143 counts or 300 seconds. The table also shows a range of 29 counts (61seconds) to 255 counts (535 seconds).

6–To change the compressor minimum–off delay from 300 seconds (5 minutes) to 360 seconds (6 minutes), refer to Code Conversion Table (Table 14 Column A) as shown in Control Parameter Table

(Table 13) for number of counts to adjust control value to.

7–Short push the pushbutton until readout displays □172□.

8–To store the new ECTO control parameter, turn off the SHIFT and CTO switch. The readout will turn off and decimals will turn on. The control resets when new ECTO parameters are stored (□8.8.8.□ readout will flash).

RESET TO FACTORY ECTO PARAMETERS

To replace the factory ECTO parameters:

1–Turn on the SHIFT switch.

2–Turn on the CTO switch. On software version 1.03 and later, also hold down the pushbutton for approximately five seconds.

3–The display will read □–––.□ and then □0□.

4–Turn off CTO and DIP switches.

TABLE 13
IMC ECTO CONTROL PARAMETERS

BLOCK 1 LHA HEATING PARAMETERS						
Control Parameter		Control Value			Units	Description
No.	Name	Min.	Default	Max.		
1.01	WARM–UP DLY	27 15	54 30	255 143	Code D Minutes	Warm–up time delay. The time that the supplemental heat is held off during the first demand of warm–up. This parameter is only used if the parameter 1.17 is set to option 1.
1.02	BL ON	0 0	0 0	14 53	Code B Seconds	Blower on delay.
1.03	BL OFF	0 0	5 21	72 302	Code B Seconds	Blower off delay.
1.04	HT DIF	5 1	16 3	32 6	Code Z Deg. F	Differential in room air temperature that constitutes a second stage call. Used in room sensor applications only. For future use.
1.05	LT MAX	1	5	15	Counts	Service relay activation. Maximum Primary and Secondary Limit counts stored before service relay is energized. If max value is set, service output is disabled.
1.06	STRIP DLY	3 13	3 13	15 63	Code B Seconds	Time delay between 1 & 2 stage of strip heat.
1.07	STRIP LOCK1	113 60	160 30	175 20	Code Y Deg. F	Second bank of electric heat lock out.
1.08	STRIP LOCK2	113 60	144 40	175 20	Code Y Deg. F	Electric heat lock out. STRIP LOCK1 should be >= STRIP LOCK2
1.09	C LOCK	128 50	255 –––	255 –––	Code Y Deg. F	Low ambient lockout for compressors. 254 value equals –30 Deg.F. A value of 255 will disable the service output.
1.10	C OFF	29 61	143 300	255 535	Code A Seconds	Compressor minimum off delay. For 1 PH, or 3 PH units with error.
1.11	C RUN	29 61	114 239	255 535	Code A Seconds	Compressor minimum run time. For 3 PH units only.
1.12	HP MAX	1	3	8	Counts	Maximum High Pressure counts that are stored before control locks off compressor stage and energizes the service relay. If max value is set, service output is disabled.
1.13	LP MAX	1	3	8	Counts	Maximum Low Pressure counts that are stored before control locks off compressor stage and energizes the service relay. If max value is set, service output is disabled.
1.14	DF OPT	0	1	1	Option Number	Defrost options: 0: No supplemental heating during defrost. 1: Supplemental heating during defrost. Defrost will be initiated when the DFT (defrost temp. switch) (S6 or S9) closes and will terminate when the DFP (defrost press. switch) (S46 or S104) opens.
1.15	DFCYCLE	1 30	2 60	3 90	Option # Minutes	Minimum time allowed between defrost cycles. Multiples of 30 minutes.
1.16	DF MAX	2 10	3 15	5 25	Option # Minutes	Maximum defrost time allowed. Multiples of five minutes.

ECTO

TABLE 13
IMC ECTO CONTROL PARAMETERS (CONTINUED)

Control Parameter		Control Value			Units	Description
No.	Name	Min.	Default	Max.		
1.17	WARM-UP MODE	0	0	2	Option Number	Warm-up mode option. 0 :Supplemental heat may be used during warm-up. Use depends on outdoor temperature. See ECTO 1.07 and 1.08. 1: For the first demand cycle, lockout supplemental heat for the first 30 minutes (default). Time is adjustable by changing the parameter WARM-UP DLY # 1.01. 2: For the first demand cycle, lockout supplemental heat if the rate of rise of the return air (or room sensor if installed) is greater than 10°F/HR.(default). For future use.

BLOCK 2 LCA HEATING PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min.	Default	Max.		
2.01	WARM-UP DLY	0 0	107 60	255 143	Code D Minutes	Warm-up time delay. The time that the economizer is forced closed during warm-up.
2.02	BL ON	0 0	0 0	0 0	Code B Seconds	Blower on delay. Reserved for future use
2.03	BL OFF	0 0	5 21	72 302	Code B Seconds	Blower off delay.
2.04	HT DIF	5 1	16 3	32 6	Code Z Deg. F	Differential in room air temperature that constitutes a second stage call. Used in room sensor applications only. For future use.
2.05	LT MAX	1	3	15	Counts	Service relay activation. Maximum Primary and Secondary Limit counts stored before service relay is energized. If max value is set, service output is disabled.
2.06	STRIP DLY	3 13	3 13	15 63	Code B Seconds	Strip heat delay between 1 & 2 stages .

BLOCK 3 LGA HEATING PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min.	Default	Max.		
3.01	WARM-UP DLY	0 0	107 60	255 143	Code D Minutes	Warm-up time delay. The time that the economizer is forced closed during warm-up.
3.02	BL ON	2 8	10 42	14 59	Code B Seconds	Blower on delay.
3.03	BL OFF	19 80	29 122	72 302	Code B Seconds	Blower off delay.
3.04	HT DIF	5 1	16 3	32 6	Code Z Deg. F	Differential in room air temperature that constitutes a second stage call. Used in room sensor applications only. For future use.
3.05	LT MAX	1	3	15	Counts	Service relay activation. Maximum Primary and Secondary Limit counts stored before service relay is energized. If max value is set, service output is disabled.
3.06	GAS2 DLY	14 29	14 29	73 153	Code A Seconds	The is the minimum low fire time before high fire is allowed.
3.07	GAS OFF DLY	14 29	48 101	143 300	Code A Seconds	Heating off delay.
3.08	CAB MAX	1	3	6	Counts	Service relay activation. Maximum Combustion Air Blower Proof Switch counts stored before service relay is energized. If max value is set, service output is disabled
3.09	ROS MAX	1	1	4	Counts	Service relay activation. Maximum Roll Out Switch counts stored before service relay is energized. If max value is set, service output disabled.
3.10	GVS MAX	1	3	6	Counts	Service relay activation. Maximum Gas Valve Sense counts stored before service relay is energized. If max value is set, service output is disabled.

TABLE 13
IMC ECTO CONTROL PARAMETERS (CONTINUED)

BLOCK 4 COOLING PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min.	Default	Max.		
4.01	COOL DN	0	54 30	255 143	Code D Minutes	Cool down delay. Time that Y2 is ignored after night setback. This delay is only used if an economizer is used and the outdoor air is suitable.
4.02	BL ON	0 0	0 0	14 59	Code B Seconds	Blower on delay.
4.03	BL OFF	0 0	0 0	57 240	Code B Seconds	Blower off delay. On A55 software versions 1.00–1.02, the maximum setting is 122 seconds.
4.04	CL DIF	1 1	16 3	32 6	Code Z Deg. F	Differential in room air temperature that constitutes a second stage call. Used in room sensor applications only. For future use.
4.05	FZ MAX	1	3	4	Counts	Service relay activation. Maximum Freeze Stat counts stored before service relay is energized. If max value is set, service output is disabled.
4.06	AWD	0 0	3 6	6 13	Code A Seconds	Low ambient anti–windmilling fan delay. The time period that the last operating fan is turned off before starting the next fan.
4.07	LAC TP 1	113 60	144 40	191 10	Code Y Deg. F	Low ambient outdoor air limit temp. 1. LAC TP1 and LAC TP2 are used to shed fans.
4.08	LAC TP2	113 60	120 55	191 10	Code Y Deg. F	Low ambient outdoor air limit temp. 2.
4.09	C LOCK	128 50	207 0	255 ---	Code Y Deg. F	Low ambient lockout for compressors. 254 value equals –30 Deg.F. A value of 255 will disable the service output. A value of 255 does not lock out the compressor.
4.10	C OFF	29 61	143 300	255 535	Code A Seconds	Compressor minimum off delay. For 1 PH, or 3 PH units with error.
4.11	C RUN	29 61	114 239	255 535	Code A Seconds	Compressor minimum run time. For 3 PH units only.
4.12	HP MAX	1	3	8	Counts	Maximum High Pressure counts that are stored before control locks off compressor stage and energizes the service relay. If max value is set, service output is disabled.
4.13	LP MAX	1	3	8	Counts	Maximum Low Pressure counts that are stored before control locks off compressor stage and energizes the service relay. If max value is set, service output is disabled.
4.14	FAN ON	0 0	1 2	114 240	Code A Seconds	Condenser fan delay; LGA/LCA300H & 360H units only. Default delay 75 seconds on 1.03, 1.04, & 1.05 versions. Default delay 2 seconds on versions 1.06 and higher.

BLOCK 5 MISCELLANEOUS PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min.	Default	Max.		
5.01	SMK OPT	0	0	3	Option Number	Options on smoke detection. 0: Unit off (Default) 1: Blower on ,Exh. Fan off, Damper open (Positive pressure) 2: Blower on, Exh. Fan on, Damper closed (Negative pressure) 3: Blower on, Exh. Fan on, Damper open (Purge)
5.02	HT OP	51 50	153 70	204 80	Code Z Deg. F	Heating setpoint in the occupied mode. Used with room sensor applications only. For future use.
5.03	HT NOP	51 50	102 60	204 80	Code Z Deg. F	Heating setpoint in the unoccupied mode. Used with room sensor applications only. For future use.
5.04	CL OP	102 60	178 75	255 90	Code Z Deg. F	Cooling setpoint in the occupied mode. Used with room sensor applications only. For future use.

ECTO

TABLE 13
IMC ECTO CONTROL PARAMETERS (CONTINUED)

BLOCK 5 MISCELLANEOUS PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min.	Default	Max.		
5.05	CL NOP	102 60	230 85	255 90	Code Z Deg. F	Cooling setpoint in the unoccupied mode. Used with room sensor applications only. For future use.
5.06	NSB OT	0 0	27 1	215 8	Code E Hours	Night setback override timer. For future use.
5.07	NO RUN	7 1	36 5	215 30	Code C Minutes	No–run timer. Off time after a no–run error.
5.08	OPT SR	1	3	15	Counts	A42 input counts before service relay is energized. P110–9.
5.09	EXH ON	0	50	100	% Damper Travel	This parameter determines when the exhaust fan is energized. The default of 50 means that the exhaust fan will turn on when the economizer damper is at 50% travel.
5.10	SKO Strike Three	0 0	57 8	255 36	Code C Minutes	Ignore LP trip when compressor run time less than this. LONG/HOT condition. See chart 1.
5.11	SK 1	0 0	107 15	256 36	Code C Minutes	Ignore LP trip when compressor run time less than this. LONG/COLD condition. See chart 1.
5.12	SK 2	0 0	14 2	255 36	Code C Minutes	Ignore LP trip when compressor run time less than this. SHORT/HOT condition. See chart 1.
5.13	SK 3	0 0	36 5	255 36	Code C Minutes	Ignore LP trip when compressor run time less than this. SHORT/COLD condition. See chart 1.
5.14	SK 4	27 1	107 4	161 6	Code E Hours	Compressor off time breakpoint for LONG/SHORT evaluation.
5.15	SK 5	50 100	97 70	191 10	Code Y Deg. F	Outdoor air temperature breakpoint for HOT/COLD evaluation. See chart 1.
5.16	IAQ 0	0	100	100	% Travel	Maximum allowed IAQ damper open. (Set to 0 to disable IAQ)
5.17	IAQ 1	0 0	64 500	255 1992	PPM	Damper □start open□ IAQ setpoint. CO_2 level (ppm) where economizer damper begins to open.
5.18	IAQ 2	0 1	128 1000	255 1992	PPM	Damper □full open□ IAQ setpoint. CO_2 level (ppm) where economizer damper is opened to maximum.
5.19	IAQ 3	0 132	191 10	255 –31	Code Y Deg. F	Low outdoor air temp. where IAQ damper is completely closed. Default –31°F on software versions 1.00–1.05.
5.20	IAQ 4	0 132	144 40	255 –31	Code Y Deg. F	Low outdoor air temp. where IAQ damper begins to close. Set IAQ 4 = 255 and IAQ 5 = 0 to disable the outdoor tempering of IAQ operation. Default –31°F on software versions 1.00–1.05.
5.21	IAQ 5	0 132	89 75	255 –31	Code Y Deg. F	High outdoor air temp. where IAQ damper begins to close. Set IAQ 4 =255 and IAQ 5 = 0 to disable the outdoor tempering of IAQ operation. Default 132°F on software versions 1.00–1.05.
5.22	IAQ 6	0 132	42 105	255 –31	Code Y Deg. F	High outdoor air temperature where IAQ damper is completely closed. Default 132°F on software version 1.00–1.05.
5.23	C3	0	0	1	Option Number	Determines if a Y1 call brings on comp1 or (comp1 + comp2) on three compressor units. 0: Y1 calls C1+ C2 , Y2 calls C3 1: Y1 calls C1 , Y2 calls C2+C3

Convert number of counts displayed to actual length of time or temperature:

CODE A: SECONDS = 2.097 x COUNTS
CODE B: SECONDS = 4.194 x COUNTS
CODE C: SECONDS = 8.388 x COUNTS
CODE D: SECONDS = 33.554 x COUNTS
CODE E: SECONDS = 134.217 x COUNTS
CODE Y: TEMP. (F) = 131.56 – (.6360 x COUNTS)
CODE Z: TEMP. (F) = 40.0 + (COUNTS/5.1)

TABLE 14
ECTO PARAMETER CODE CONVERSION TABLE

CODE							
	A	B	C	D	E	Y	Z
Count	Sec.	Sec.	Sec.	Sec.	Sec.	° F	° F
0	0	0	0	0	0	132	40
5	10	21	42	168	671	128	41
10	21	42	84	336	1342	125	42
15	31	63	126	503	2013	122	43
20	42	84	168	671	2684	119	44
25	52	105	210	839	3355	116	45
30	63	126	252	1007	4027	112	46
35	73	147	294	1174	4698	109	47
40	84	168	336	1342	5369	106	48
45	94	189	377	1510	6040	103	49
50	105	210	419	1678	6711	100	50
55	115	231	461	1845	7382	97	51
60	126	252	503	2013	8053	93	52
65	136	273	545	2181	8724	90	53
70	147	294	587	2349	9395	87	54
75	157	315	629	2517	10066	84	55
80	168	336	671	2684	10737	81	56
85	178	356	713	2852	11408	78	57
90	189	377	755	3020	12080	74	58
95	199	398	797	3188	12751	71	59
100	210	419	839	3355	13422	68	60
105	220	440	881	3523	14093	65	61
110	231	461	923	3691	14764	62	62
115	241	482	965	3859	15435	58	63
120	252	503	1007	4026	16106	55	64
125	262	524	1049	4194	16777	52	65

CODE							
	A	B	C	D	E	Y	Z
Count	Sec.	Sec.	Sec.	Sec.	Sec.	° F	° F
130	273	545	1090	4362	17448	49	65
135	283	566	1132	4530	18119	46	66
140	294	587	1174	4698	18790	43	67
145	304	608	1216	4865	19461	39	68
150	315	629	1258	5033	20133	36	69
155	325	650	1300	5201	20804	33	70
160	336	671	1342	5369	21475	30	71
165	346	692	1384	5536	22146	27	72
170	356	713	1426	5704	22817	23	73
175	367	734	1468	5872	23488	20	74
180	377	755	1510	6040	24159	17	75
185	388	776	1552	6207	24830	14	76
190	398	797	1594	6375	25501	11	77
195	409	818	1636	6543	26172	8	78
200	419	839	1678	6711	26843	4	79
205	430	860	1720	6879	27514	1	80
210	440	881	1761	7046	28186	–2	81
215	451	902	1803	7214	28857	–5	82
220	461	923	1845	7382	29528	–8	83
225	472	944	1887	7550	30199	–12	84
230	482	965	1929	7717	30870	–15	85
235	493	986	1971	7885	31541	–18	86
240	503	1007	2013	8053	32212	–21	87
245	514	1028	2055	8221	32883	–24	88
250	524	1049	2097	8389	33554	–27	89
255	535	1069	2139	8556	34225	–31	90

IMC BOARD INPUTS AND OUTPUTS

When necessary, individual inputs and outputs may be read at the IMC board connectors. IMC boards are shown on wiring diagrams as dashed boxes. See shaded areas in figure 30. Parts of the IMC boards will be located in all wiring diagram sections. See figure 31 to find the jack/plug connector on the IMC board(s). Use table 15 in this section for a description of each pin number, a description of the input or output, and the type of input or output.

Example:

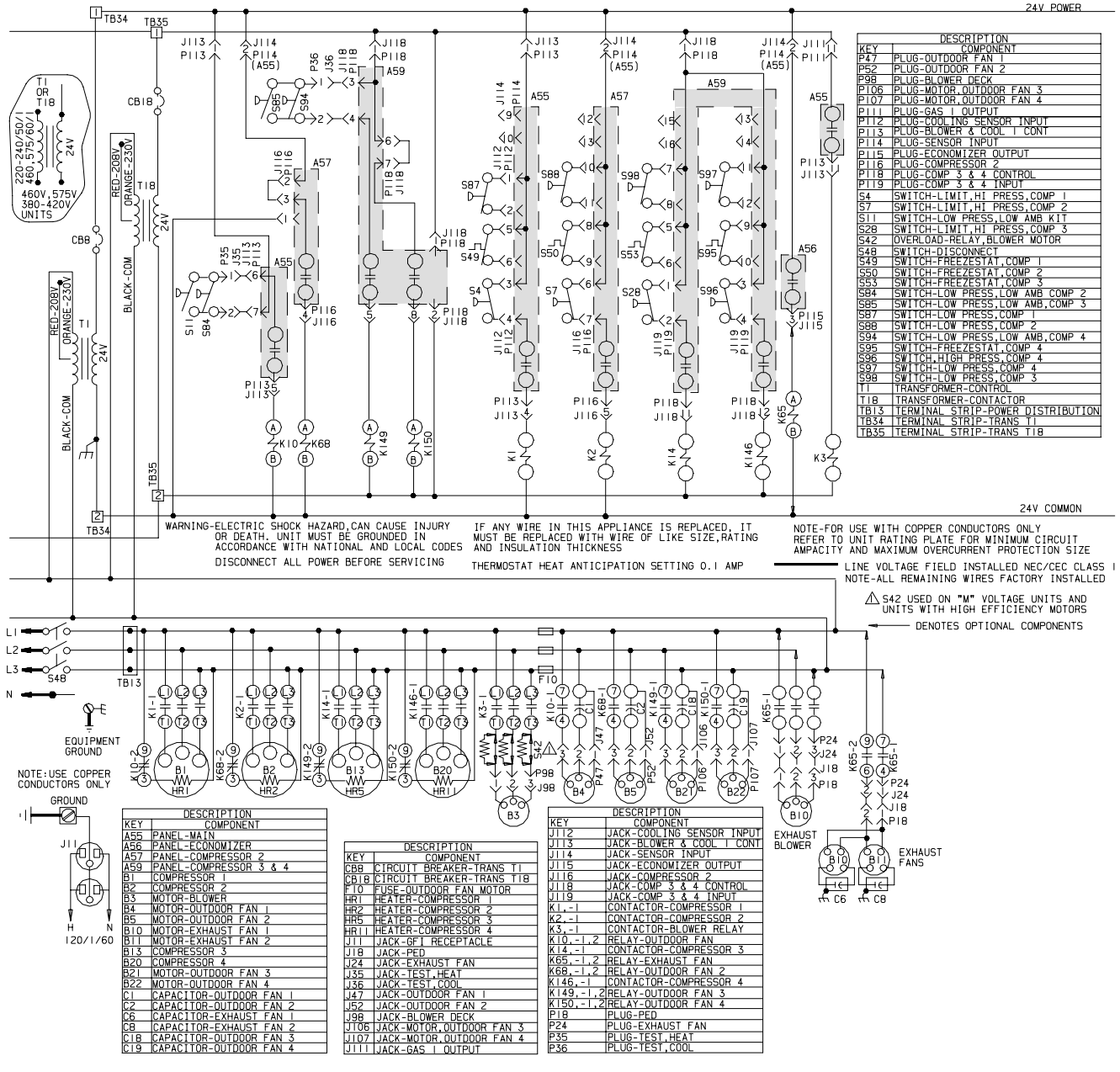
To determine if 24 volts is being supplied to the K3 blower contactor:

1–Using the unit wiring diagram and figure 31, locate K3 and identify appropriate IMC board and jack/plug. (A55 main board and J/P113–11.)

2–Find the I&O table for P113. Pin 11 shows a 24 volt output to the blower.

TYPICAL LGA OR LCA UNIT SCHEMATIC (17-1/2 & 20 TON)

SHADED AREAS INDICATE IMC BOARD



KEY	COMPONENT
P47	PLUG-OUTDOOR FAN 1
P52	PLUG-OUTDOOR FAN 2
P98	PLUG-BLOWER DECK
P106	PLUG-MOTOR,OUTDOOR FAN 3
P107	PLUG-MOTOR,OUTDOOR FAN 4
P111	PLUG-GAS 1 OUTPUT
P112	PLUG-COOLING SENSOR INPUT
P113	PLUG-BLOWER & COOL 1 CONT
P114	PLUG-SENSOR INPUT
P115	PLUG-ECONOMIZER OUTPUT
P116	PLUG-COMPRESSOR 2
P118	PLUG-COMP 3 & 4 CONTROL
P119	PLUG-COMP 3 & 4 INPUT
S4	SWITCH-LIMIT,HI PRESS,COMP 1
S7	SWITCH-LIMIT,HI PRESS,COMP 2
S11	SWITCH-LOW PRESS,LOW AMB KIT
S28	SWITCH-LIMIT,HI PRESS,COMP 3
S42	OVERLOAD-RELAY,BLOWER MOTOR
S48	SWITCH-DISCONNECT
S49	SWITCH-FREEZESTAT,COMP 1
S50	SWITCH-FREEZESTAT,COMP 2
S53	SWITCH-FREEZESTAT,COMP 3
S84	SWITCH-LOW PRESS,LOW AMB COMP 2
S85	SWITCH-LOW PRESS,LOW AMB,COMP 3
S87	SWITCH-LOW PRESS,COMP 1
S88	SWITCH-LOW PRESS,COMP 2
S94	SWITCH-LOW PRESS,LOW AMB,COMP 4
S95	SWITCH-FREEZESTAT,COMP 4
S96	SWITCH,HIGH PRESS,COMP 4
S97	SWITCH-LOW PRESS,COMP 4
S98	SWITCH-LOW PRESS,COMP 3
TI	TRANSFORMER-CONTROL
T18	TRANSFORMER-CONTACTOR
TB13	TERMINAL STRIP-POWER DISTRIBUTION
TB34	TERMINAL STRIP-TRANS TI
TB35	TERMINAL STRIP-TRANS T18

KEY	COMPONENT
A55	PANEL-MAIN
A56	PANEL-ECONOMIZER
A57	PANEL-COMPRESSOR 2
A59	PANEL-COMPRESSOR 3 & 4
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-OUTDOOR FAN 1
B5	MOTOR-OUTDOOR FAN 2
B10	MOTOR-EXHAUST FAN 1
B11	MOTOR-EXHAUST FAN 2
B13	COMPRESSOR 3
B20	COMPRESSOR 4
B21	MOTOR-OUTDOOR FAN 3
B22	MOTOR-OUTDOOR FAN 4
C1	CAPACITOR-OUTDOOR FAN 1
C2	CAPACITOR-OUTDOOR FAN 2
C6	CAPACITOR-EXHAUST FAN 1
C8	CAPACITOR-EXHAUST FAN 2
C18	CAPACITOR-OUTDOOR FAN 3
C19	CAPACITOR-OUTDOOR FAN 4

KEY	COMPONENT
CB8	CIRCUIT BREAKER-TRANS TI
CB18	CIRCUIT BREAKER-TRANS T18
F10	FUSE-OUTDOOR FAN MOTOR
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
HR11	HEATER-COMPRESSOR 4
J11	JACK-GFI RECEPTACLE
J18	JACK-PED
J24	JACK-EXHAUST FAN
J35	JACK-TEST,HEAT
J36	JACK-TEST,COOL
J47	JACK-OUTDOOR FAN 1
J52	JACK-OUTDOOR FAN 2
J98	JACK-BLOWER DECK
J106	JACK-MOTOR,OUTDOOR FAN 3
J107	JACK-MOTOR,OUTDOOR FAN 4
J111	JACK-GAS 1 OUTPUT

KEY	COMPONENT
J112	JACK-COOLING SENSOR INPUT
J113	JACK-BLOWER & COOL 1 CONT
J114	JACK-SENSOR INPUT
J115	JACK-ECONOMIZER OUTPUT
J116	JACK-COMPRESSOR 2
J118	JACK-COMP 3 & 4 CONTROL
J119	JACK-COMP 3 & 4 INPUT
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3,-1	CONTACTOR-BLOWER RELAY
K10,-1,2	RELAY-OUTDOOR FAN
K14,-1	CONTACTOR-COMPRESSOR 3
K65,-1,2	RELAY-EXHAUST FAN
K68,-1,2	RELAY-OUTDOOR FAN 2
K146,-1	CONTACTOR-COMPRESSOR 4
K149,-1,2	RELAY-OUTDOOR FAN 3
K150,-1,2	RELAY-OUTDOOR FAN 4
P18	PLUG-PED
P24	PLUG-EXHAUST FAN
P35	PLUG-TEST,HEAT
P36	PLUG-TEST,COOL

FIGURE 30

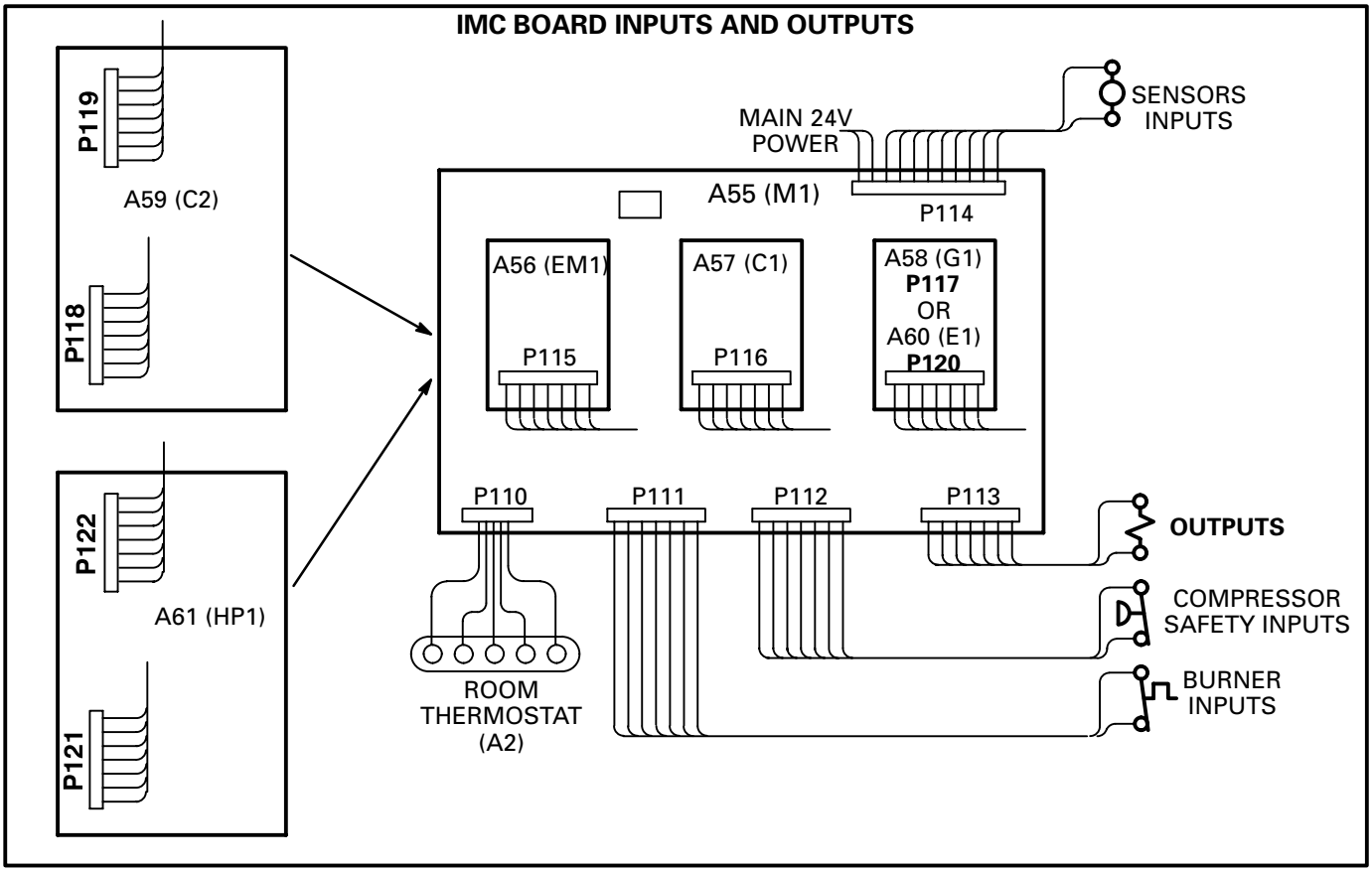


FIGURE 31

Signal Types: **BI**–Binary Input (on/off)

AI–Analog Input **BO**–Binary Output (on/off)

AO–Analog Output **RES**–Resistance Temperature Sensor (NTC)

TABLE 15
IMC BOARD INPUTS AND OUTPUTS (CONTINUED)

PLUG #P110 CONTROL INPUTS

PIN #	NAME	DESCRIPTION	TYPE
1	COM	ROOM THERMOSTAT COMMON	24VAC COM
2	OCP	OCCUPIED (ON WHEN OCCUPIED)	24VAC BI
3	Y2	HIGH COOL DEMAND	24VAC BI
4	Y1	LOW COOL DEMAND	24VAC BI
5	W2	HIGH HEAT DEMAND	24VAC BI
6	W1	LOW HEAT DEMAND	24VAC BI
7	G	BLOWER DEMAND	24VAC BI
8	A17	SMOKE DETECTOR (NORM. OFF)	24VAC BI
9	A42	OPTION 1 (NORM. ON)	24VAC BI

I/O

TABLE 15 IMC BOARD INPUTS AND OUTPUTS (CONTINUED)			
PLUG #P111 HEAT SAFETY			
PIN #	NAME	DESCRIPTION	TYPE
1	S10-C	PLT1-C (PRI. LIMIT 1)	SW (24VAC)
2	S10-NC	PLT1-NC (PRI. LIMIT1)	
3	S10-NO	PLT1-NO (PRI. LIMIT1)	
4	S21-C	SLT1-C (SEC. LIMIT1)	SW (24VAC)
5	S21-NC	SLT1-NC (SEC. LIMIT1)	
6	S47	ROS1 (ROLL OUT SWITCH 1)	SW (24VAC)
7			
8	S18	CAB1(COMB. AIR PROOF 1 SWITCH)	SW (24VAC)
9			
10	GV1	GV1 (GAS VALVE 1 SENSE)	24VAC BI
11	TB35-1	24 VAC (FOR HEATING OUTPUTS & BLOWER)	24VAC POWER
12	TB35-2	RETURN (FOR TRANS. PROT.)	24VAC POWER
PLUG #P112 COOLING SAFETY			
1	S87	LP1 (LOW PRESS. 1)	SW (24VAC)
2			
3	S4	HP1 (HIGH PRESS. 1)	SW (24VAC)
4			
5	S49	FRZ1 (FREEZE STAT 1)	SW (24VAC)
6			
7	S6	DFT1 (DEF. TEMP. STAT 1)	SW (24VAC)
8			
9	S46	DFP1 (DEF. PRESS. 1)	SW (24VAC)
10			
11	S27	DFS (DIRTY FILTER SWITCH)	SW (24VAC)
12			
13	S52	AFS (AIR FLOW SWITCH)	SW (24VAC)
14			
PLUG #P113 OUTPUTS			
1	TB34-1	24VAC (FOR RELAY OUTS)	24VAC POWER
2	TB34-2	RETURN (FOR TRANS. PROT.)	24VAC POWER
3	SR	SERVICE. RELAY (24VAC OUT)	24VAC BO
4	K1-A	COMPRESSOR 1	24VAC BO
5	K10-A	FAN 1	24VAC BO
6	S11	LOW PRESS. (LOW AMB. CONTROL FAN 1)	SW (24VAC)
7	S11		
8	L1	RV1 (REVERSING VALVE 1)	24VAC BO
9	K13-A	CAB 1 (COMBUSTION AIR BLOWER RELAY 1)	24 VAC BO
10	W2	H2/E2 (HEAT2/ELECTRIC HEAT 2)	24 VAC BO
11	K3-A	BLOWER	24 VAC BO
12	A3-1	H1/E1 (HEAT1/ ELECTRIC HEAT 1)	24 VAC BO

TABLE 15 IMC BOARD INPUTS AND OUTPUTS (CONTINUED)			
PLUG #P114 ANALOG INPUTS			
PIN #	NAME	DESCRIPTION	TYPE
1	TB34–2	COMMON (FOR MAIN CONTROL)	24VAC POWER
2	TB34–1	24VAC (FOR MAIN CONTROL)	24VAC POWER
3	A2	RMS (ROOM SENSOR)	RES (0–5VDC)
4	A2		
5	RT16	RAT (RETURN AIR TEMP)	RES (0–5VDC)
6	RT16		
7	RT6	DAT (DISCHARGE AIR TEMP)	RES (0–5VDC)
8	RT6	DAT (DISCHARGE AIR TEMP)	RES (0–5VDC)
9	RT11	RESERVED	RES (0–5VDC)
10	RT11		
11	A63	IAQ (INDOOR AIR QUALITY)	0–10VDC AI
12	A63		
13	RT17	OAT (OUTDOOR AMB. TEMP)	RES (0–5VDC)
14	RT17		
PLUG #P115 A56 EM1 ECONOMIZER BOARD			
1	TB34–2	COMMON	24 VAC POWER
2	VOT	DAMPER CONTROL	0–10 VDC A0
3	K65	EXHAUST FAN	24VAC BO
4	GLO	GLOBAL CONTROL INPUT	24VAC BI
5	A62 +	INDOOR ENTHALPY SENSOR HONEYWELL C7400A	4–20mA AI
6	A62 S		
7	A7 +	OUTDOOR ENTHALPY SENSOR HONEYWELL C7400A	4–20 mA AI
8	A7 S		
9	DPOS	DAMPER POSITION FEEDBACK	0–10VDC AI
PLUG #P116 A57 C1			
1	TB34–2	RETURN (FOR TRANS. PROT.)	COM (24VAC)
2	S84	LOW PRESS (LOW AMB. CONTROL, FAN 2)	SW (24VAC)
3	S84		
4	K68	FAN 2	24VAC BO
5	K2	COMPRESSOR 2	24VAC BO
6	S7	HP2 (HIGH PRESS. 2)	SW (24VAC)
7	S7		
8	S50	FRZ2 (FREEZE STAT 2)	SW (24VAC)
9	S50		
10	S88	LP2 (LOW PRESS. 2)	SW (24VAC)
11	S88		
12	RT13	RESERVED	RES (0–5VDC)
13	RT13		

I/O

TABLE 15 IMC BOARD INPUTS AND OUTPUTS (CONTINUED)			
PLUG #P117 A58 G1 BOARD			
PIN #	NAME	DESCRIPTION	TYPE
1	TB35–1	24VAC IN	24VAC POWER
2	TB35–2	RETURN (FOR TRANS. PROT.)	24VAC POWER
3	K19–A	CAB2 (COMBUSTION AIR BLOWER RELAY 2)	24VAC BO
4	W2	H4 (HEAT 4)	24VAC BO
5	A12–1	H3 (HEAT 3)	24VAC BO
6	S99–C	PLT2–C (PRI. LIMIT2)	SW (24VAC)
7	S99–NC	PLT2–NC(PRI. LIMIT2)	
8	S100–C	SLT2–C (SEC. LIMIT2)	SW (24VAC)
9	S100–NC	SLT2–NC (SEC. LIMIT2)	
10	S69	ROS2 (ROLL OUT SWITCH2)	SW (24VAC)
11	S69		
12	S45	CAB2 (COMB. AIR PROOF 2 SWITCH)	SW (24VAC)
13	S45		
14	GV2	GV2 (GAS VALVE 2 SENSE)	24VAC BI
PLUG #P118 A59 C2 BOARD			
1	TB35–1	24VAC	24VAC POWER
2	TB35–2	COMMON	24VAC POWER
3	S11	LOW PRESS (LOW AMB. , FAN 3)	SW (24VAC)
4	S11		
5	K149	FAN 3	24VAC BO
6	S85	LOW PRESS (LOW AMB., FAN 4)	SW (24VAC)
7	S85		
8	K150	FAN 4	24VAC BO
9	K152	FAN 5	24VAC BO
10	K153	FAN 6	24VAC BO
11	K14	COMPRESSOR 3	24VAC BO
12	K146	COMPRESSOR 4	24VAC BO
15	RT14	RESERVED	RES (0–5 VDC)
16	RT14		

TABLE 15 IMC BOARD INPUTS AND OUTPUTS (CONTINUED)			
PLUG #P119 COMPRESSOR SAFETY			
PIN #	NAME	DESCRIPTION	TYPE
1	S28	HP3 (HIGH PRESS. 3)	SW (24VAC)
2	S28		
3	S96	HP4 (HIGH PRESS. 4)	SW (24VAC)
4	S96		
5	S53	FRZ3 (FREEZE STAT 3)	SW (24VAC)
6	S53		
7	S98	LP3 (LOW PRESS. 3)	SW (24VAC)
8	S98		
9	S95	FRZ4 (FREEZE STAT 4)	SW (24VAC)
10	S95		
11	S97	LP4 (LOW PRESS. 4)	SW (24VAC)
12	S97		
13	RT15	RESERVED	RES (0–5VDC)
14	RT15		
PLUG #P120 A60 E1 BOARD			
1	K9–5	24 VAC IN	24VAC POWER
2	T2	RETURN (FOR TRANS. PROT.)	24VAC POWER
3	K17	E3 (ELECTRIC HEAT 3)	24VAC BO
4	K18	E4 (ELECTRIC HEAT 4)	24VAC BO
PLUG #P121 A61 HP1 BOARD			
1	TB34–1	24VAC IN	24VAC POWER
2	TB34–2	COMMON	24VAC POWER
3	K68	FAN 2	24VAC BO
4	S84	LOW PRESS (LOW AMB. CONTROL, FAN 3)	SW (24VAC)
5	S84		
6	K149	FAN 3 (FAN 2 ON B BOX HEAT PUMP)	24VAC BO
7	K150	FAN 4	24VAC BO
8	L2	RV2 (REVERSING VALVE 2)	24VAC BO
9	K2	COMPRESSOR 2	24VAC BO
PLUG #P122 COMPRESSOR SAFETY			
1	S7	HP2 (HIGH PRESS. 2)	SW (24VAC)
2	S7		
3	S50	FRZ2 (FREEZE STAT 2)	SW (24VAC)
4	S50		
5	S88	LP2 (LOW PRESS. 2)	SW (24VAC)
6	S88		
7	S9	DFT2 (DEFROST TEMP. STAT 2)	SW (24VAC)
8	S9		
9	S104	DFP2 (DEFROST PRESS. 2)	SW (24VAC)
10	S104		
11	RT13	RESERVED	RES. (0–5VDC)
12	RT13		

NOTES:

NOTES: