PRODUCTION LITERATURE

Technical Publications
Litho U.S.A.
E1998

KITS COMMON TO HEATING AND COOLING EQUIPMENT

503,872M
8/98
Supersedes 4/98

M1-4 AND M1-5 INTEGRATED MODULAR CONTROL (IMC)

GUIDE TO THE M1-4 AND M1-5 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 has the capability to 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

- **D** Indicates thermostat demand
- **D** Makes troubleshooting easier
- **D** Increases unit and component reliability
- **D** Provides consistent central control location
- **D** Provides adjustable control parameters
- **D** 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

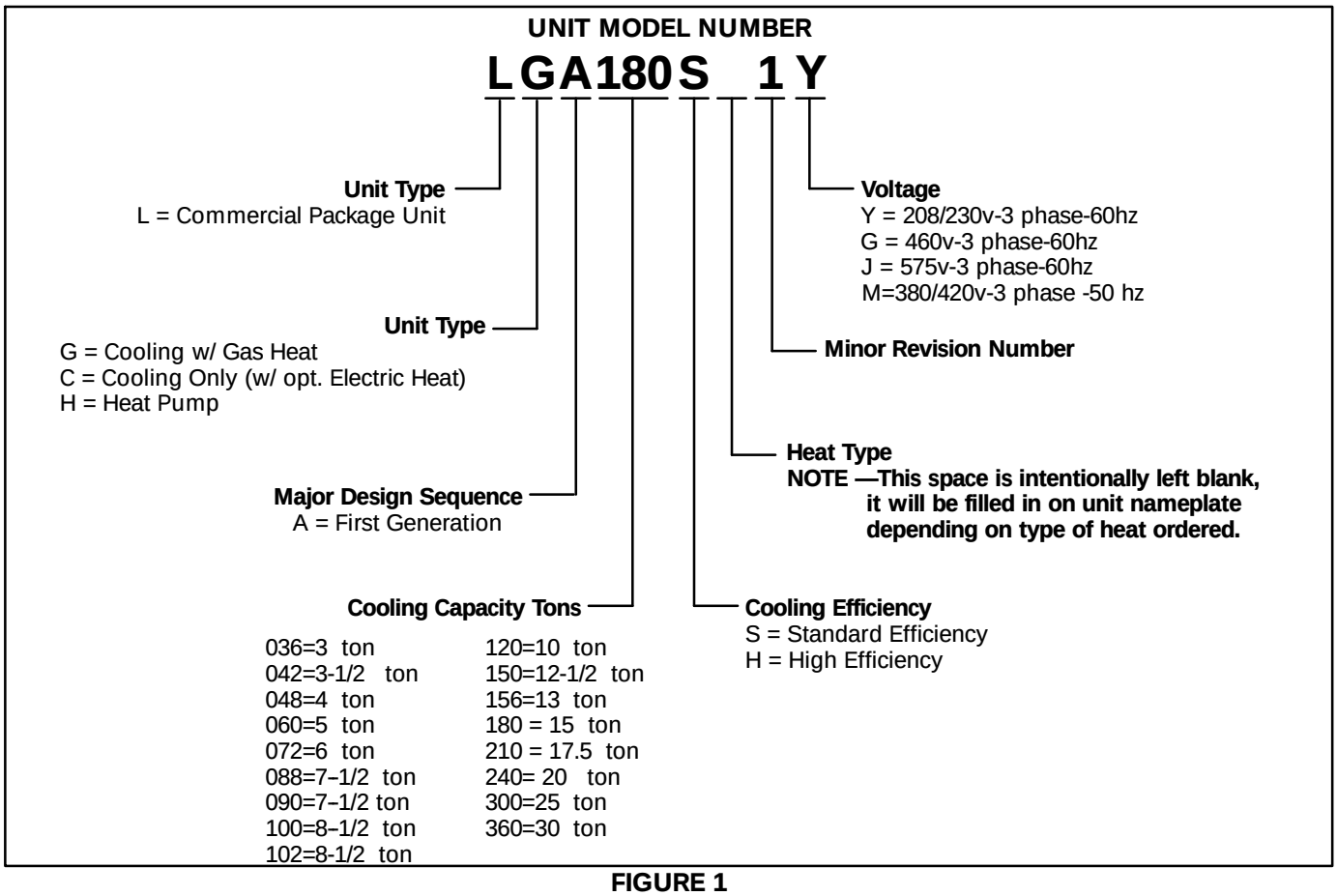


FIGURE 1

IMC AND ADD–ON BOARD LOCATION AND OPERATION

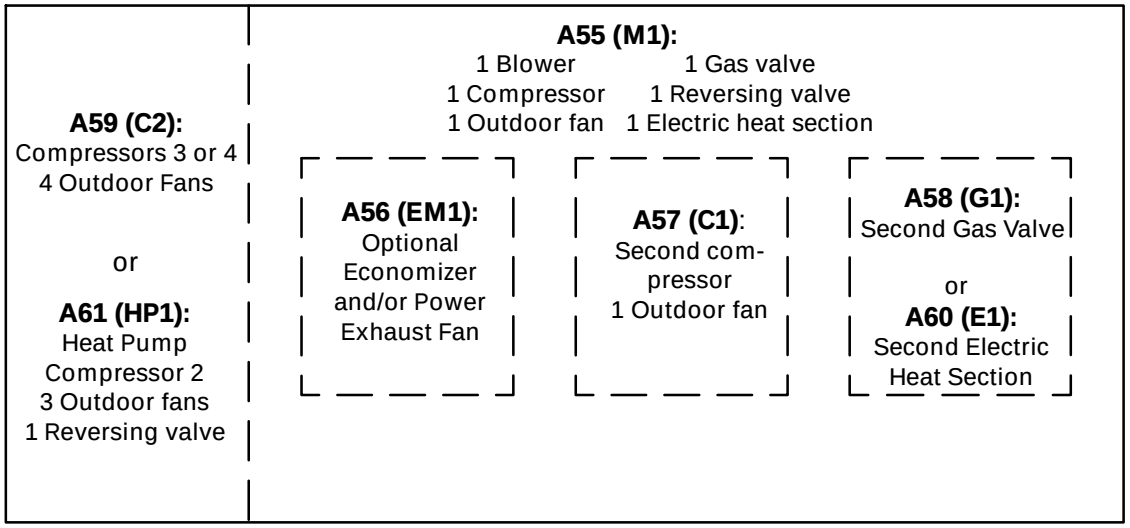


FIGURE 2

A55 (M1) MAIN CONTROL PANEL LOCATION BY UNIT

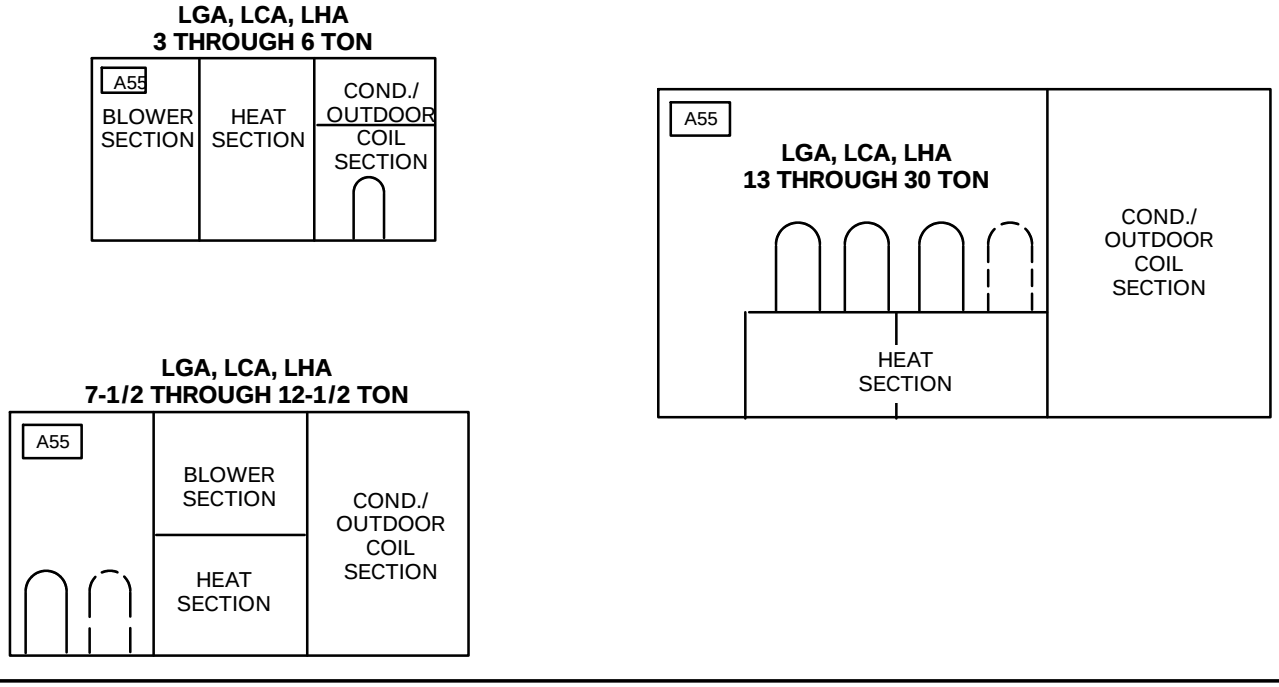


FIGURE 3

IMC BOARD COMPONENTS

LED READOUT

On unit power-up the A55 M1 board LED readout will display “8.8.8.”, within seconds, the “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.”, 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.

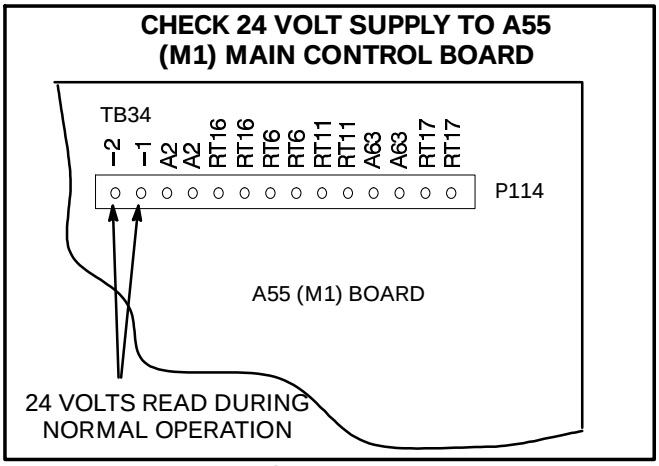


FIGURE 4

THERMOSTAT INPUT INDICATING LED’S

Thermostat input indicating LED’s are located on the M1 board above P117 connector. **LED’S indicate a thermostat demand only**. See figure 5.

THERMOSTAT INPUT INDICATING LED’S

G – Blower on

W1 – First stage heat

W2 – Second stage heat

Y1 – First stage cool

Y2 – Second stage cool

OCP – Occupied

NOTE – LED’s 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.

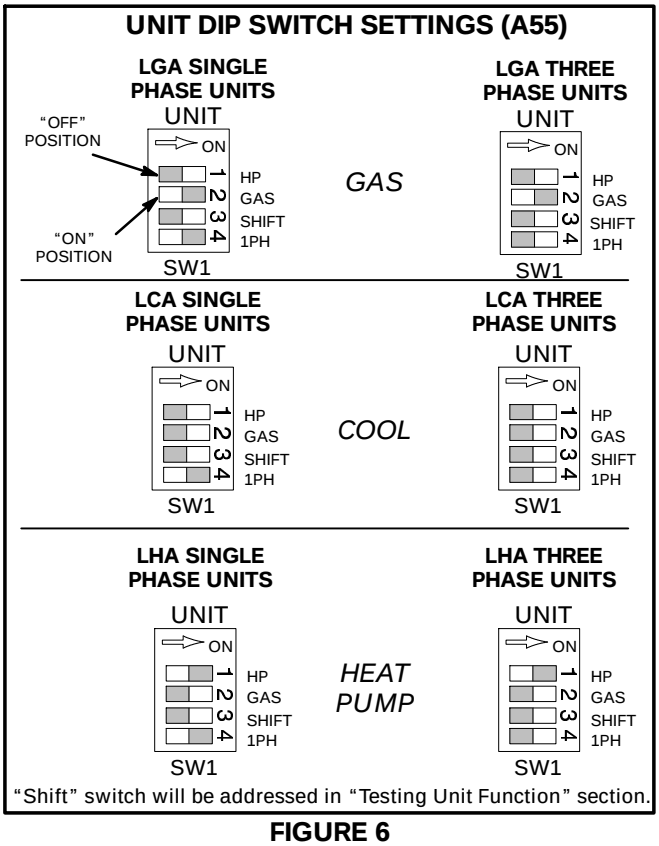
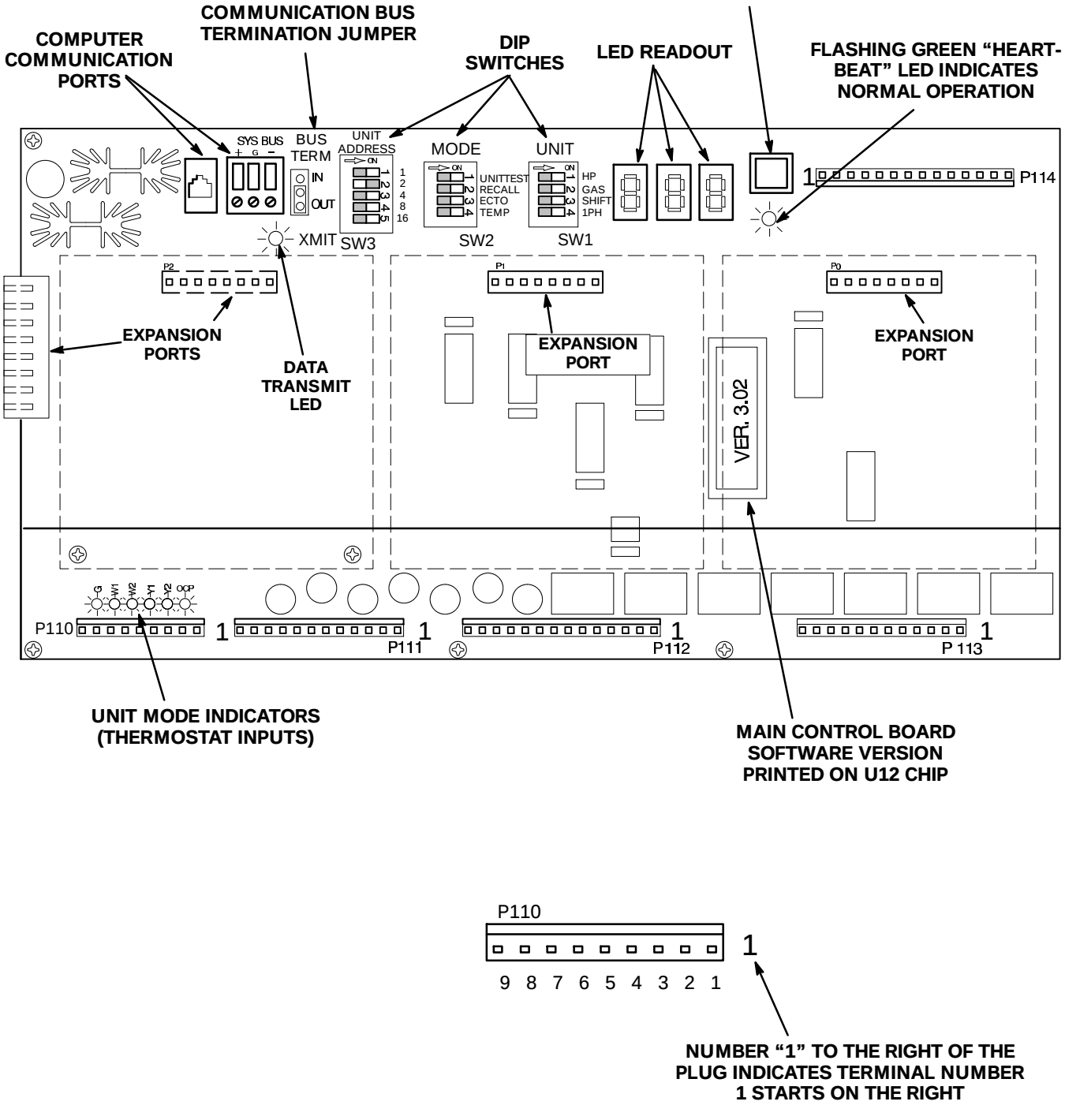


FIGURE 6

A55 (M1) MAIN CONTROL BOARD

NOTE–CONNECTOR NOMENCLATURE ON BOARD DENOTES GAS UNIT FUNCTIONS.



NUMBER "1" TO THE RIGHT OF THE PLUG INDICATES TERMINAL NUMBER 1 STARTS ON THE RIGHT

IMC BOARD COMPONENTS

DIP SWITCH SETTINGS - Continued

A59 (C2) DIP SWITCH SETTINGS

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

LGA/LCA156 & 180 which contain four condenser fans and three compressors.

LGA/LCA210, 240, 300S which contain four condenser fans and four compressors.

LGA/LCA300H which contain six condenser fans and four compressors.

LGA/LCA360 which contain six condenser fans and three compressors.

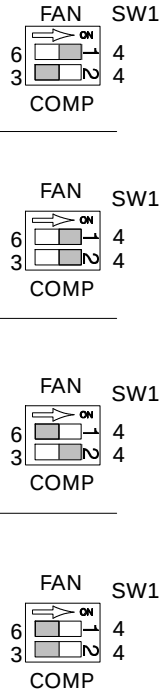


FIGURE 7

A61 (HP1) DIP SWITCH SETTINGS

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

LHA090 & 120 which contain two fans.

LHA180 & 240 which contain 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.

DATA TRANSMIT LED

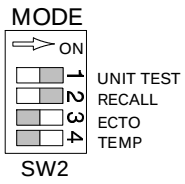
The yellow LED flashes when the IMC is transmitting data to an external device such as a PC or energy management system.

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

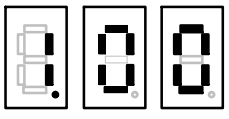


FIGURE 9

UNIT START–UP

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 LED's 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.

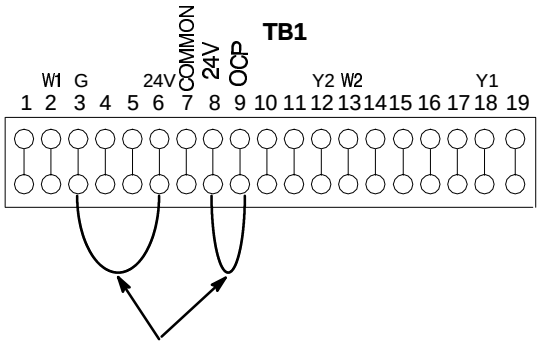
UNIT START-UP WITH TB1 JUMPERS

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.

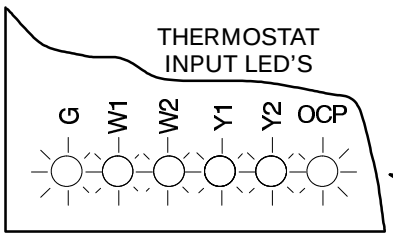
2–Jumper terminals 6 (24V) to 3 (G) to maintain blower operation throughout checkout.

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

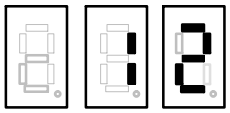
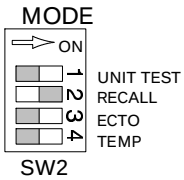


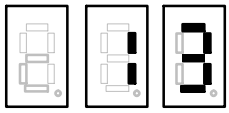
FIGURE 11

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	ACTION
1	Power loss for two cycles. This may indicate that the unit power is ”dirty” or is of low quality.	None
2	ECTO access error. This may indicate a problem with the ECTO memory chip and parameters may not be changeable.	Control will operate with the factory ECTO defaults.
3	Reserved.	
4*	A17 input indicates smoke alarm.	Defined by ECTO 5.01. Default action unit off.
5*	S52 (Air Flow Switch) This indicates no blower air 16 seconds after blower demand.	Unit off.
6*	S27 (Dirty Filter Switch) This indicates a dirty filter.	None
7-9	Reserved.	
10*	24 VAC power loss at TB35-1 on A55 (M1) board. P111 pin 11.	Unit off.
11*	24 VAC power loss atTB34-1 on A55 (M1) board. P113 pin 1.	Unit off.
12	S4 (High Press. 1) is open. Note: On LHA088S units, S4 or S5 (discharge temp.) is open.	Compr. 1 off.
13*	S4 (High Press. 1) opened 3 (default) times during a demand. The number of times is defined in ECTO 1.12 or 4.14. Note: On LHA088S units, S4 or S5 (discharge temp.) has opened 3 (default) times.	Compr. 1 locked off. Requires a reset or two short pushes of pushbutton to restore.
14	S7 (High Press. 2) is open.	Compr. 2 off
15*	S7 (High Press. 2) opened 3 (default) time during a demand. The number of times is defined in ECTO 1.12 or 4.14.	Compr. 2 locked off. Requires a reset or two short pushes of pushbutton to restore.
16	S28 (High Press. 3) is open.	Compr. 3 off
17*	S28 (High Press. 3) opened 3 (default) time during a demand. The number of times is defined in ECTO 1.12 or 4.14	Compr. 3 locked off. Requires a reset or two short pushes of pushbutton to restore.
18	S96 (High Press. 4) is open.	Compr. 4 off
19*	S96 (High Press. 4) opened 3 (default) time during a demand. The number of times is defined in ECTO 1.12 or 4.14.	Compr. 4 locked off. Requires a reset or two short pushes of pushbutton to restore.
20	A42 input is open on A55 (M1) board P110 pin 9. Units with external overloads on the blower motor use this error to indicate tripped overload.	Unit off
21*	A42 input has opened 3 (default) times during a demand. ECTO 5.08.	Unit off
22	S87 (Low Press. 1) is open.	Compr.1 off.
23*	S87 (Low Press. 1) has opened 3 (default) times during a demand. The number of times is defined in ECTO 1.13 or 4.15.	Compr 1 locked off. Requires a reset or two short pushes of pushbutton to restore.
24	S88 (Low Press. 2) is open.	Compr. 2 off.
25*	S88 (Low Press. 2) has opened 3 (default) times during a demand. The number of times is defined in ECTO 1.13 or 4.15.	Compr 2 locked off. Requires a reset or two short pushes of pushbutton to restore.
26	S98 (Low Press. 3) is open.	Compr. 3 off.
27*	S98 (Low Press. 3) has opened 3 (default) times during a demand. The number of times is defined in ECTO 1.13 or 4.15.	Compr 3 locked off. Requires a reset or two short pushes of pushbutton to restore.
28	S97 (Low Press. 4) is open.	Compr.4 off
29*	S97 (Low Press. 4) has opened 3 (default) times during a demand. The number of times is defined in ECTO 1.13 or 4.15.	Compr 4 locked off. Requires a reset or two short pushes of pushbutton to restore.
30-31	Reserved.	
32	S49 (Freeze stat 1) is open.	Compr. 1 off.
33*	S49 (Freeze stat 1) has opened 3 (default) times during a demand. The number of times is defined in ECTO 4.04.	Compr. 1 off.
34	S50 (Freeze stat 2) is open.	Compr. 2 off.

*Service relay contacts are energized. + Not stored in memory.

IMC ERROR CODES

35*	S50 (Freeze stat 2) has opened 3 (default) times during a demand. The number of times is defined in ECTO 4.04.	Compr. 2 off.
36	S53 (Freeze stat 3) is open.	Compr. 3 off.
37*	S53 (Freeze stat 3) has opened 3 (default) times during a demand. The number of times is defined in ECTO 4.04	Compr. 3 off
38	S95 (Freeze stat 4) is open.	Compr. 4 off.
39*	S95 (Freeze stat 4) has opened 3 (default) times during a demand. The number of times is defined in ECTO 4.04.	Compr. 4 off.
40+	Return air temperature (RT16) exceeded heating limit set in ECTO 5.06. See operation section. For information only.	Heating demand ignored. No heating.
41+	Return air temperature (RT16) exceeded cooling limit set in ECTO 5.07. See operation section. For information only.	Cooling demand ignored. No cooling.
42–43	Reserved.	
44*	Gas valve 1 is energized but no demand. (GV1). Check gas control and wiring.	Unit off
45*	Gas valve 2 is energized but no demand. (GV3). Check gas control and wiring.	Unit off.
46*	No 24VAC relay power on A60 (EI) board, K9–5 input. (A60)	Second heat section off.
47*	No 24VAC relay power on A58 (G1) board, TB35–1 input. (A58)	Second heat section off.
48*	No 24VAC relay power on A61 (HP1) board, TB34–1 input. (A61)	Second compr. Off.
49*	No 24VAC relay power on A59 (C2) board, TB35–1 input. (A59)	Third and fourth compr. Off.
50	LGA unit: S10 (Primary Limiti) is open. LCA/LHA Unit: Jumper is open A55 P111 pin 1 and 2.	First heat section off.
51	LGA Unit: S10 (Primary Limit 1) has opened 3 (default) times during a demand ECTO 3.04. LCA/LHA Unit: Jumper is open. A55 P111 pin 1 and 2.	First heat section off.
52	LGA Unit: S21 (Secondary Limit 1) is open. LCA/LHA Units: Jumper is open. A55 P111 pin 1 and 2.	First heat section off.
53*	LGA Unit: S21 (Secondary Limit 1) has opened 3 (default) times during a demand ECTO 3.04. LCA/LHA Unit: Jumper is open. A55 P111 pin 1 and 2.	First heat section off.
54	LGA Unit: S47 (Roll Out) is open. LCA/LHA Unit: S15 (El. Heat Limit) is open.	First heat section off.
55*	LGA Unit: S47 (Roll Out Switch 1) opened 1 (default) time during a demand. ECTO 3.08. LCA/LHA Unit: S15 (El. Heat Limit 1 has opened 1 (default) times during a demand.	First heat section off.
56	LGA Unit: S18 (Combustion Air Proof Switch 1) is open. LCA/LHA Unit: S63 (El. Heat Limit) is open.	First heat section off.
57*	LGA Unit: S18 (Combustion Air Proof Switch 1) has opened 3 (default) times during a demand. ECTO 3.07. LCA/LHA Unit: S63 (El. Heat Limit) has opened 3 (default) times during a demand. ECTO 2.04	First heat section off.
58	Gas valve 1 not energized two minutes after thermostat demand. Check gas supply, ignition control, and wiring. (GV1)	Only action taken is storing code in memory.
59*	Gas valve 1 not energized 3 (default) times (2 minutes after a demand). Check gas supply, ignition control and wiring. ECTO 3.09. (GV1)	Only action taken is storing code in emory.
60	S99 (Primary Limit 2) is open.	Second heat section off.
61*	S99 (Primary Limit 2) has opened 3 (default) times during a demand. ECTO 3.04.	Second heat section off.
62	S100 (Secondary Limit 2) is open.	Second heat section off.
63*	S100 (Secondary Limit 2) has opened 3 (default) times during a demand. ECTO 3.04.	Second heat section off.
64	S69 (Roll Out Switch 2) is open.	Second heat section off.
65*	S69 (Roll Out Switch 2) has opened 1 (default) times during a demand. ECTO 3.08.	Second heat section off.
66	S45 (Combustion Air Proof Switch 2) is open.	Second heat section off.
67*	S45 (Combustion Air Proof Switch2) has opened 3 (default) times during a demand. ECTO 3.07.	Second heat section off.

*Service relay contacts are energized. + Not stored in memory.

IMC ERROR CODES

68	Gas valve 2 not energized two minutes after demand. Check gas supply, ignition control, and wiring (GV3).	Only action taken is storing code in memory.
69*	Gas valve 2 not energized 3 (default) times (2 minutes after demand). Check gas supply, ignition control and wiring. ECTO 3.09. (GV3).	Only action taken is storing code in memory.
70–73	Reserved.	
74*	Zone sensor (A2) problem. Check sensor and wiring.	IMC will switch over to the backup mode option set with ECTO 6.01. If no backup mode is selected, the unit will shut down.
75	Outdoor Temperature (RT17) Sensor Problem. Check wiring and sensor.	The control defaults to a high outdoor temp. operation.
76	Reserved	
77*	Discharge (Supply) Air Temperature Sensor (RT6) problem. Check wiring and sensor.	No free cooling. Economizer damper will close. All economizer modes.
78*	Return Air Temperature Sensor (RT16) problem. Check wiring and sensor.	No free cooling if economizer is in TMP (temperature) mode, dampers will closed.
79*	A major communication problem between the main board and add–on boards has occurred.	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.	Main board has reset the communications to the add–on boards.
81	Reserved.	
82	Main board reset or power outage has occurred.	Only action taken is store code in memory. Note – This code is always recorded at power up and is only displayed in error recall mode.
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. Check UNIT DIP switch setting and add–on boards types.	Unit is off.
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.	Main control has locked out all add–on boards. Reset control to restore.
85	Reserved	
86*	Thermostat input conflict. Simultaneous heat and cool demands. Check thermostat wiring.	Unit is off.
87*	UNIT (equipment type) DIP switch has changed while unit is energized. Check UNIT DIP switch setting and reset. control. Make sure the UNIT DIP switch settings agree with the unit type.	Unit is off.
88	This may indicate a problem with the ECTO chip.	Control will operate with the factory default 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.	Unit is off.
90	Reserved.	
91*	Outdoor enthalpy sensor (A7) problem. Check sensor and wiring. (Only available if the A56 board is software version 1.06 or later.)	No economizer free cooling operation if economizer mode is set to ODE or DIF.
92*	Indoor enthalpy sensor (A52) problem . Check sensor and wiring. (Only available if the A56 board is software version 1.06 or later.)	No economizer free cooling operation if economizer mode is set to DIF.
93*	The control has changed the system mode because an error with the controlling sensor has occurred.	IMC has switched over to the backup mode option set with ECTO 6.01.
94	Reserved	
95	ECTO parameter has been changed by the pushbutton.	For information only. Indicates that someone has made a ECTO change.
96–126	Reserved.	
127	Error buffer overflow.	This means multiple errors occurred and some may not have been stored.
128–255	Reserved.	

*Service relay contacts are energized. + Not stored in memory.

COMPRESSOR STAGING

Table 5 shows default compressor stages. Compressor stages may be changed by adjusting the 5.04 ECTO parameter. Refer to the ECTO section to read and change ECTO settings. Table 4 (option 1) and table 6 (option 3) show optional compressor staging.

TABLE 4
TWO COMPRESSOR STAGES - OPTION 1

UNIT	ECONOMIZER	OPERATION	
		Y1 THERMOSTAT DEMAND	Y1 AND Y2 THERMOSTAT DEMAND OR Y2 ONLY THERMOSTAT DEMAND
1 Compressor	No Economizer	Compr.1	Compr.1
	Economizer	FreeCool	FreeCool + Compr.1
2 Compressors	No Economizer	Compr.1	Compr.1 + Compr.2
	Economizer	FreeCool	FreeCool + Compr.1 + Compr.2
3 Compressors	No Economizer	Compr.1 + Compr.2	Compr.1 + Compr.2 + Compr.3
	Economizer	FreeCool	FreeCool+ Compr.1 + Compr.2 + Compr.3
4 Compressors	No Economizer	Compr.1 + Compr.2	Compr.1 + Compr.2 + Compr.3 + Compr.4
	Economizer	FreeCool	FreeCool + Compr.1 + Compr.2 + Compr.3 + Compr.4

TABLE 5
TWO COMPRESSOR STAGES - OPTION 2 - DEFAULT

UNIT	ECONOMIZER	OPERATION	
		Y1 THERMOSTAT DEMAND	Y1 AND Y2 THERMOSTAT DEMAND OR Y2 ONLY THERMOSTAT DEMAND
1 Compressor	No Economizer	Compr.1	Compr.1
	Economizer	FreeCool	FreeCool + Compr.1
2 Compressors	No Economizer	Compr.1	Compr.1 + Compr.2
	Economizer	FreeCool	FreeCool + Compr.1
3 Compressors	No Economizer	Compr.1 + Compr.2	Compr.1 + Compr.2 + Compr.3
	Economizer	FreeCool	FreeCool+ Compr.1 + Compr.2
4 Compressors	No Economizer	Compr.1 + Compr.2	Compr.1 + Compr.2 + Compr.3 + Compr.4
	Economizer	FreeCool	FreeCool + Compr.1 + Compr.2

TABLE 6
THREE COMPRESSOR STAGES - OPTION 3

UNIT	ECONOMIZER	OPERATION		
		Y1 THERMOSTAT DEMAND	Y2 ONLY THERMOSTAT DEMAND	Y1 AND Y2 THERMOSTAT DEMAND
1 Compressor	No Economizer	Compr.1	Compr.1	Compr.1
	Economizer	FreeCool	FreeCool + Compr.1	FreeCool + Compr.1
2 Compressors	No Economizer	Compr.1	Compr.1 + Compr.2	Compr.1 + Compr.2
	Economizer	FreeCool	FreeCool + Compr.1	FreeCool + Compr.1 +Compr.2
3 Compressors	No Economizer	Compr.1	Compr.1 + Compr.2	Compr.1 + Compr.2 + Compr.3
	Economizer	FreeCool	FreeCool + Compr.1	FreeCool + Compr.1 + Compr. 2
4 Compressors	No Economizer	Compr.1 + Compr.2	Compr.1 + Compr.2 + Compr.3	Compr.1 + Compr.2 + Compr.3 + Compr.4
	Economizer	FreeCool	FreeCool + Compr.1 + Compr.2	FreeCool + Compr.1 + Compr.2+ Compr.3

* An additional relay may be required with three-stage operation.

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).

FREEZESTATS (S49, S50, S53, S59)

Normally closed freezestats open when evaporator coil temperature drops to de-energize the corresponding compressor. Once coil temperature rises the switch automatically resets to allow compressor operation.

HIGH PRESSURE SWITCHES (S4, S7, S28, S96)

High pressure switches open on a pressure rise to de-energize the corresponding compressor for five minutes (ECTO 5.02). Switches automatically reset when pressure drops. The corresponding compressor is locked out after three occurrences. (ECTO 4.14).

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.

ZONE SENSOR

Zone sensor applications allow optional heating and cooling stages. See ECTO 6.01. For example: if option 2 is selected and the zone sensor fails, the IMC will operate from the room thermostat.

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).

RETURN AIR TEMPERATURE LIMITS

Zone temperatures may be limited by changing ECTO parameter 5.05. Change ECTO 5.06 to interrupt a heating demand and ECTO 5.07 to interrupt a cooling demand. If return air temperatures are exceeded, the demand will be interrupted. Error codes 40 or 41 are displayed but not stored in memory for recall.

SUPERMARKET REHEAT MODE LGA Units Only

An optional ECTO setting allows simultaneous heating and cooling to remove humidity for process air applications. A de-humidistat will bring on first-stage cooling to dehumidify and a room thermostat will energize heating to maintain indoor temperature. ECTO 4.24.

The following conditions apply when the unit is operating in the reheat mode:

1- Dehumidistat Demand Met First -
Unit will terminate heating and start the autochangeover delay. After the changeover delay normal heating mode will resume.

2-Heating Demand Met First -
Unit will continue to cool without interruption.

3-Heating Operation; Dehumidistat Demand Starts- Units will continue to heat without interruption.

4-Cooling Operation; Heating Demand Terminates-
Unit will terminate heating and start the autochangeover delay. After the changeover delay normal cooling mode will resume.

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.

Defrost Readout

The readout will display IDF1I when the first stage is operating in defrost mode, IDF2I will display when the second stage is operating in defrost mode, and IDF-I will display when both stages are operating in defrost mode.

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.

LOW PRESSURE SWITCHES (S87, S88, S98, S97)

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 4.08, 4.09, 4.10, and 4.11 to adjust the cut-out temperature.

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

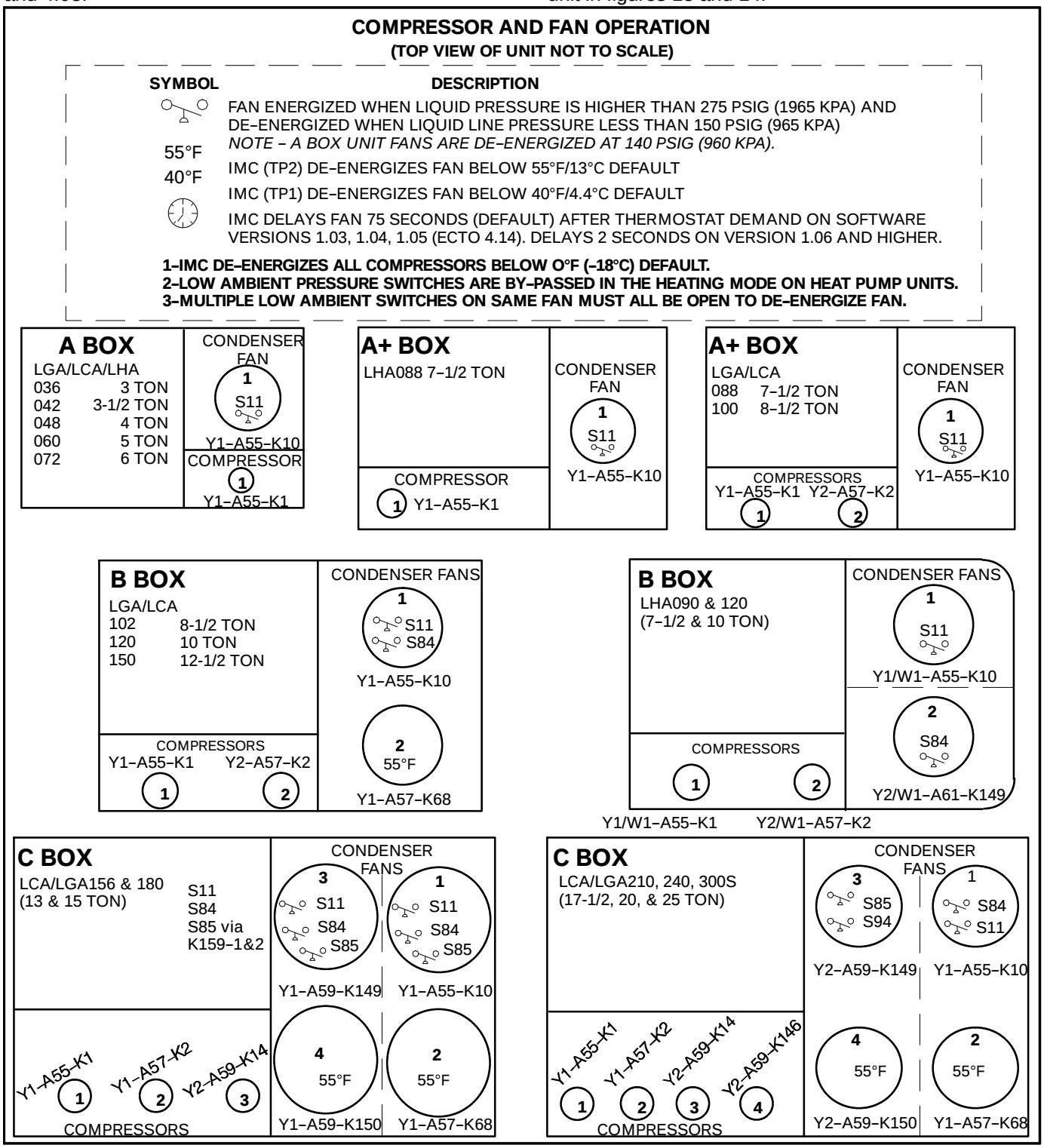


FIGURE 13

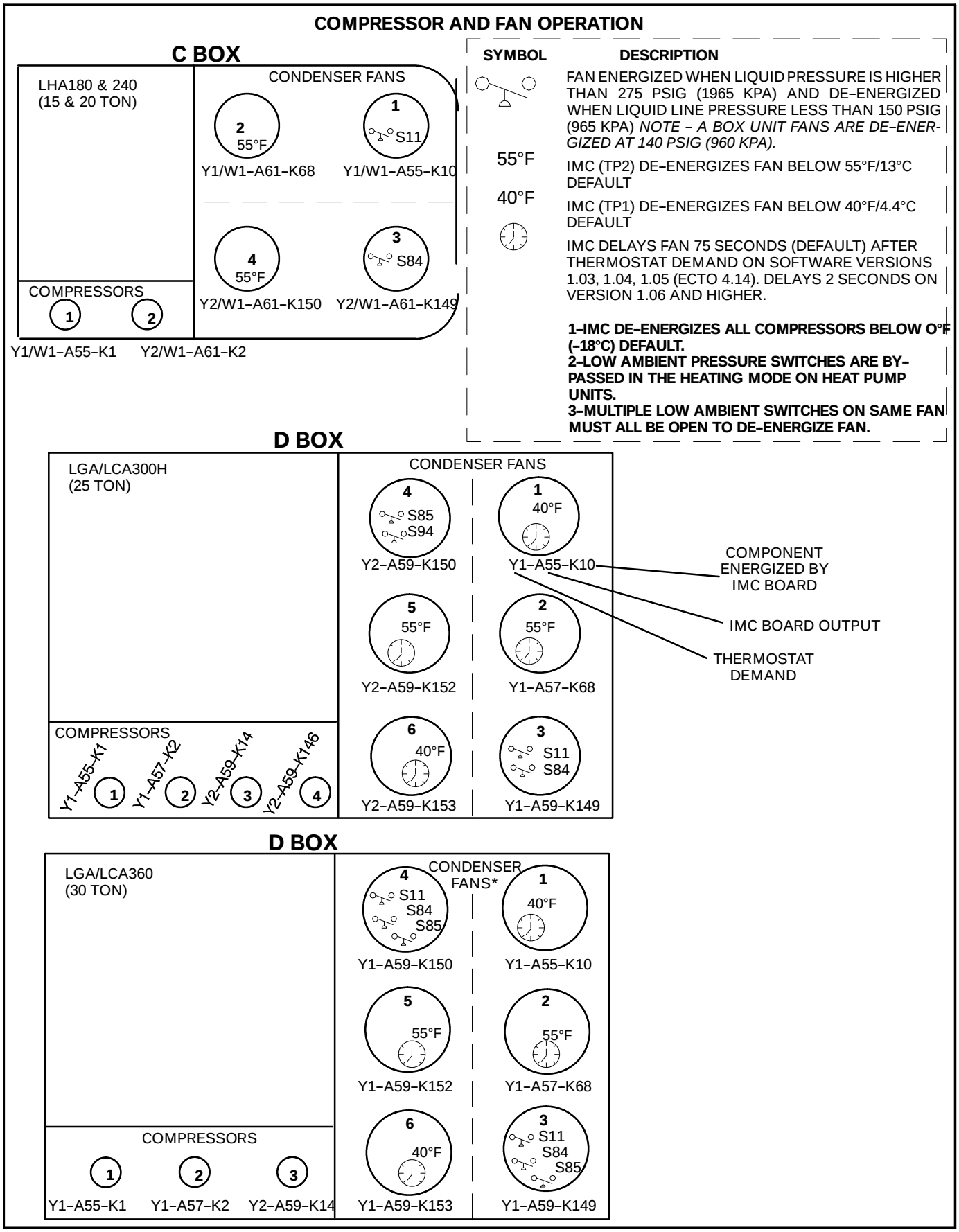

COMPRESSOR AND FAN OPERATION
C BOX
LHA180 & 240
(15 & 20 TON)
CONDENSER FANS
2
55°F
Y1/W1–A61–K68
1
S11
Y1/W1–A55–K10
4
55°F
Y2/W1–A61–K150
3
S84
Y2/W1–A61–K149
COMPRESSORS
1
2
Y1/W1–A55–K1
Y2/W1–A61–K2
SYMBOL
DESCRIPTION
FAN ENERGIZED WHEN LIQUID PRESSURE IS HIGHER THAN 275 PSIG (1965 KPA) AND DE–ENERGIZED WHEN LIQUID LINE PRESSURE LESS THAN 150 PSIG (965 KPA) NOTE – A BOX UNIT FANS ARE DE–ENERGIZED AT 140 PSIG (960 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.
1–IMC DE–ENERGIZES ALL COMPRESSORS BELOW O°F (–18°C) DEFAULT.
2–LOW AMBIENT PRESSURE SWITCHES ARE BY–PASSED IN THE HEATING MODE ON HEAT PUMP UNITS.
3–MULTIPLE LOW AMBIENT SWITCHES ON SAME FAN MUST ALL BE OPEN TO DE–ENERGIZE FAN.
D BOX
LGA/LCA300H
(25 TON)
CONDENSER FANS
4
S85
S94
Y2–A59–K150
1
40°F
Y1–A55–K10
5
55°F
Y2–A59–K152
2
55°F
Y1–A57–K68
6
40°F
Y2–A59–K153
3
S11
S84
Y1–A59–K149
COMPRESSORS
Y1–A55–K1
1
Y1–A57–K2
2
Y2–A59–K14
3
Y2–A59–K146
4
COMPONENT ENERGIZED BY IMC BOARD
IMC BOARD OUTPUT
THERMOSTAT DEMAND
D BOX
LGA/LCA360
(30 TON)
CONDENSER FANS*
4
S11
S84
S85
Y1–A59–K150
1
40°F
Y1–A55–K10
5
55°F
Y1–A59–K152
2
55°F
Y1–A57–K68
6
40°F
Y1–A59–K153
3
S11
S84
S85
Y1–A59–K149
COMPRESSORS
1
2
3
Y1–A55–K1
Y1–A57–K2
Y2–A59–K14

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 the A56 (EM1) 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.

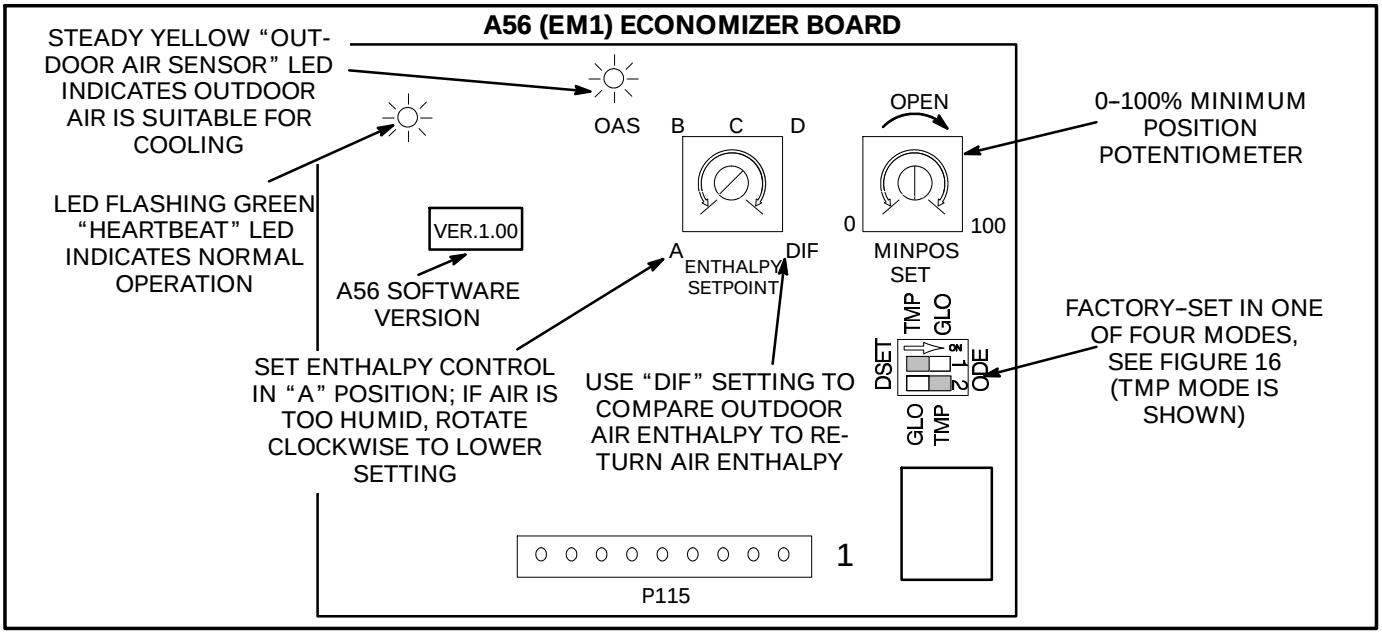
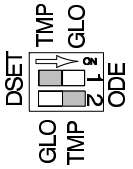


FIGURE 15

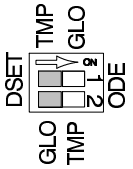
A56 (EM1) DIP SWITCH SETTINGS

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

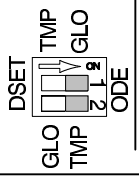
TMP (SENSIBLE TEMPERATURE)
Switches set to read sensible temperature. A56 allows free cooling when outdoor air temperature is less than return air temperature. The enthalpy setpoint is ignored in this mode.



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.

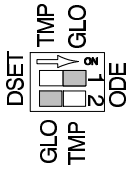


ODE (OUTDOOR ENTHALPY)
Switches set to read outdoor air enthalpy (temperature and humidity). Dampers open for free cooling if outdoor air is less than the A56 (EM1) board setpoint.



GLO (GLOBAL)

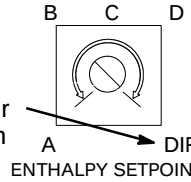
Switches set to read global enthalpy. Multiple unit installations use only one enthalpy sensor to determine outdoor air suitability (rather than one enthalpy sensor per unit). This setting is also used for motorized outdoor air damper applications.



Global Minimum/Maximum (Min/Max) mode is available by changing ECTO parameter 5.24. Instead of modulating dampers, Min/Max mode will either open dampers to maximum position or close dampers to minimum position.

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.



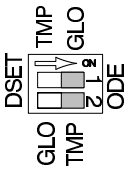


FIGURE 16

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)

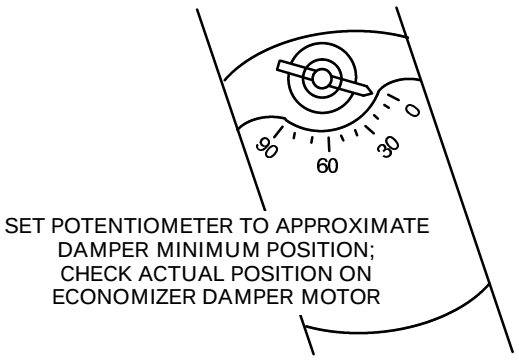


FIGURE 17

DAMPER MAXIMUM POSITION

Economizer dampers open to 100% at the default setting. Adjust ECTO parameter 5.23 to reduce the maximum damper opening for free cooling.

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 (Default Option)

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 (3)

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) -- Units with two-stage compressor operation which contain IMC version M1-4 or M1-5 will operate only stage 1 with a Y2 demand (default).

TABLE 6
ECONOMIZER OPERATION WITH GLOBAL SENSING
Energy Management System (Default Option)

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 (4)

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

NOTE - In Global Min/Max mode dampers open to minimum when table 6 indicate minimum; dampers open to maximum when table 6 indicates modulating.

(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.

(4) -- Units with two-stage compressor operation which contain IMC version M1-4 or M1-5 will operate only stage 1 with a Y2 demand (default).

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).

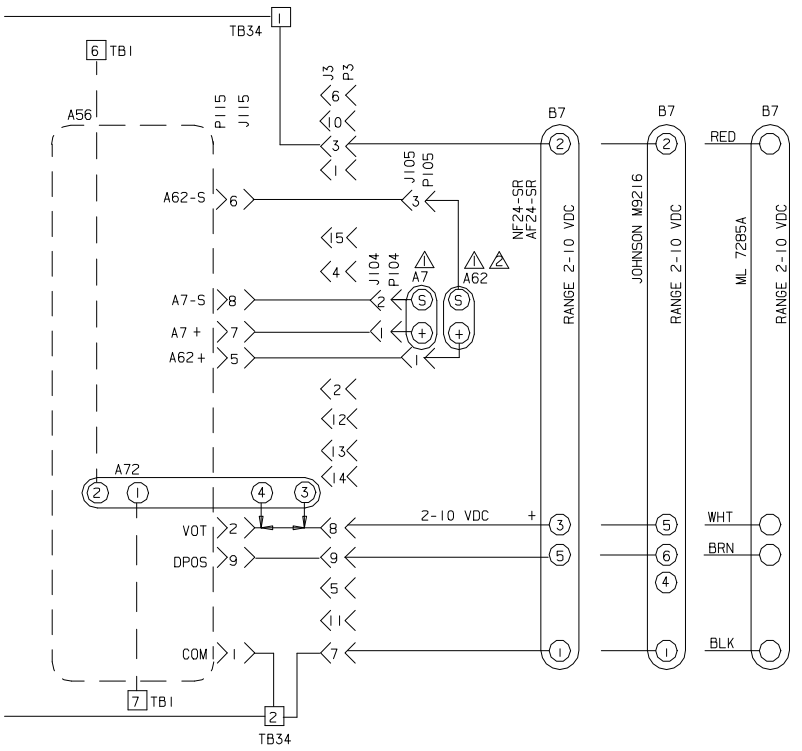
NOTE - Allow approximately 30 seconds for voltage to react.

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.



DESCRIPTION	
KEY	COMPONENT
A7	SENSOR-SOLID STATE ENTHALPY
A56	PANEL-ECONOMIZER
A62	SENSOR-ENTHALPY,INDOOR
A72	CONTROL-REMOTE,MIN POS(OPT)
B7	MOTOR-DAMPER
J3	JACK-UNIT ECONOMIZER
J104	JACK-SENSOR,OUTDOOR ENTHALPY
J105	JACK-SENSOR,RETURN AIR ENTHALPY
J115	JACK-ECONOMIZER,OUTPUT
P3	PLUG-UNIT ECONOMIZER
P104	PLUG-SENSOR,OUTDOOR ENTHALPY
P105	PLUG-SENSOR,RETURN AIR ENTHALPY
P115	PLUG-ECONOMIZER,OUTPUT
TB1	TERMINAL STRIP-CLASS II VOLTAGE
TB34	TERMINAL STRIP-TRANSFORMER TI

⚠1 DELETE A7 AND A62 (IF USED) FOR EITHER GLOBAL ENTHALPY OR SENSIBLE TEMPERATURE CONTROL

⚠2 FOR UNIT DIFFERENTIAL ENTHALPY CONTROL, ADD A62 RETURN AIR ENTHALPY SENSOR

NOTE: THIS DIAGRAM USED ONLY WHEN ECONOMIZER OR MOTORIZED OUTDOOR AIR DAMPERS ARE INSTALLED

WIRING DIAGRAM	8/97
ACCESSORIES	
"L" SERIES ECONOMIZER AND MOTORIZED OUTSIDE AIR DAMPER	
ECONOMIZER-SECTION DI	
Supersedes Form No. 531,713W	New Form No. 531,770W

 Litho U.S.A.

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 MODULATING MODE OF OPERATION

In the GLO (modulating) mode, dampers modulate 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
GLO MIN/MAX MODE OF OPERATION
(only EM1 board versions 1.06 and higher)

In the GLO (min/max) mode, dampers open to maximum position for free cooling when the global input is energized; dampers open to the minimum position when the global input is off. Dampers will fluctuate to maintain supply air temperature (RT6) at 55°F (13°C).

NOTE - The global input turns on the blower.

1- Change ECTO 5.24 option to 1. See ECTO section.

2- Set the A56 DIP switch to GLO.

3- The damper will energize to the minimum position set on the potentiometer on the A56 (EM1) board.

4- Connect a jumper between TB1-6 (24vac) and TB1-1 (global). The blower will be energized and the damper will open to maximum position. Maximum position may be adjusted in ECTO 5.23. Default is 100%.

NOTE - The OAS LED is on if the globlal input is on.

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

5- If the damper does not actuate check all connections and wiring between J115 and J3.

STEP 8

ENTHALPY SENSOR OPERATION (A7 AND A62)

1- Connect a DC ampmeter as shown in figures 18 and/or 19.

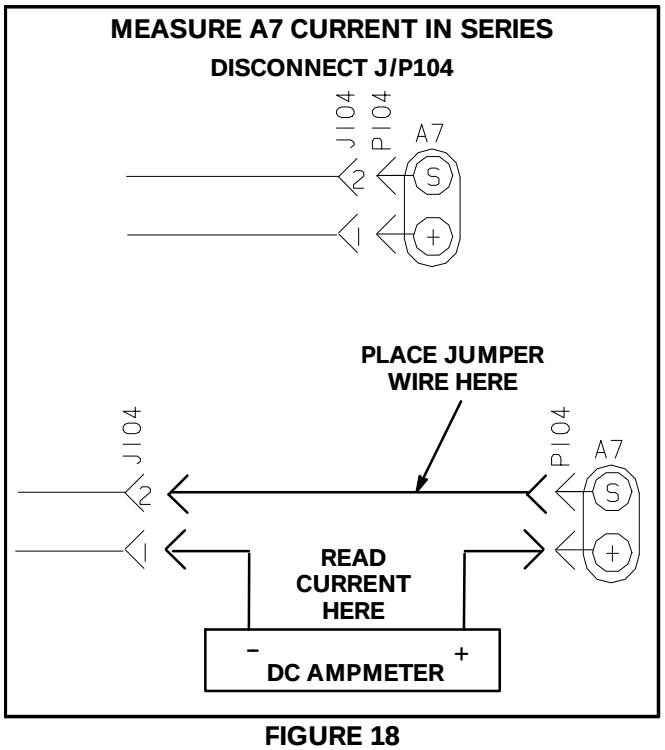


FIGURE 18

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.

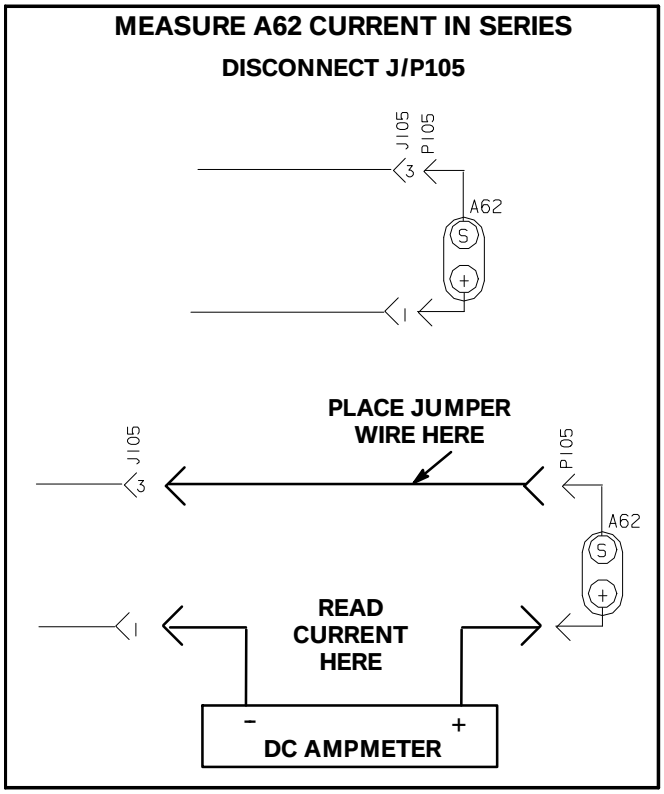
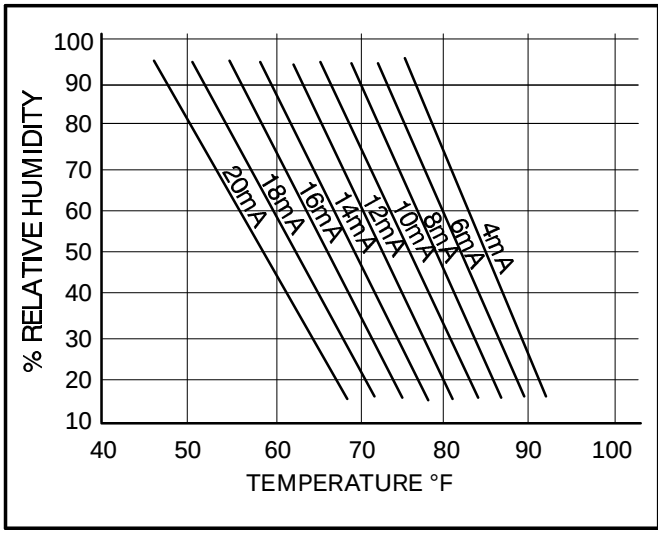


FIGURE 19

TABLE 8
ENTHALPY SENSOR OUTPUT CURRENT
HONEYWELL C7400



ECONOMIZER

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. Figure 20 shows default or proportional operation.

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

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

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

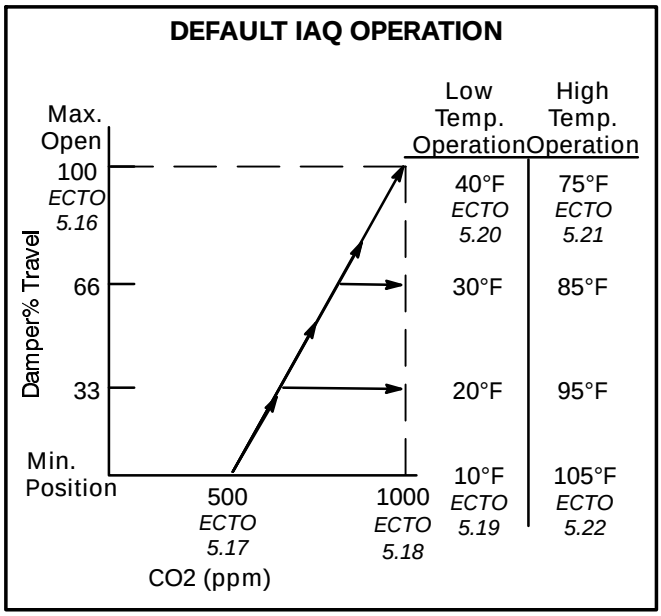


FIGURE 20

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.

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

Setpoint Control Option

Setpoint Control mode is commonly used in areas with high occupancy and frequent changeout such as classrooms or conference rooms

In applications requiring this on/off damper response to CO_2 levels, set the full open" (ECTO 5.17) setpoint higher than the "start open" (ECTO 5.18) setpoint. The dampers will drive to fully-open position immediately. Figure 21 shows the setpoint control option.

Change ECTO 5.19 and 5.20 to set the minimum outdoor temperature limits. Change ECTO 5.21 and 5.22 to set the maximum temperature value.

IMPORTANT - Mixed air temperatures less than 45°F (7°C) on units with an aluminized heat exchanger or less than 30°F (-1°C) on stainless steel heat exchangers will void the manufacturer's warrantee..

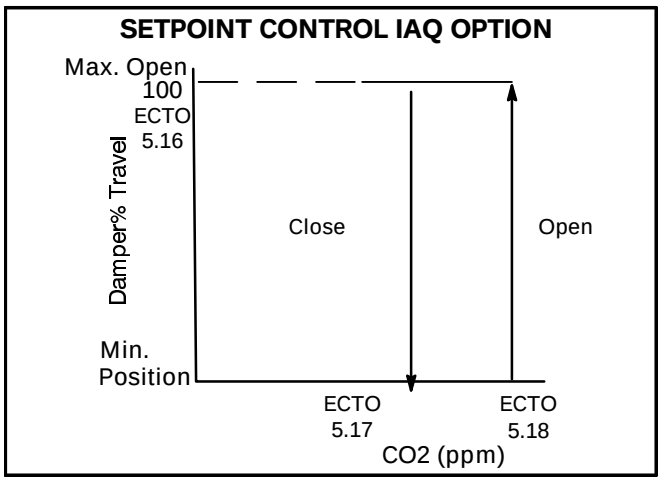


FIGURE 21

Determine IAQ Input

Check IAQ input (ppm) as follows:

1- Set the TEMP dip switch to ON.

2- Toggle the pushbutton to .4. The display will alternate between .4 and the IAQ input.

3- Use the following formulas or table 9 to determine DC voltage or CO2 ppm. Divide the reading (counts) by 255 to determine DC voltage. Multiply the reading (counts) by 7.843 to determine the CO2 ppm.

Counts ÷ 255 = DC Voltage

Counts X 7.843 = CO2 ppm

TABLE 9

IAQ CONVERSION		
COUNTS	INPUT D.C. VOLTAGE	CO2 PPM
0	0	0
25	.98	196
50	1.96	392
75	2.94	588
100	3.92	784
125	4.90	980
150	5.88	1176
175	6.86	1373
200	7.84	1569
225	8.82	1765
255	10.0	2000

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 22.

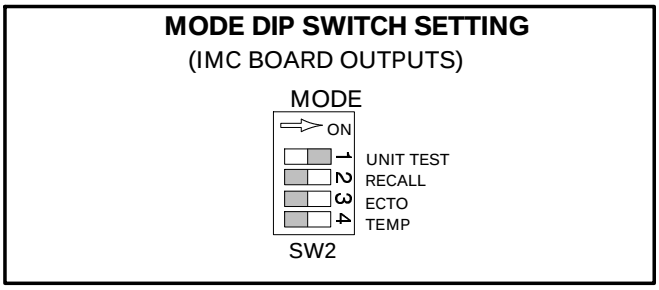


FIGURE 22

For a few seconds only a decimal point will be displayed. Then a "0" will be displayed indicating an IMC board output. See figure 23.

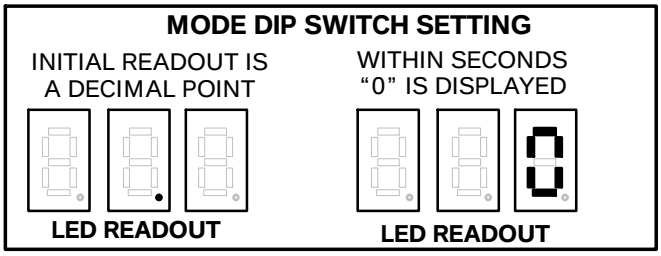


FIGURE 23

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 10 for type of output. Two pushes, or a double push, will toggle the output downward from 9 to 0.

TABLE 10
TESTING OUTPUTS

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

(1) Fans which are controlled by a low ambient pressure switch will not be energized.

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 24.

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

The display will read E if DIP switches have been set incorrectly. See figure 24.

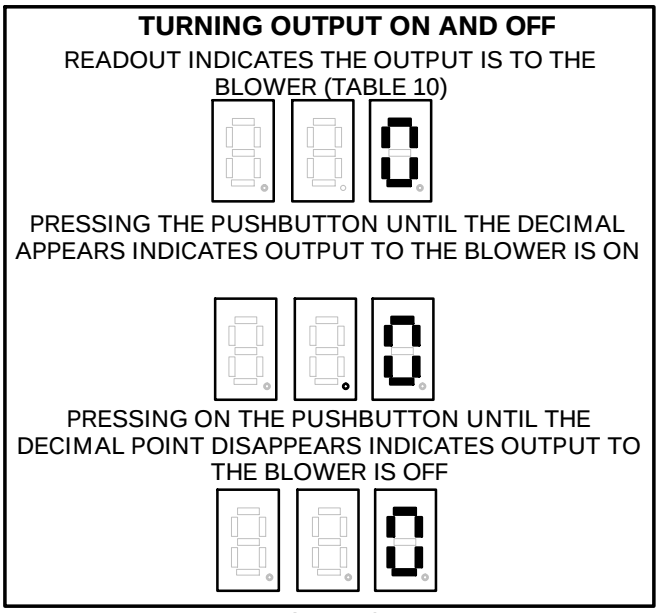


FIGURE 24

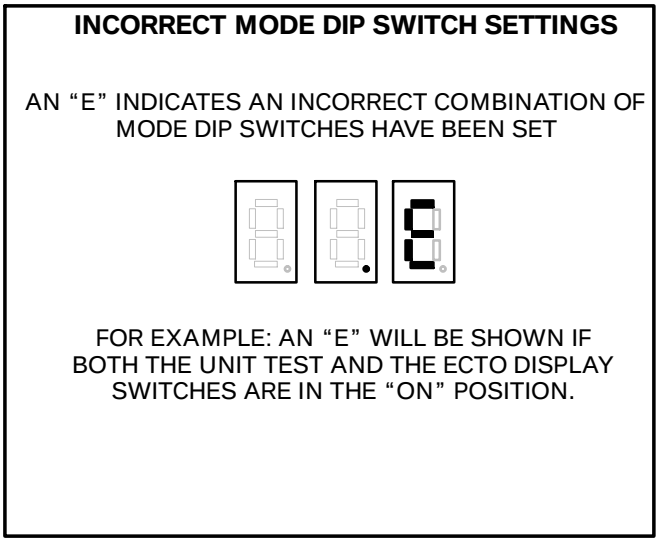


FIGURE 25

Example:

To check fan 3 operation (see figure 26):

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.

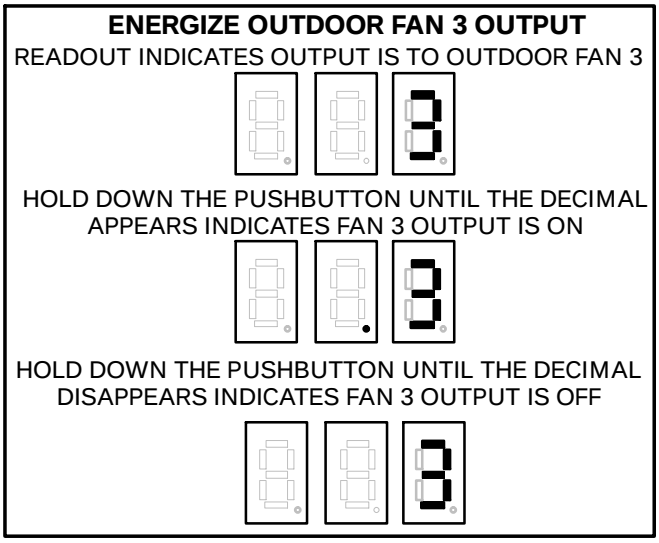


FIGURE 26

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. Make sure the decimal point is to the right of the readout. Move the MODE DIP "UNIT TEST" switch #1 to "ON". See figure 27.

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

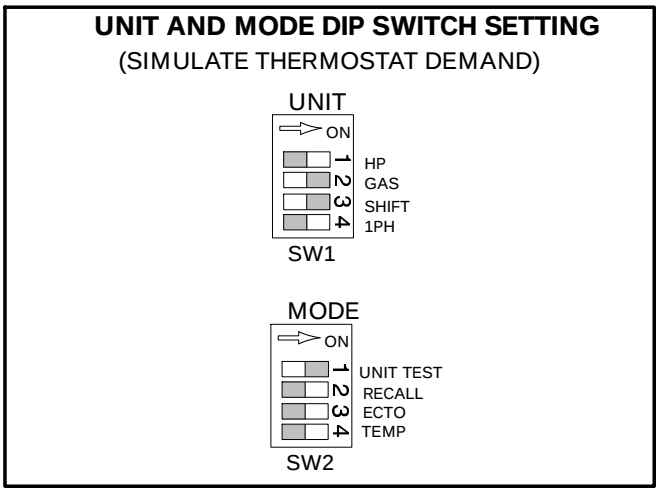


FIGURE 27

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",. A double push will toggle the readout downward from "S01" to "c01. Table 10 shows test inputs on two-stage units (ECTO 5.04 set to 1 or 2).

Table 11 shows test inputs for three-stage units (ECTO 5.04 set to 3).

NOTE - When a cooling stage is de-energized, all lower stages are de-energized simultaneously.

TABLE 11

TESTING INPUTS (TWO-STAGE)

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)

TABLE 12

TESTING INPUTS (THREE-STAGE)

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	3RD 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 28.

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.

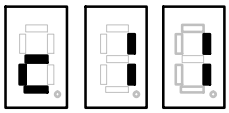
3-Press pushbutton until decimal appears; all compressors will be energized.

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.

TURNING INPUT ON AND OFF

c11 READOUT INDICATES THE INPUT IS TO FIRST–AND SECOND–STAGE COOLING (TABLE 4)



PRESSING THE PUSHBUTTON UNTIL THE DECIMALS APPEAR (C1.1.) SIMULATES A Y1 AND Y2 THERMOSTAT DEMAND

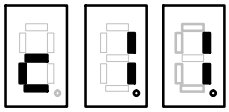


FIGURE 28

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 29, to read the outputs shown in table 13.

Display will alternately flash from readout to output.

The display will read E to indicate a wrong combination of DIP switches have been set. See figure 29.

A single push on the pushbutton will toggle the readout upward from .0 to .6, incrementally, as shown in table 14. A double push will toggle the readout downward from .6 to .0 incrementally.

DISPLAY SENSOR INPUT DIP SWITCH SETTING

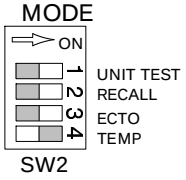
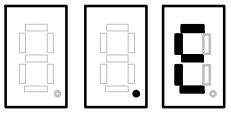


FIGURE 29

INCORRECT MODE DIP SWITCH SETTINGS

AN “E” INDICATES AN INCORRECT COMBINATION OF MODE DIP SWITCHES HAVE BEEN SET



FOR EXAMPLE: AN “E” WILL BE SHOWN IF BOTH THE TEMP AND THE ECTO SWITCHES ARE IN THE “ON” POSITION.

FIGURE 30

TABLE 13
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–%

DEGREES CELSIUS (°C)

Change ECTO parameter 5.03 to option to display all temperature in °C.

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 zone air sensor temperatures are displayed to the nearest degree.

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. Zone 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 31 shows an output reading of 100.

3-Divide output reading by 25.5 to get IAQ sensor output voltage. See figure 31.

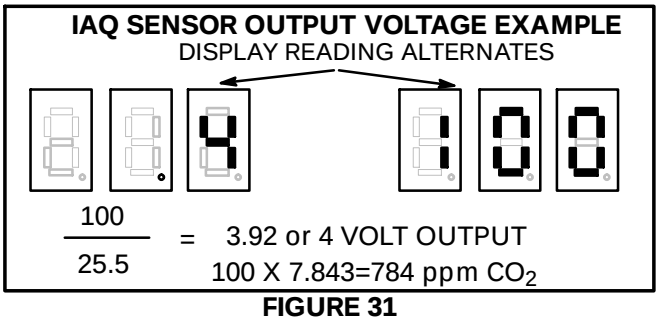


FIGURE 31

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 14.

TABLE 14
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

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 15.

READING CONTROL PARAMETERS

Control parameters can be viewed using the pushbutton and display. Set the MODE DIP "ECTO" switch #3 to "ON" to read the parameter which corresponds to a control value. See figure 32.

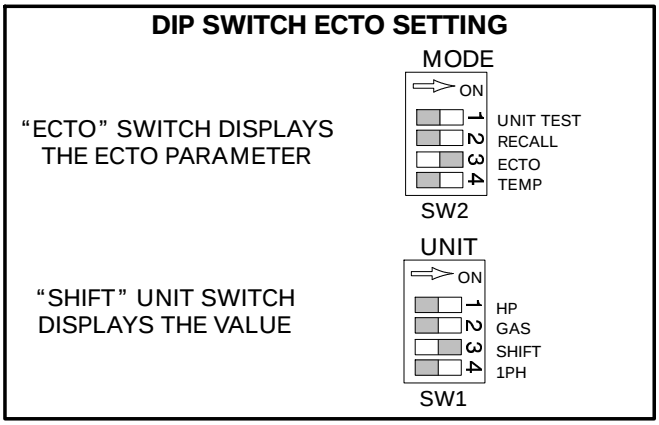


FIGURE 32

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 32.

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 ECTO 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 16 to determine actual time or temperature span. Parameters may be calculated from counts using the following code calculations.

CODE A: SECONDS = 2 x COUNTS
CODE B: SECONDS = 4 x COUNTS
CODE C: SECONDS = 8 x COUNTS
CODE D: SECONDS = 32 x COUNTS
CODE E: SECONDS = 128 x COUNTS
CODE F: TEMP. (F) = 16 x COUNTS
CODE W: TEMP. (F) = 0.25 x COUNTS
CODE X: TEMP. (F) = 164.45 - (.6769 X COUNTS)
CODE Y: TEMP. (F) = 131.56 - (.6360 x COUNTS)
CODE Z: TEMP. (F) = 100- (.25 X COUNTS)

Change ECTO Summary:

1–Turn ECTO 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 ECTO and SHIFT switch.

Example:

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

1-Set the MODE DIP "ECTO" 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 15) 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 16 Column A) as shown in

Control Parameter Table (Table 15) 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 ECTO 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 ECTO 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 ECTO and DIP switches.

TABLE 15
IMC ECTO CONTROL PARAMETERS

BLOCK 1 LHA HEATING PARAMETERS						
Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
1.01	Warm-Up Delay	28 15	56 30	255 136	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	Blower On Delay	0 0	0 0	15 60	Code B Seconds	Blower on delay. The time before the blower turns on after a heating demand.
1.03	Blower Off Delay	0 0	5 20	75 300	Code B Seconds	Blower off delay. The time the blower stays on after the heating demand is lost
1.04	Max. Heating Limit Occurrences	1	5	15	Code B Counts	Service relay activation. Maximum Primary and Secondary Limit occurrences stored before service relay is energized. If max value is set, service output is disabled. **Note: Heating stage is not locked out.**
1.05	Supplemental Heat Stage Delay	3 12	3 12	15 60	Code B Seconds	Time delay between 1 & 2 stage of supplemental heat.
1.06	Supplemental Heat 2 Lockout Temperature	113 60	160 30	175 20	Code Y Deg. F	Temperature setpoint for lockout for the second bank of supplemental heat. **Note: This parameter must be less than or equal to ECTO1.07.**
1.07	Supplemental Heat 1 Lockout Temperature	113 60	144 40	175 20	Code Y Deg. F	Temperature setpoint for lockout of first bank of supplemental heat. **Note: This parameter must be equal to or greater than ECTO1.06.**
1.08	Compressor 1 Low Temperature Lockout	81 80	255 Disabled	254 -30	Code Y Deg. F	Low ambient lockout for compressor 1. 254 value equals -30 °F (-34°C). A value of 255 (-31°F) will disable low ambient lockout function. **Note: This lockout is for heating only.**
1.09	Compressor 2 Low Temperature Lockout	81 80	255 Disabled	254 -30	Code Y Deg. F	Low ambient lockout for compressor 2. 254 value equals -30 °F (-34°C). A value of 255 (-31°F) will disable low ambient lockout function. **Note: This lockout is for heating only.**
1.10	Compressor Minimum Off Delay	30 60	150 300	255 510	Code A Seconds	Compressor minimum off delay. Used on 1 PH units. Also used on all units after an error occurs.
1.11	Compressor Minimum Run Time	30 60	120 240	255 510	Code A Seconds	Compressor minimum run time. Used on 3 PH units.
1.12	Max. High Pressure Occurrences	1	3	8	Counts	Maximum High Pressure occurrences 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	Max. Low Pressure Occurrences	1	3	8	Counts	Maximum Low Pressure occurrences 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	Defrost Supplemental Heat Option	0	1	1	Option	Defrost options: 0: No supplemental heating during defrost. 1: Supplemental heating on during defrost.
1.15	Minimum Time Between Defrost	1 32	2 64	3 96	Option Minutes	Minimum time allowed between defrost cycles.
1.16	Maximum Defrost Time	2 10	3 15	5 25	Code Minutes	Maximum defrost time allowed. Minutes = Value x 5.

BLOCK 1 LHA HEATING PARAMETERS						
Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
1.17	Warm-Up Options	0	0	2	Option	Warm-up mode option. 0: Supplemental heat may be used during warm-up. Use depends on outdoor temperature. See ECTO 1.06 and 1.07. 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 future use.
1.18	Supplemental Heat 1 Differential	0 0	8 2	15 3.75	Code W Deg. F	Supplemental heat stage 1differential. Used in zone sensor applications. **Note: This parameter must be equal to or less than ECTO 1.19**.
1.19	Supplemental Heat 2 Differential	0 0	12 3	15 3.75	z Deg. F	Supplemental heat stage 2 differential. Used in zone sensor applications. **Note: This parameter must be equal to or greater than ECTO 1.18**
1.20	Supplemental Heat 1 Latch Option	0	0	1	Option	Supplemental heat stage 1 latch option. Used in zone sensor applications. 0: Latch Disabled 1: Latch Enabled
1.21	Supplemental Heat 2 Latch Option	0	0	1	Option	Supplemental heat stage 2 latch option. Used in zone sensor applications. 0: Latch Disabled 1: Latch Enabled
1.22	Supplemental Heat 1 Stage-Up Timer	0 0	0 0	225 60	Code F Minutes	Supplemental heat stage 1 stage-up timer. The maximum time that stage 1 runs before calling supplemental heat stage 1. Used in zone sensor applications.
1.23	Supplemental Heat 2 Stage-Up Timer	0 0	0 0	225 60	Code F Minutes	Supplemental heat stage 2 stage-up timer. The maximum time that supplemental heat 1 runs before calling supplemental heat stage 2. Used in zone sensor applications.
1.24	Stage Down Timer	0 0	57 15	225 60	Code F Minutes	Time delay before a lower stage turns off following a higher stage termination.
BLOCK 2 HEATING PARAMETERS						
Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
2.01	Warm Up Delay	0 0	112 60	255 136	Code D Minutes	Warm-up time delay. The time that the economizer is forced closed during warm-up.
2.02	Blower On Delay	0 0	0 0	0 0	Code B Seconds	Blower on delay. The time before the blower turns on after a heating demand. Reserved for future use
2.03	Blower Off Delay	0 0	5 20	75 300	Code B Seconds	Blower off delay. The time the blower stays on after the heating demand is lost
2.04	Max. Heating Limit Occurrences	1	3	15	Counts	Service relay activation. Maximum Primary and Secondary Limit occurrences stored before service relay is energized. If max value is set, service output is disabled. **Note: Heating stage is not locked out**
2.05	Heat Stage Delay	3 12	3 12	15 60	Code B Seconds	Time delay between 1 & 2 stage of heat.
2.06	Stage 2 Latch Option	0	0	1	Option	Stage 2 latch option. Used in zone sensor applications. 0: Latch Disabled 1: Latch Enabled
2.07	Stage 2 Stage-Up Timer	0 0	57 15	225 60	Code F Minutes	Stage 2 stage up timer. The maximum time that stage 1 runs before calling heat stage 2. Used in zone sensor applications.
2.08	Stage Down Timer	0 0	57 15	225 60	Code F Minutes	Time delay before a lower stage turns off following a higher stage termination.
BLOCK 3 LGA HEATING PARAMETERS						
Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
3.01	Warm Up Delay	0 0	112 60	255 136	Code D Minutes	Warm-up time delay. The time that the economizer is forced closed during warm-up.
3.02	Blower On Delay	2 8	10 40	15 60	Code B Seconds	Blower on delay. The time before the blower turns on after a heating demand.

BLOCK 3 LGA HEATING PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
3.03	Blower Off Delay	20 80	30 120	75 300	Code B Seconds	Blower off delay. The time the blower stays on after the heating demand is lost.
3.04	Max. Heating Limit Occurrences	1	3	15	Counts	Service relay activation. Maximum Primary and Secondary Limit occurrences stored before service relay is energized. If max value is set, service output is disabled. **Note: Heating stage is not locked out.**
3.05	High Fire Delay	15 30	15 30	80 160	Code A Seconds	The minimum low fire time before high fire is allowed.
3.06	Heating Off Delay	15 30	50 100	150 300	Code A Seconds	Heating off delay.
3.07	Max. Combustion Air Proof Switch Occurrences	1	3	6	Counts	Service relay activation. Maximum Combustion Air Blower Proof Switch occurrences stored before service relay is energized. If max value is set, service output is disabled. **Note: Heating stage is not locked out.**
3.08	Max. Roll Out Switch Occurrences	1	1	4	Counts	Service relay activation. Maximum Roll Out Switch occurrences stored before service relay is energized. If max value is set, service output disabled. **Note: Heating stage is not locked out.**
3.09	Max. Gas Valve Sense Occurrences	1	3	6	Counts	Service relay activation. Maximum Gas Valve Sense occurrences stored before service relay is energized. If max value is set, service output is disabled. **Note: Heating stage is not locked out.**
3.10	Stage 2 Latch Option	0	0	1	Option	Stage 2 latch option. Used in zone sensor applications. 0: Latch Disabled 1: Latch Enabled
3.11	Stage 2 Stage-Up Timer	0 0	57 15	225 60	Code F Minutes	Stage 2 stage-up timer. The maximum time that stage 1 runs before calling heat stage 2. Used in zone sensor applications.
3.12	Stage Down Timer	0 0	57 15	225 60	Code F Minutes	Time delay before a lower stage turns off following a higher stage termination.

BLOCK 4 COOLING PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
4.01	Cool Down Delay	0 0	56 30	255 136	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	Blower On Delay	0 0	0 0	15 60	Code B Seconds	Blower on delay. The time before the blower turns on after a cooling demand.
4.03	Blower Off Delay	0 0	0 0	60 240	Code B Seconds	Blower off delay. The time the blower stays on after the cooling demand is lost.
4.04	Max. Freeze Stat Occurrences	1	3	4	Counts	Service relay activation. Maximum Freeze Stat occurrences stored before service relay is energized. If max value is set, service output is disabled. **Note: The cooling stage is not locked out**.
4.05	Fan Re-Start Delay	0 0	3 6	8 16	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.
4.06	Low Ambient Setpoint Temp. 1	113 60	144 40	191 10	Code Y Deg. F	Low ambient outdoor air limit temp. 1. Parameters 4.06 and 4.07 are used to shed fans. See Operation section.
4.07	Low Ambient Setpoint Temp. 2	113 60	120 55	191 10	Code Y Deg.F	Low ambient outdoor air limit temp. 2. Parameters 4.06 and 4.07 are used to shed fans. See Operation section.
4.08	Compressor 1 Low Temperature Lockout	81 80	207 0	254 -30	Code Y Deg. F	Low ambient lockout for compressor 1. 254 value equals -30 °F (-34°C). A value of 255 (-31°F) will disable low ambient lockout function. **Parameter value must be less than or equal to 4.09.**
4.09	Compressor 2 Low Temperature Lockout	81 80	207 0	254 -30	Code Y Deg. F	Low ambient lockout for compressor 2. 254 value equals -30 °F (-34°C). A value of 255 (-31°F) will disable low ambient lockout function. **Parameter value must be equal to or greater than 4.08 .**
4.10	Compressor 3 Low Temperature Lockout	81 80	207 0	254 -30	Code Y Deg. F	Low ambient lockout for compressor 3. 254 value equals -30 °F (-34°C). A value of 255(-31°F) will disable low ambient lockout function. **Parameter value must be equal to or greater than 4.08 and 4.09.**

BLOCK 4 COOLING PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
4.11	Compressor 4 Low Temperature Lock-out	81 80	207 0	254 -30	Code Y Deg. F	Low ambient lockout for compressor 4. 254 value equals -30 °F (-34°C). A value of 255 (-31°F) will disable low ambient lockout function . **Parameter value must be equal to or greater than 4.10, 4.09 and 4.08.**
4.12	Compressor Minimum Off Delay	30 60	150 300	255 510	Code A Seconds	Compressor minimum off delay. Used on 1 PH units. Also used on all units after an error occurs.
4.13	Compressor Minimum Run Time	30 60	120 240	255 510	Code A Seconds	Compressor minimum run time. Used on 3 PH units.
4.14	Max. High Pressure Occurrences	1	3	8	Counts	Maximum High Pressure occurrences that are stored before control locks off compressor stage and energizes the service relay. If max value is set, service output is disabled.
4.15	Max. Low Pressure Occurrences	1	3	8	Counts	Maximum Low Pressure occurrences that are stored before control locks off compressor stage and energizes the service relay. If max value is set, service output is disabled.
4.16	Condenser Fan Delay	0 0	1 2	120 240	Code A Seconds	Condenser fan delay. Used only on 25 & 30 ton units.
4.17	Stage 2 Latch Option	0	0	1	Option	Stage 2 latch option. Used in zone sensor applications. 0: Latch Disabled 1: Latch Enabled
4.18	Stage 3 Latch Option	0	0	1	Option	Stage 3 latch option. Used in zone sensor applications. 0: Latch Disabled 1: Latch Enabled
4.19	Stage 4 Latch Option	0	0	1	Option	Stage 4 latch option. Used in zone sensor applications. 0: Latch Disabled 1: Latch Enabled
4.20	Stage 2 Stage-Up Timer	0 0	57 15	225 60	Code F Minutes	Stage 2 stage up timer. The maximum time that cooling stage 1 runs before calling cooling stage 2. Used in zone sensor applications.
4.21	Stage 3 Stage-Up Timer	0 0	57 15	225 60	Code F Minutes	Stage 3 stage up timer. The maximum time that cooling stage 2 runs before calling cooling stage 3. Used in zone sensor applications.
4.22	Stage 4 Stage-Up Timer	0 0	57 15	225 60	Code F Minutes	Stage 4 stage up timer. The maximum time that cooling stage 3 runs before calling cooling stage 4. Used in zone sensor applications.
4.23	Stage Down Timer	0 0	57 15	225 60	Code F Minutes	Stage down timer. Used in zone sensor applications.
4.24	Reheat Control Option	0	0	1	Option	Supermarket reheat option. Allows for simultaneous heating and cooling based on the limitations outlined in Operation section.

BLOCK 5 MISCELLANEOUS PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
5.01	Smoke Alarm Option	0	0	3	Option	Operation options if smoke alarm occurs. 0: Unit off 1: Blower on, Exhaust Fan off, Outdoor Air Damper open (Positive pressure) 2: Blower on, Exhaust Fan off, Outdoor Air Damper closed (Negative pressure) 3: Blower on, Exhaust Fan on, Outdoor Air Damper open (Purge)
5.02	Error Timed Off Delay	8 1	38 5	225 30	Code C Minutes	Off time delay if a “no-run” error occurs.
5.03	Celsius Temperature Option	0	0	1	Option	Degrees Celsius option. 0: Displays degrees Fahrenheit 1: Displays degrees Celsius

BLOCK 5 MISCELLANEOUS PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
5.04	Thermostat Staging Options	1	2	3	Option	Staging option for thermostat input.. 1: Two cooling stages. Units with Economizers Y1=Free Cooling, Y2=adds all mechanical stages. 2: Two cooling stages. Units with Economizers Y1=Free Cooling, Y2= adds first stage of mechanical. 3: Three cooling stages. Y1 only = first stage, Y2 only = second stage, Y1+Y2 = third stage. Units with Economizers Y2 only adds first stage of mechanical, Y1+Y2 adds first and second stage of mechanical. **See operation section for more information.**
5.05	Return Air Temp. Limit Option	0	0	1	Option	Return air temperature limit option enable. Set to 1 to use 5.06 or 5.07. Return air limits may be used for limiting zone temperatures.
5.06	Return Air Temp. Heating Limit	95 100	95 100	124 80	Code X Deg. F	Return air limit for heating. **5.05 MUST BE SET TO 1 TO ENABLE**. If the return air heating limit is exceeded, the heating demands are interrupted.
5.07	Return Air Temp. Cooling Limit	124 80	154 60	154 60	Code X Deg. F	Return air limit for cooling. **5.05 MUST BE SET TO 1 TO ENABLE**. If the return air cooling limit is exceeded, the cooling demands are interrupted.
5.08	A42 Input Occurrences	1	3	15	Counts	A42 input occurrences before service relay is energized. (PI10-9)
5.09	Exhaust Fan On Setpoint	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	Low Pressure Strike Three Run Time 1	0 0	60 8	255 34	Code C Minutes	Ignore LP trip when compressor run time less than this. LONG/HOT condition. See chart 1 in Operation section.
5.11	Low Pressure Strike Three Run Time 2	0 0	113 15	255 34	Code C Minutes	Ignore LP trip when compressor run time less than this. LONG/COLD condition. See chart 1 in Operation section.
5.12	Low Pressure Strike Three Run Time 3	0 0	15 2	255 34	Code C Minutes	Ignore LP trip when compressor run time less than this. SHORT/HOT condition. See chart 1 in Operation section.
5.13	Low Pressure Strike Three Run Time 4	0 0	38 5	255 34	Code C Minutes	Ignore LP trip when compressor run time less than this. SHORT/ COLD condition. See chart 1 in Operation section.
5.14	Low Pressure Strike Three Off Time	28 1	113 4	169 6	Code E Hours	Compressor off time breakpoint for LONG/SHORT evaluation.
5.15	Low Pressure Strike Three Temp. Setpoint	50 100	97 70	191 10	Code Y Deg.F	Outdoor air temperature breakpoint for HOT/COLD evaluation. See chart 1 in Operation section.
5.16	IAQO - Max. Damper Open	0	100	100	% Travel	Maximum allowed IAQ damper open. (Set to 0 to disable IAQ)
5.17	IAQ 1 - Damper Start Open Setpoint	0 0	64 500	255 1992	PPM	Damper "start open" IAQ setpoint. CO^2 level (ppm) where economizer damper begins to open.
5.18	IAQ2 - Damper Full Open Setpoint	0 0	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 - Damper Full Closed Setpoint	0 132	191 10	255 -31	Code Y Deg.F	Low outdoor air temp. where IAQ damper is completely closed.
5.20	IAQ 4 - Low Temp. Start Closing	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.
5.21	IAQ 5 - High Temp. Start Closing	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.
5.22	IAQ 6 - High Temp. Full Close	0 132	42 105	255 -31	Code Y Deg.F	High outdoor air temp. where IAQ damper is completely closed.
5.23	Free Cooling Max. Damper	0	100	100	% Travel	The maximum allowed damper opening for **FREE COOLING.**
5.24	Economizer Global Option	0	0	1	Option	Global control option. 0: Free Cooling when Global input is present 1: Global input absent -- Damper position = Minimum Damper Setpoint (Set on A56) Global input present -- Damper position = Maximum Damper Setpoint (ECTO 5.23) **Available only on economizer (A56) board software versions 1.07+**

ECTO

BLOCK 6 SYSTEM PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
6.01	System Mode	0	0	11	Option	System mode of operation. **Control Value** **Control Mode** **Backup Mode** 0 Local Thermostat None 1 IMC Zone Sensor None 2 IMC Zone Sensor Local Thermostat 3 IMC Zone Sensor Return Air Sensor 4 Remote Demand None 5 Remote Demand Local Thermostat 6 Remote Demand Return Air Sensor 7 Remote Demand IMC Zone Sensor 8 Direct None 9 Direct Local Thermostat 10 Direct Return Air Sensor 11 Direct IMC Zone Sensor
6.02	Occupied Heating Backup Setpoint	60 85	120 70	180 55	Code Z Deg. F	Backup occupied heating setpoint. Used if the communications link is lost between the IMC and the EMS. Used only with IMC zone sensor applications.
6.03	Unoccupied Heating Backup Setpoint	60 85	160 60	180 55	Code Z Deg. F	Backup unoccupied heating setpoint. Used if the communications link is lost between the IMC and the EMS. Used only with IMC zone sensor applications
6.04	Occupied Cooling Backup Setpoint	60 85	100 75	180 55	Code Z Deg. F	Backup occupied cooling setpoint. Used if the communications link is lost between the IMC and the EMS. Used only with IMC zone sensor applications.
6.05	Unoccupied Cooling Backup Setpoint	60 85	60 85	180 55	Code Z Deg. F	Backup unoccupied cooling setpoint. Used if the communications link is lost between the IMC and the EMS. Used only with IMC zone sensor applications.
6.06	Night Setback Override Timer	0 0	28 1	225 8	Code E Hours	Night setback override timer. Used with IMC zone sensor applications.
6.07	Heating Deadband	4 1	4 1	15 3.75	Code W Deg. F	Heating deadband . Used only with IMC zone sensor applications.
6.08	Cooling Deadband	4 1	4 1	15 3.75	Code W Deg. F	Cooling deadband. Used only with zone sensor applications.
6.09	Stage 1 Heating Differential	0 0	2 0.5	12 3	Code W Deg. F	Heating stage 1 differential. Used only with IMC zone sensor applications.
6.10	Stage 1 Cooling Differential	0 0	2 0.5	12 3	Code W Deg. F	Cooling stage 1 differential. Used only with IMC zone sensor applications.
6.11	Stage 2 Heating Differential	0 0	4 1	12 3	Code W Deg. F	Heating stage 2 differential. Used only with IMC zone sensor applications.
6.12	Stage 2 Cooling Differential	0 0	2 0.5	12 3	Code W Deg. F	Cooling stage 2 differential. Used only with IMC zone sensor applications.
6.13	Stage 3 Cooling Differential	0 0	4 1	12 3	Code W Deg. F	Cooling stage 3 differential. Used only with IMC zone sensor applications.
6.14	Stage 4 Cooling Differential	0 0	4 1	12 3	Code W Deg. F	Cooling stage 4 differential. Used only with IMC zone sensor applications.
6.15	Autochangeover Deadband	16 4	16 4	40 10	Code W Deg. F	Autochangeover deadband temperature. Used only with IMC zone sensor applications.
6.16	Autochangeover Delay	15 1	75 5	225 15	Code B Minutes	Autochangeover time delay. Used only with IMC zone sensor applications.
6.17	Blower Control	0	0	1	Counts	Blower control option for IMC zone sensor applications. (During occupied) 0 = Blower cycles with demands 1 = Continuous blower
6.18	IMC Zone Sensor Calibration	20 5	0 0	236 -5	Code Deg. F	IMC zone sensor calibration offset. Code : 20 16 12 8 4 0 252 248 244 240 236 Offset +5 +4 +3 +2 +1 0 -1 -2 -3 -4 -5 (Deg. F)

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

CODE A: SECONDS = 2 x COUNTS
CODE B: SECONDS = 4 x COUNTS
CODE C: SECONDS = 8 x COUNTS
CODE D: SECONDS = 32 x COUNTS
CODE E: SECONDS = 128 x COUNTS

CODE F: TEMP. (F) = 16 x COUNTS
CODE W: TEMP. (F) = 0.25 x COUNTS
CODE X: TEMP. (F) = 164.45 - (.6769 x COUNTS)
CODE Y: TEMP. (F) = 131.56 - (.6360 x COUNTS)
CODE Z: TEMP. (F) = 100 - (.25 X Counts)

TABLE 16
ECTO PARAMETER CODE CONVERSION TABLE

Count	Time						Temperature							
	A	B	C	D	E	F	W		X		Y		Z	
	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	°F	°C	°F	°C	°F	°C	°F	°C
0	0	0	0	0	0	0	0	0	164	74	132	55.3	100	37.8
5	10	20	40	160	640	80	1	0.7	161	72	128	53.5	99	37.1
10	20	40	80	320	1280	160	3	1.4	158	70	125	51.8	98	36.4
15	30	60	120	480	1920	240	4	2.1	154	68	122	50.0	96	35.7
20	40	80	160	640	2560	320	5	2.8	151	66	119	48.2	95	35.0
25	50	100	200	800	3200	400	6	3.5	148	64	116	46.5	94	34.3
30	60	120	240	960	3840	480	8	4.1	144	62	112	44.7	93	33.6
35	70	140	280	1120	4480	560	9	4.8	141	60	109	42.9	91	32.9
40	80	160	320	1280	5120	640	10	5.5	137	59	106	41.2	90	32.3
45	90	180	360	1440	5760	720	11	6.2	134	57	103	39.4	89	31.6
50	100	200	400	1600	6400	800	13	6.9	131	55	100	37.6	88	30.9
55	110	220	440	1760	7040	880	14	7.6	127	53	97	35.9	86	30.2
60	120	240	480	1920	7680	960	15	8.3	124	51	93	34.1	85	29.5
65	130	260	520	2080	8320	1040	16	9.0	120	49	90	32.3	84	28.8
70	140	280	560	2240	8960	1120	18	9.7	117	47	87	30.6	83	28.1
75	150	300	600	2400	9600	1200	19	10.4	114	45	84	28.8	81	27.4
80	160	320	640	2560	10240	1280	20	11.0	110	44	81	27.0	80	26.7
85	170	340	680	2720	10880	1360	21	11.7	107	42	78	25.3	79	26.0
90	180	360	720	2880	11520	1440	23	12.4	104	40	74	23.5	78	25.4
95	190	380	760	3040	12160	1520	24	13.1	100	38	71	21.7	76	24.7
100	200	400	800	3200	12800	1600	25	13.8	97	36	68	20.0	75	24.0
105	210	420	840	3360	13440	1680	26	14.5	93	34	65	18.2	74	23.3
110	220	440	880	3520	14080	1760	28	15.2	90	32	62	16.4	73	22.6
115	230	460	920	3680	14720	1840	29	15.9	87	30	58	14.7	71	21.9
120	240	480	960	3840	15360	1920	30	16.6	83	28	55	12.9	70	21.2
125	250	500	1000	4000	16000	2000	31	17.3	80	27	52	11.1	69	20.5
130	260	520	1040	4160	16640	2080	33	17.9	76	25	49	9.4	68	19.8
135	270	540	1080	4320	17280	2160	34	18.6	73	23	46	7.6	66	19.1
140	280	560	1120	4480	17920	2240	35	19.3	70	21	43	5.8	65	18.5
145	290	580	1160	4640	18560	2320	36	20.0	66	19	39	4.1	64	17.8
150	300	600	1200	4800	19200	2400	38	20.7	63	17	36	2.3	63	17.1
155	310	620	1240	4960	19840	2480	39	21.4	60	15	33	0.5	61	16.4
160	320	640	1280	5120	20480	2560	40	22.1	56	13	30	-1.2	60	15.7

Count	Time						Temperature							
	A	B	C	D	E	F	W		X		Y		Z	
	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	°F	°C	°F	°C	°F	°C	°F	°C
165	330	660	1320	5280	21120	2640	41	22.8	53	12	27	-3.0	59	15.0
170	340	680	1360	5440	21760	2720	43	23.5	49	10	23	-4.8	58	14.3
175	350	700	1400	5600	22400	2800	44	24.2	46	8	20	-6.5	56	13.6
180	360	720	1440	5760	23040	2880	45	24.8	43	6	17	-8.3	55	12.9
185	370	740	1480	5920	23680	2960	46	25.5	39	4	14	-10.1	54	12.2
190	380	760	1520	6080	24320	3040	48	26.2	36	2	11	-11.8	53	11.6
195	390	780	1560	6240	24960	3120	49	26.9	32	0	8	-13.6	51	10.9
200	400	800	1600	6400	25600	3200	50	27.6	29	-2	4	-15.4	50	10.2
205	410	820	1640	6560	26240	3280	51	28.3	26	-4	1	-17.1	49	9.5
210	420	840	1680	6720	26880	3360	53	29.0	22	-5	-2	-18.9	48	8.8
215	430	860	1720	6880	27520	3440	54	29.7	19	-7	-5	-20.6	46	8.1
220	440	880	1760	7040	28160	3520	55	30.4	16	-9	-8	-22.4	45	7.4
225	450	900	1800	7200	28800	3600	56	31.1	12	-11	-12	-24.2	44	6.7
230	460	920	1840	7360	29440	3680	58	31.7	9	-13	-15	-25.9	43	6.0
235	470	940	1880	7520	30080	3760	59	32.4	5	-15	-18	-27.7	41	5.3
240	480	960	1920	7680	30720	3840	60	33.1	2	-17	-21	-29.5	40	4.7
245	490	980	1960	7840	31360	3920	61	33.8	-1	-19	-24	-31.2	39	4.0
250	500	1000	2000	8000	32000	4000	63	34.5	-5	-20	-27	-33.0	38	3.3
255	510	1020	2040	8160	32640	4080	64	35.2	-8	-22	-31	-34.8	36	2.6

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 33. Parts of the IMC boards will be located in all wiring diagram sections. See figure 34 to find the jack/plug connector on the IMC board(s). Use table 17 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:

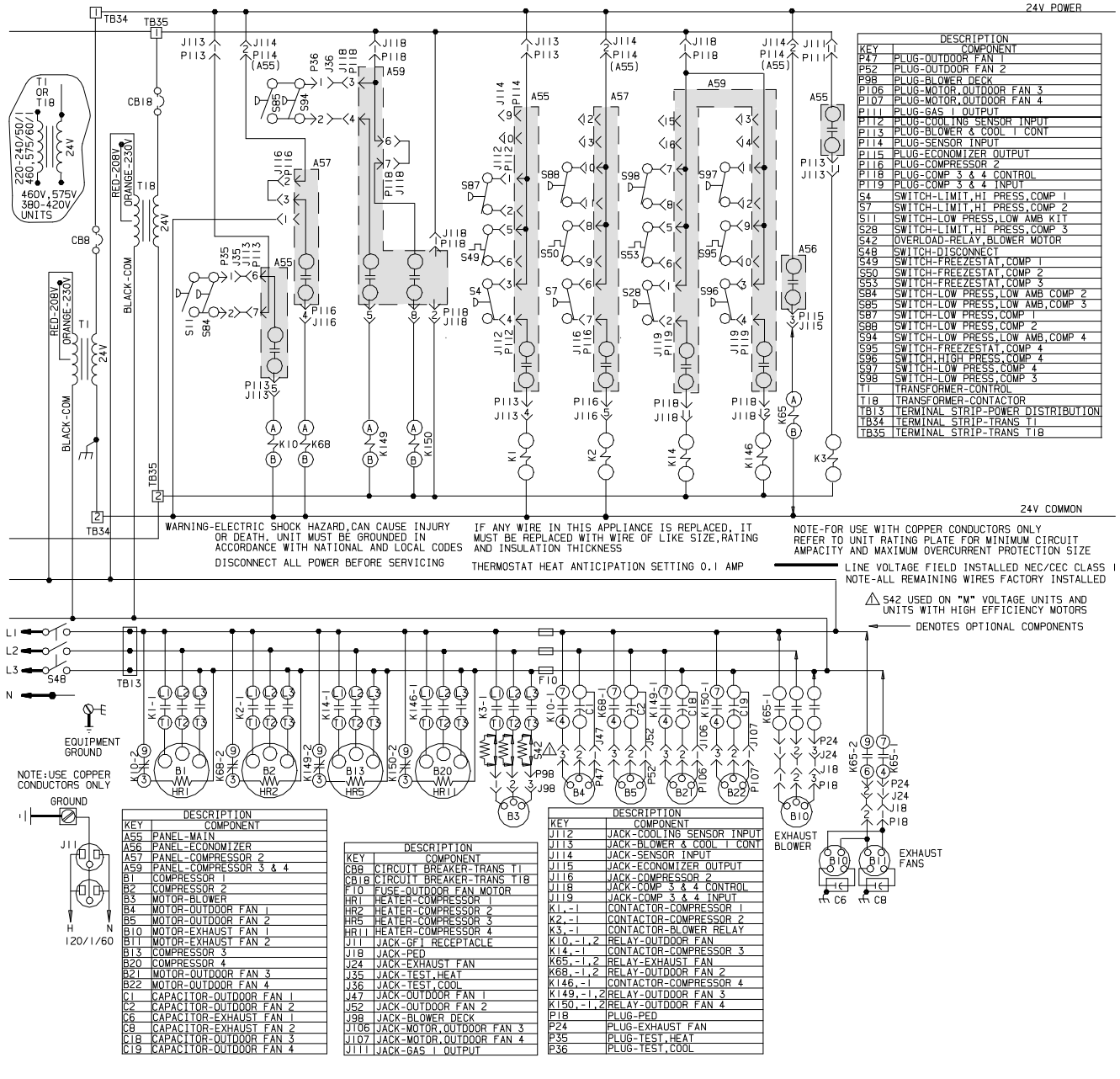
To determine if 24 volts is being supplied to the K3 blower contactor:

1–Using the unit wiring diagram and figure 34, 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 33

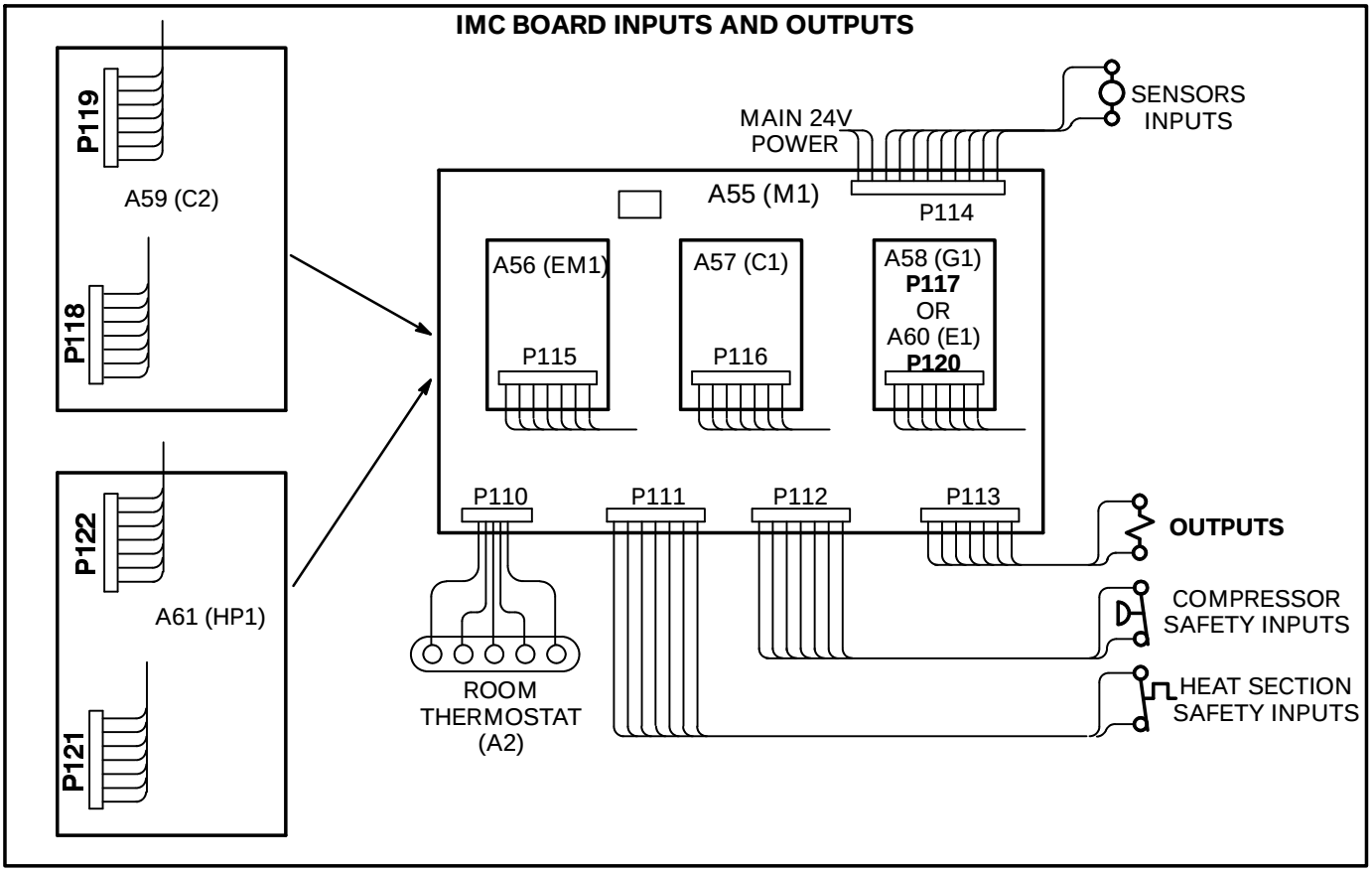


FIGURE 34

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

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

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

TABLE 17
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 17 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 17 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	ZONE 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		

TABLE 17 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 17 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 2)	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		