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M1-6 VERSION 4.01 INTEGRATED MODULAR CONTROL (IMC)

GUIDE TO THE M1-6 VERSION 4.01 INTEGRATED MODULAR CONTROL USED IN L SERIES 3 THROUGH 30 TON UNITS

TABLE OF CONTENTS

IMPORTANT: This manual is for use with IMC board M1-6 version 4.01 only. Check IMC software version as shown in figure 9 to be sure the IMC version is 4.01.

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). The IMC has the capability to communicate with personal computers using the L Connection™ network. As in standard installations, a thermostat or zone sensor is required for system operation.

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

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

INTEGRATED MODULAR CONTROL (IMC) FEATURES

- Indicates thermostat demand
- Makes troubleshooting easier
- Increases unit and component reliability
- Provides consistent central control location
- Provides adjustable control parameters
- Uses the L Connection communication network to interface with energy management systems and 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	L Series 036, 042, 048, 060, 072 (3, 3.5, 4, 5, & 6 TON)	M1						OPT
A+	LHA088 (7.5 TON)	M1						OPT
	LGA/LCA/LGC/LCC 088 & 100 (7.5 & 8.5 TON)	M1	C1					OPT
B	LGA/LCA/LGC/LCC102, 120, 150 (8.5, 10, 12.5 TON)	M1	C1					OPT
	LHA090 & 120 (7.5 & 10 TON)	M1					HP1	OPT
C	LGA/LGC156, 180, 210, 240, 300S (13, 15, 18.5, 20 & 25 TON)	M1	C1	C2		G1		OPT
	LCA/LCC156, 180, 210, 240, 300S (13, 15, 18.5, 20 & 25 TON)	M1	C1	C2	OPT			OPT
	LHA180 & 240 (15 & 20 TON)	M1			OPT		HP1	OPT
D	LGA/LGC300 & 360 (25 & 30 TON)	M1	C1	C2		G1		OPT
	LCA/LCC300H & 360 (25 & 30 TON)	M1	C1	C2	OPT			OPT

Note: A67 RH1 board is installed in Humiditrol® units only.

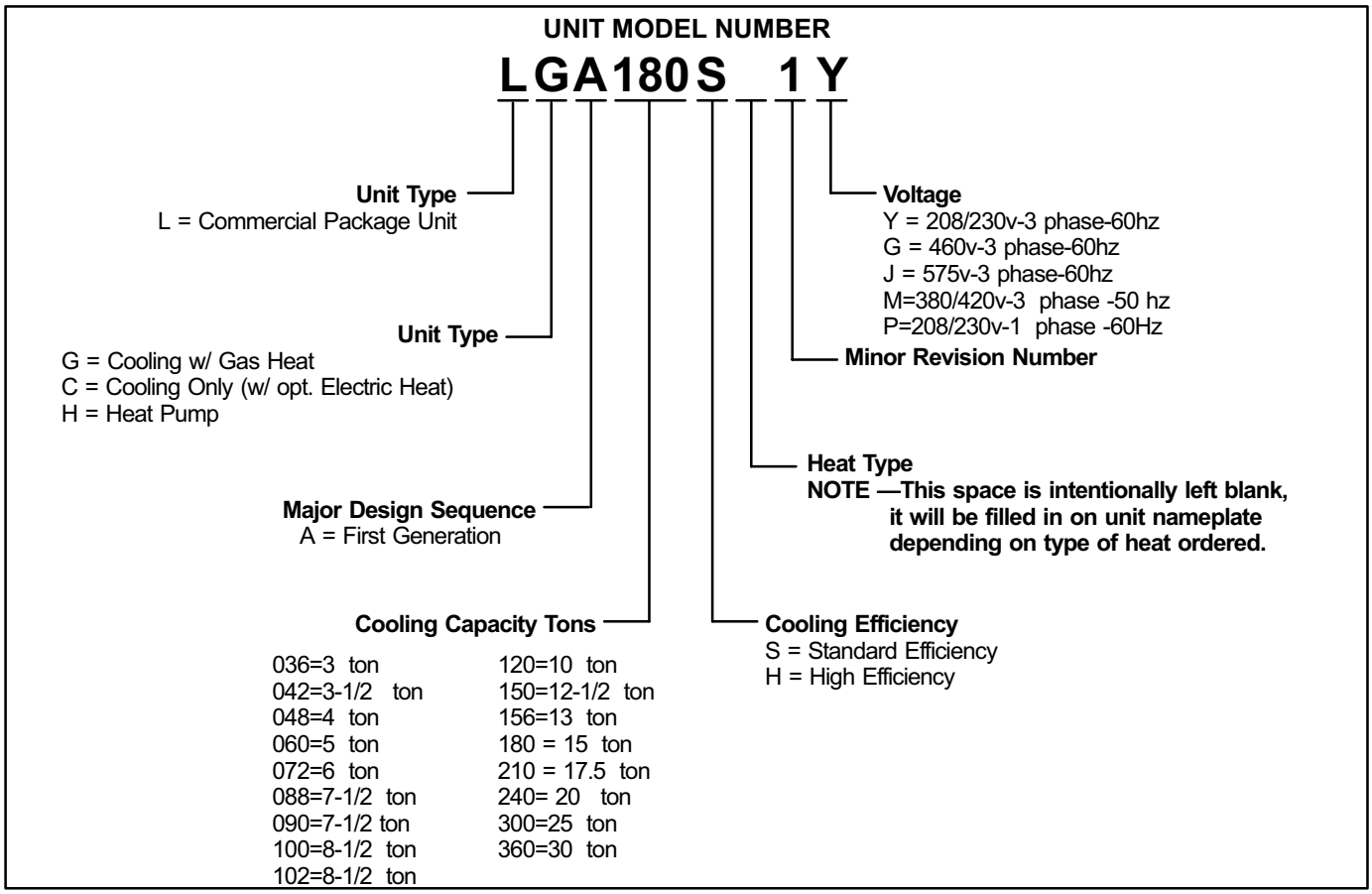


FIGURE 1

IMC AND ADD-ON BOARD LOCATION AND OPERATION

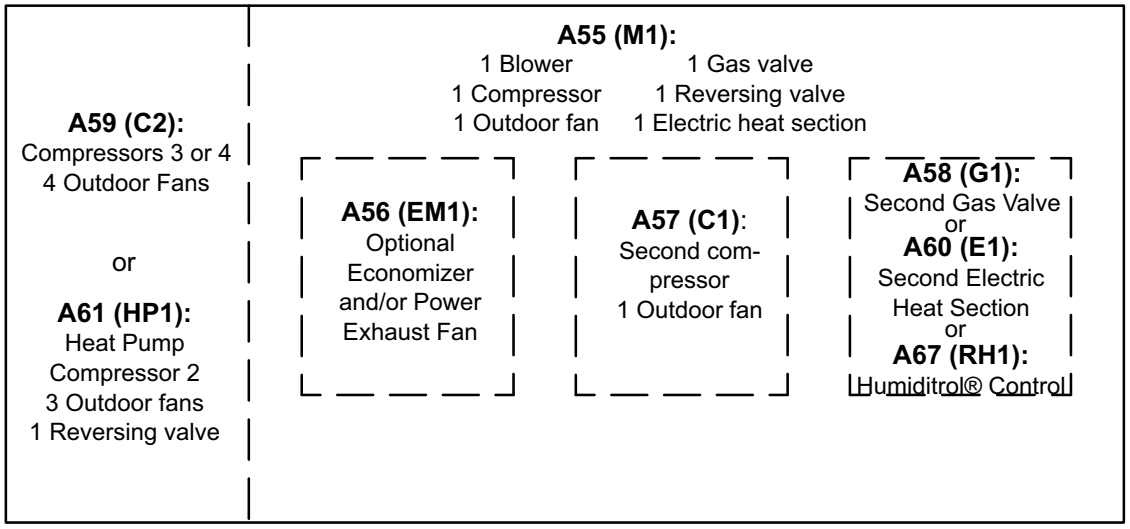


FIGURE 2

A55 (M1) MAIN CONTROL PANEL LOCATION BY UNIT

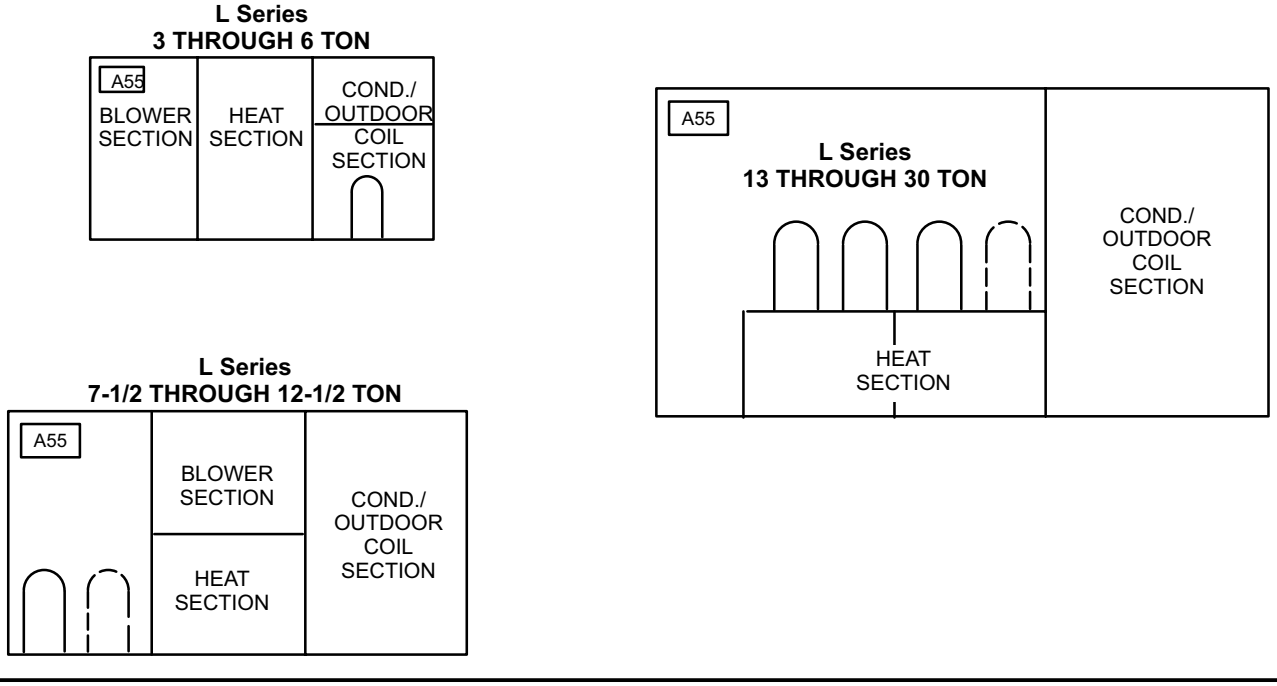


FIGURE 3

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	N/A	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.

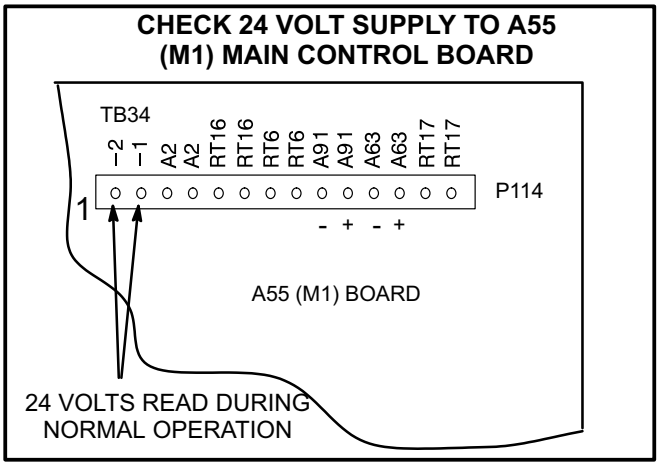


FIGURE 4

THERMOSTAT INPUT INDICATING LED’S

Thermostat input indicating LED’s are located on the M1 board above P110 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 to unit. The IMC checks switch position on power-up and after a reset.

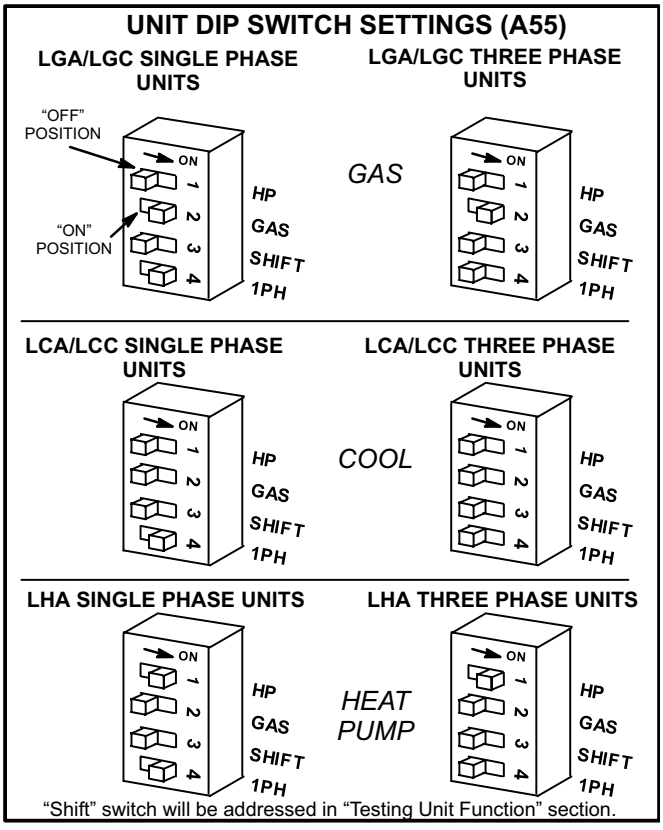
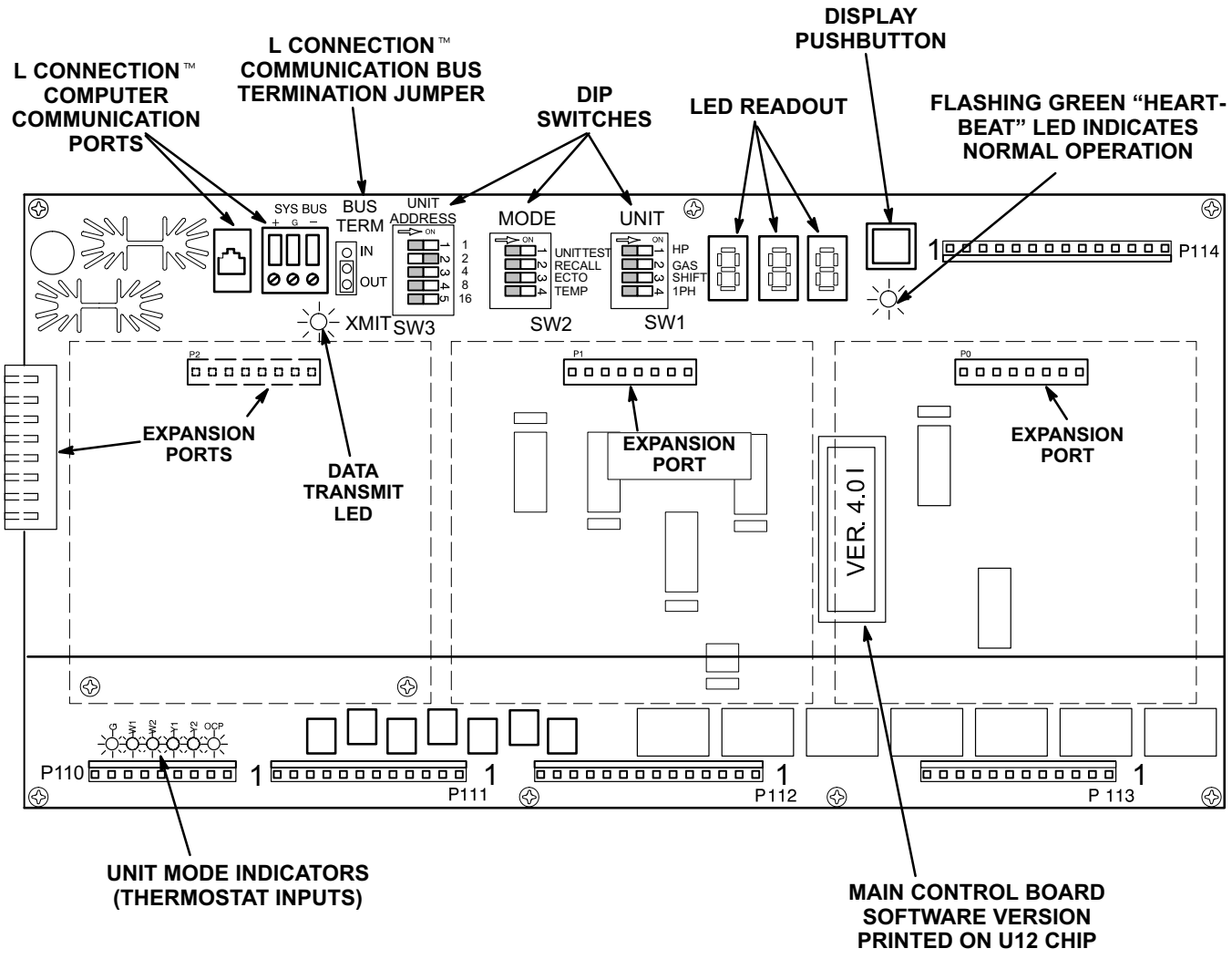
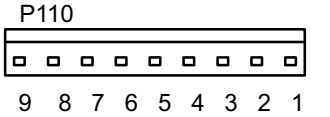


FIGURE 6

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

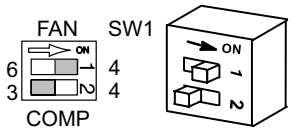
IMC Board Components

DIP SWITCH SETTINGS - Continued

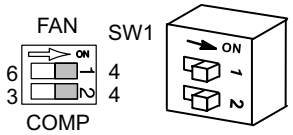
A59 (C2) DIP SWITCH SETTINGS

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

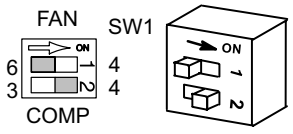
156 & 180 units which contain four condenser fans and three compressors.



210, 240, 300S units which contain four condenser fans and four compressors.



300H units which contain six condenser fans and four compressors.



360 units which contain six condenser fans and three compressors.

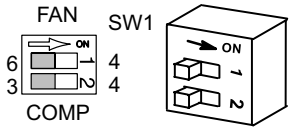
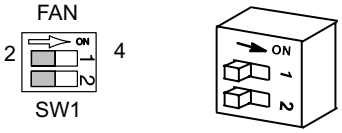


FIGURE 7

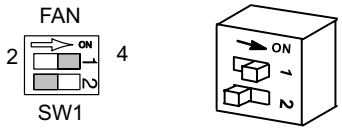
A61 (HP1) DIP SWITCH SETTINGS

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

090 & 120 units which contain two fans.



180 & 240 units 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

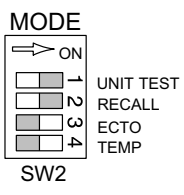
The yellow LED flashes when the IMC is transmitting data to an external device such as a PC or energy management system.

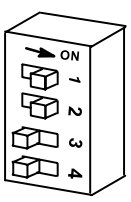
CHECK SOFTWARE VERSION

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

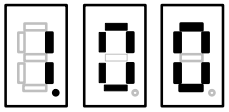


FIGURE 9

VERIFY IMC BOARD FUNCTIONS (Local thermostat mode only)

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.

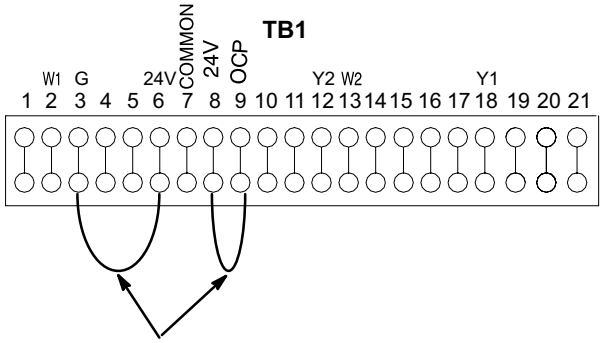
UNIT START-UP WITH TB1 JUMPERS

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).



MAINTAIN BLOWER OPERATION; LEAVE JUMPERS IN PLACE UNTIL UNIT CHECK-OUT IS COMPLETE

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

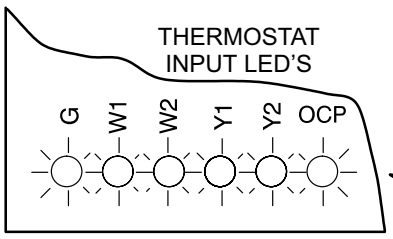
2-Jumper terminals 6 (24V) to 3 (G) to maintain blower operation throughout checkout.

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

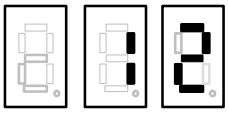
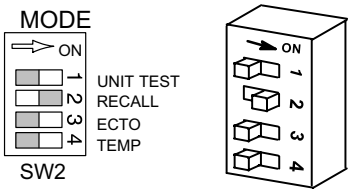


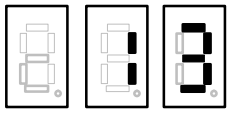
FIGURE 11

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 LED code no longer turns “off” and back “on”, 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 on 3-phase units. 1-phase units: IMC will cycle compressor off for 5 minutes (default).
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 at TB34-1 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. 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.
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.

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

IMC ERROR CODES

Error #	PROBLEM	ACTION
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.	Heating demand ignored. No heating.
41+	Return air temperature (RT16) exceeded cooling limit set in ECTO 5.07. See operation section.	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 (E1) 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/LGC unit: S10 (Primary Limiti) is open. LCA/LCC/LHA Unit: Jumper is open A55 P111 pin 1 and 2.	First heat section off.
51	LGA/LGC Unit: S10 (Primary Limit 1) has opened 3 (default) times during a demand ECTO 3.04. LCA/LCC/LHA Unit: Jumper is open. A55 P111 pin 1 and 2.	First heat section off.
52	LGA/LGC Unit: S21 (Secondary Limit 1) is open. LCA/LCC/LHA Units: Jumper is open. A55 P111 pin 1 and 2.	First heat section off.
53*	LGA/LGC Unit: S21 (Secondary Limit 1) has opened 3 (default) times during a demand ECTO 3.04. LCA/LCC/LHA Unit: Jumper is open. A55 P111 pin 1 and 2.	First heat section off.
54	LGA/LGC Unit: S47 (Roll Out) is open. LCA/LCC/LHA Unit: S15 (El. Heat Limit) is open.	First heat section off.
55*	LGA/LGC Unit: S47 (Roll Out Switch 1) opened 1 (default) time during a demand. ECTO 3.08. LCA/LCC/LHA Unit: S15 (El. Heat Limit 1 has opened 1 (default) times during a demand.	First heat section off.
56	LGA/LGC Unit: S18 (Combustion Air Proof Switch 1) is open. LCA/LCC/LHA Unit: S63 (El. Heat Limit) is open.	First heat section off.
57*	LGA/LGC Unit: S18 (Combustion Air Proof Switch 1) has opened 3 (default) times during a demand. ECTO 3.07. LCA/LCC/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 memory.
60	S99 (Primary Limit 2) is open.	Second heat section off.
61*	S99 (Primary Lim. 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.
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.

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

IMC ERROR CODES

Error #	PROBLEM	ACTION
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	Relative humidity sensor (A91) problem. Check sensor and wiring.	No reheat.
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	IMC configuration error. Unit DIP sw. is set to LCA, LCC, or LHA unit but ECTO 4.24 options 1 & 2 apply to LGA/LGC units OR Unit DIP sw. is set to LHA but ECTO 4.24 option 3 applies to Humiditrol® units.	No reheat.
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	Humiditrol® reheat ECTO 4.24 is set to option 3 but RH1 add-on board is not installed OR the RH1 add-on board is detected but ECTO 4.24 is not set to option 3.	No reheat.
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.	Local operation only.
90	RAM error.	System reset.
91*	Outdoor enthalpy sensor (A7) open. 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 (A62) open. 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 of an error with the controlling sensor or because of a loss of communication.	IMC has switched over to the backup mode option set with ECTO 6.01.
94	Zone sensor setpoint out-of-range error.	IMC reverts to default 65°F (18°C) heating and 80°F (27°C) cooling setpoints.
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 have not been stored.
128-255	Reserved.	

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

Main Control Operation

SYSTEM MODE

The IMC will operate the unit based on the System Mode selected in ECTO 6.01. The default System Mode is the Local Thermostat mode.

Local Thermostat Mode

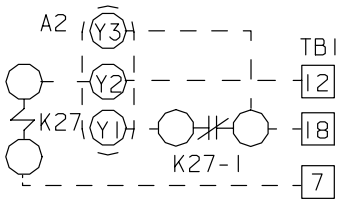
Units are shipped from the factory in Local Thermostat System Mode (control value 0). The IMC will operate the unit based on the thermostat Y1, Y2, W1, W2, G, and OCP demands.

Cooling Stages

Table 5 shows cooling stages when the IMC is in the default Local Thermostat mode. Cooling 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.

Three cooling stages (option 3) require the use of a three-stage cool thermostat and a K27 relay. See wiring pictoral in figure 13 and wiring diagram control C section.

THREE-STAGE COOLING (ECTO 5.04 OPTION 3) WIRING



A2 - Three-stage thermostat
K27 - Relay, Transfer 2

FIGURE 13

TABLE 4
TWO COOLING 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 COOLING 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 COOLING 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 K27 relay is required with three-stage operation.

SYSTEM MODE - Continued

Zone Sensor Mode

ECTO 6.01 option 1, 2, or 3 allows the IMC to control the unit based on the internal setpoints and the temperature from the A2 zone sensor. The internal setpoints can be adjusted using the optional NCP Network Control Panel. The A2 zone sensor is wired directly to each unit TB1-16 and 17. The optional NCP communicates with the IMC via the L Connection network bus.

Zone Sensor Back-Up Modes

Select the appropriate ECTO 6.01 option to determine the zone sensor back-up mode. The back-up mode is used in the event that the A2 room sensor fails or is disconnected.

Option 1-IMC Zone Sensor System Mode 1 has no back-up mode of control should the A2 zone sensor fail.

Option 2-IMC Zone Sensor System Mode 2 will default to a local thermostat if one is installed (should the A2 zone sensor fail). The IMC will switch over and operate based on the signals from the room thermostat.

Option 3-IMC Zone Sensor System Mode 3 will default to return air sensor RT16 (should the A2 zone sensor fail). The IMC will switch over and operate based on the temperature from the return air sensor. **RT16 is standard on all L Series units; therefore IMC Zone Sensor System Mode 3 is the recommended System Mode when units are setup in the zone sensor mode.**

NOTE - The RT16 has a lower resolution than the A2 zone sensor and should only be used as back-up.

L Connection Network Back-Up Setpoints

ECTO 6.02 through 6.05 back-up setpoints are used when the communication link has been lost on the L Connection system bus. Five minutes after communication is interrupted, the IMC will reset and start using the back-up setpoints. The IMC will default to occupied (6.02 & 6.04) back-up setpoints when the factory-installed jumper between unit TB1-8 & 9 is left in place. **It is recommended that occupied back-up setpoints be used.** If the unoccupied back-up setpoints are desired, remove the factory-installed jumper between TB1 8 & 9.

Heating and Cooling Stages in Zone Sensor Mode

In Zone Sensor Mode, ECTO parameters can be changed to control up to 2 stages of heating and 4 stages of cooling on LGA, LGC, LCA, and LCC units; up to 2 stages of cooling and 3 stages of heating can be controlled on LHA units. Use the following ECTO parameters to control staging:

Cooling - 4.17 through 4.23
6.08,
6.10
6.12 through 6.14

Heating - 1.18 through 1.24
3.10 through 3.12
6.07
6.09
6.11.

The number of stages achieved is dependent on the type of equipment and whether or not an economizer is used. On units with economizers, free cooling becomes stage 1 and all compressor stages shift up one stage. On units with 4 compressors and an economizer, compressors 3 and 4 are controlled together for stage 4.

Off Delay in Zone Sensor Mode

In Zone Sensor Mode, the IMC initiates a 2-minute off delay on any power-up or reset. During the 2-minute delay, no blower, heating, or cooling operation will occur.

Blower Operation in Zone Sensor Mode

In Zone Sensor Mode, ECTO parameter 6.17 can be changed to allow either continuous or cycled blower operation.

COMPRESSOR MINIMUM RUN TIME (Three phase units only)

Each compressor stage has a minimum run time of four minutes (ECTO 1.11, 4.13).

COMPRESSOR OFF DELAY (Single phase units only)

Compressors have a five minute (default) compressor off delay. (ECTO 1.10, 4.12).

BLOWER ON DELAY

On gas units, the blower is delayed 40 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).

UNOCCUPPIED OR NIGHT SETBACK MODE

During the unoccupied time period dampers do not operate at minimum position (no minimum ventilations requirements during unoccupied period).

Local Thermostat Mode

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

Zone Sensor Mode

The occupied time period is controlled by the optional NCP when installed. The TB1-9 input is ignored while in the zone sensor mode except during back-up operation.

BURNER CONTROL - Gas 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 display and store error code 58 for gas valve 1 and 68 for gas valve 2.

If the gas valve is energized and de-energized 3 (default) times during a single heating demand, the IMC will display and store error code 59 for gas valve 1 and 69 for gas valve 2. The service relay will be activated.

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 30 second (default) delay between first and second stages. A timed off delay (100 seconds default) will prevent gas heat operation until 100 seconds has passed from the previous cycle. (ECTO 3.05, 3.06).

LGA/LGC/LCA/LCC 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 60 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 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 two different ways. See the Electronic Configure to Order Control Parameters section to lock out supplemental heat during warm-up. ECTO 1.01, 1.17.

COOL-DOWN MODE (During occupied time period)

To conserve energy, the IMC ignores second-stage cooling demand 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.

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. The corresponding compressor is locked out after three occurrences. (ECTO 4.04).

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)

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.

REHEAT OPERATION

Reheat is a combination of cooling to dehumidify and heating to maintain space temperature. Supermarket reheat uses gas heat and Humiditrol® units route hot gas to a reheat coil downstream of the evaporator. An L Series gas heat unit is required for Supermarket Reheat and a Humiditrol® unit is required for Humiditrol Reheat.

IMC REHEAT OPTIONS

Refer to table 7 for operation requirements.

Supermarket Reheat (ECTO 4.24 option 1)

A de-humidistat will bring on first-stage cooling to dehumidify and a room thermostat will energize heating to maintain indoor temperature.

An optional de-humidistat is required. Refer to figure 14.

Supermarket Reheat (ECTO 4.24 option 2)

A relative humidity sensor will bring on first-stage cooling if humidity is higher than the IMC or NCP setpoint. A room thermostat or zone sensor will energize heating to maintain indoor temperature.

An optional RH sensor is required. Refer to figure 15.

Humiditrol® Reheat (ECTO 4.24 option 3)

A relative humidity sensor will energize first-stage compressor(s) and hot gas will be routed to the reheat coil if humidity is higher than the IMC or NCP setpoint.

An optional RH sensor is required. Refer to Humiditrol® unit instructions and figure 15.

Table 7
Operation Requirements

	Supermarket Reheat Option		Humiditrol® Reheat Option
	4.24=1	4.24=2	4.24=3
Blower must be energized	No	No	Yes
Occupied period required	No	No	Yes
Economizer during reheat	Yes	No	No
System Mode	6.01=0	Any	Any

RH Measurement/Display (ECTO 4.24 option 4)

When optional relative humidity sensors are installed, the RH can be displayed on an optional Network Control Panel or PC program. Refer to figure 15. ECTO 4.24 option 4.

Adjust Relative Humidity Setpoint

Set the RH setpoint by adjusting ECTO 4.25 (default 60%) or with the optional Network Control Panel. If the space relative humidity is greater than the setpoint, the unit will energize first-stage cooling and either the zone sensor or room thermostat will energize heating to maintain the indoor temperature.

SUPERMARKET REHEAT DIAGRAM
(ECTO 4.24 Option 1)

A2 - Thermostat, Room
S86 - De-Humidistat
TB1 - L Series Unit Terminal Block
K55 - Relay, Blower

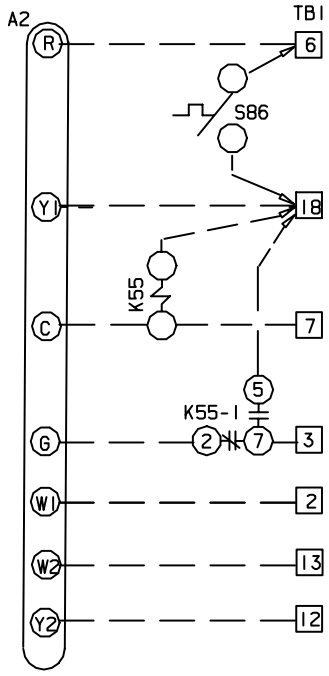
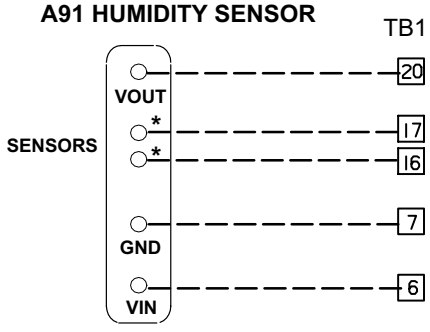


FIGURE 14

SUPERMARKET/HUMIDITROL REHEAT DIAGRAM
(ECTO 4.24 Option 2 or 3)



***Terminals on combination RH/ temperature sensors only.**

0 - 10VDC = 0-100% RH

FIGURE 15

FRESH AIR TEMPERING MODE (FAT)

Fresh air tempering is used in applications with large outdoor air requirements which have high, frequently changing occupancy loads. FAT reduces temperature fluctuations in the conditioned space.

RT6 air sensor is installed in discharge air ductwork. During the heating mode, the first or only stage of heating is energized when discharge air temperature falls below RT6 setpoint (typically 65°F or 18°C).

FAT heating is de-energized in two ways:

1- Discharge air temperature reaches 85°F or 29°C (ECTO 6.21 default 20°F or 11°C range).

2- Return air temperature (RT16) is 80°F (27°C) or higher. The return air temperature which de-energizes FAT can be adjusted: set ECTO 5.05 to option 1 (enable) AND set ECTO 5.06 to the desired heating limit (default 85°F or 29°C).

IMPORTANT - Disconnect factory-installed wiring to RT6 located in unit. FAT mode will not operate properly if unit sensor is connected.

1- Change ECTO parameter 6.20 to a value greater than 138 to enable FAT. The factory-set ECTO default of 138 will disable FAT. A typical FAT setpoint is 65°F (18°C), an ECTO value of 146. ECTO 6.20.

2- A typical FAT setpoint of 65°F (18°C) which has a default 20°F (11°C) deadband will de-energize FAT heating at 85°F (29°C). Change ECTO value 6.21 to adjust this deadband range.

3- Each FAT cycle will start a minimum of 8 minutes (default) from the start of the last cycle. Change ECTO value 6.22 to adjust the minimum time between start of FAT cycles.

Figure 16 illustrates fresh air tempering operation. If FAT setpoint 6.20 is set at a typical 65°F (18°C), first or only stage of heating will energize at 65°F (18°C) and de-energize at 85°F (29°C).

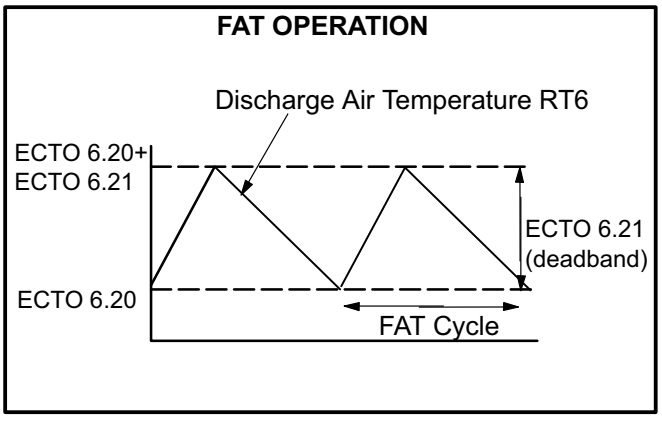


FIGURE 16

GAS HEAT OPERATION-GAS UNITS

The IMC has gas heat output control for up to two gas heat burners with two-stage gas valves. A first-stage heat demand energizes the gas valve low fire and a second-stage heat demand energizes the high fire. On units that have two heat sections, a first-stage heat demand energizes low fire on both gas valves and a second-stage heat demand energizes high fire on both gas valves.

ELECTRIC HEAT OPERATION-LCA/LCC UNITS

Electric Heat Operation

First-stage heating demand energizes first-stage electric heat (K15 and K17). Second-stage heating demand energizes second-stage electric heat (K16 and K18). When first-stage and second-stage heating demands are simultaneous, a 12-second delay will occur between stage one and stage two (ECTO 2.05).

Primary or Secondary Limits

If an electric heat limit (S15 or S63) 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 2.04).

HEAT PUMP OPERATION-LHA UNITS

Heat Operation

First-stage heating demand energizes compressor(s) for first-stage heating. Second-stage heating 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 12-second delay (ECTO 1.05).

Primary or Secondary Limits

If an electric heat limit (S15 or S63) opens, electric heat is de-energized.

If an electric heat limit opens five times during a thermostat cycle, the service alarm output will turn on (ECTO 1.04).

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 Test

Unit must be operating in heating mode to initiate a defrost test.

Initiate defrost:

1- Turn UNIT TEST and RECALL DIP switches to “ON”. The software version will be displayed.

2- Hold pushbutton down for five seconds (long push).

NOTE - Only stages currently operating in heating are tested. If both stages are operating in heating, both stages of defrost are tested and the defrost times for both stages are synchronized.

3- Defrost will terminate automatically when defrost pressure switch (S46 or S104) opens.

Terminate defrost manually:

1- Press the pushbutton (short push).

Re-run a defrost test:

1- Press the pushbutton (short push) to by-pass delays.

2- Hold pushbutton down for five seconds (long push).

Defrost Readout

The readout will display “DF1“ when the first stage is operating in defrost mode, “DF2“ will display when the second stage is operating in defrost mode, and “DF-“ will display when both stages are operating in defrost mode. The readout does not function during the defrost test.

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 (ECTO1.06).

The IMC will not allow any banks of electric heat to energize when outdoor air temperature is above 40°F default (ECTO 1.07).

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 elapsed).

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 5.02 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, 4.15).

CHART 1
LOW PRESSURE IGNORE DEFAULT TIME PERIOD

		Compressor Off Time ECTO 5.14	
		Short < 4 Hrs.	Long > or = 4 Hrs.
Ambient Temperature ECTO 5.15	Cold < 70 Deg. F	5 Minutes ECTO 5.13	15 Minutes ECTO 5.11
	Hot > or = 70 Deg. F	2 Minutes ECTO 5.12	8 Minutes ECTO 5.10

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 five minutes allows pressures to equalize ensuring start-up. (ECTO 5.02).

THERMOSTAT BOUNCE DELAY (Local thermostat mode only)

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

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.

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 4.06 and 4.07.

Various fans in D box units have a 2-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 17 and 18.

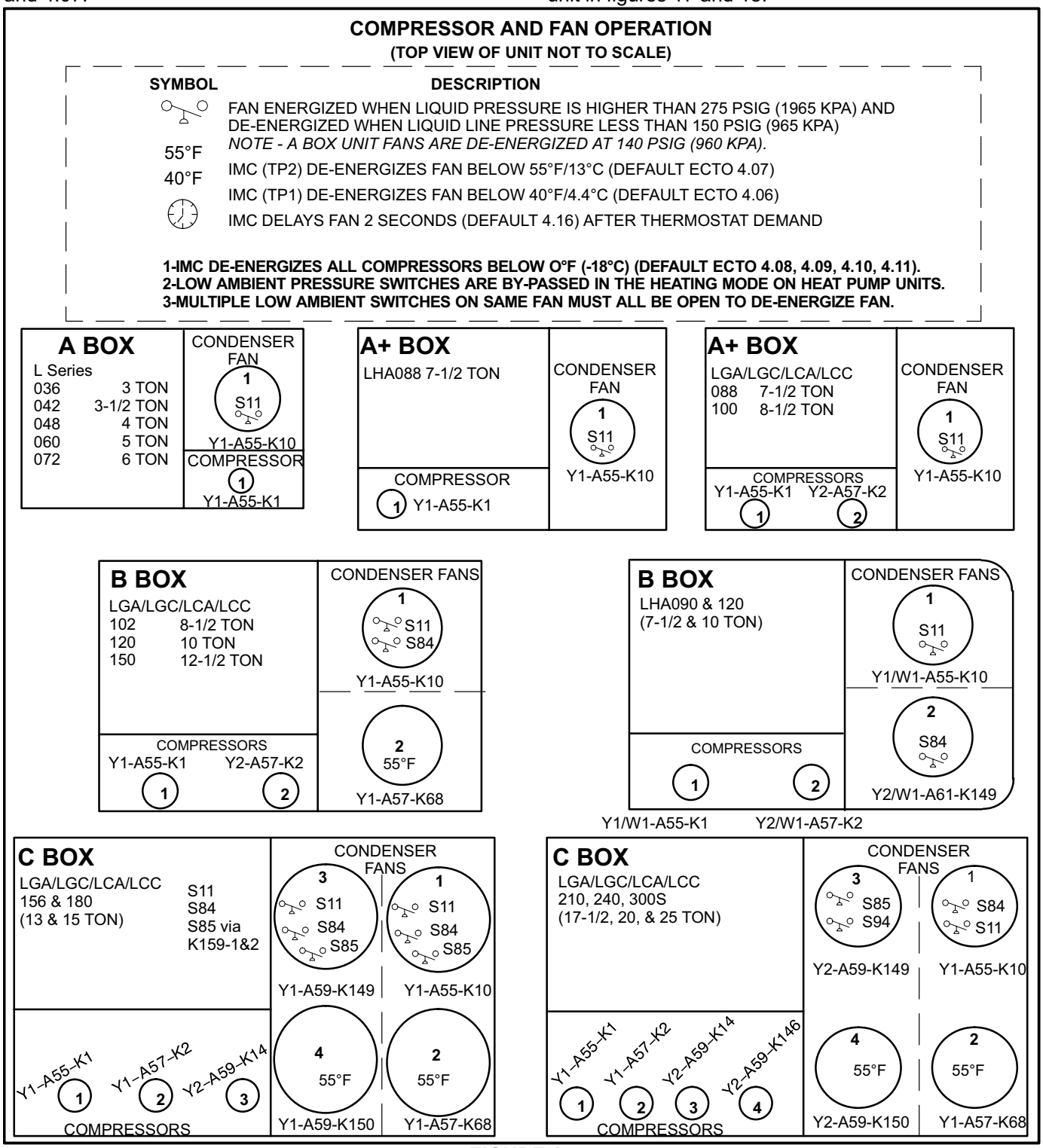


FIGURE 17

COMPRESSOR AND FAN OPERATION

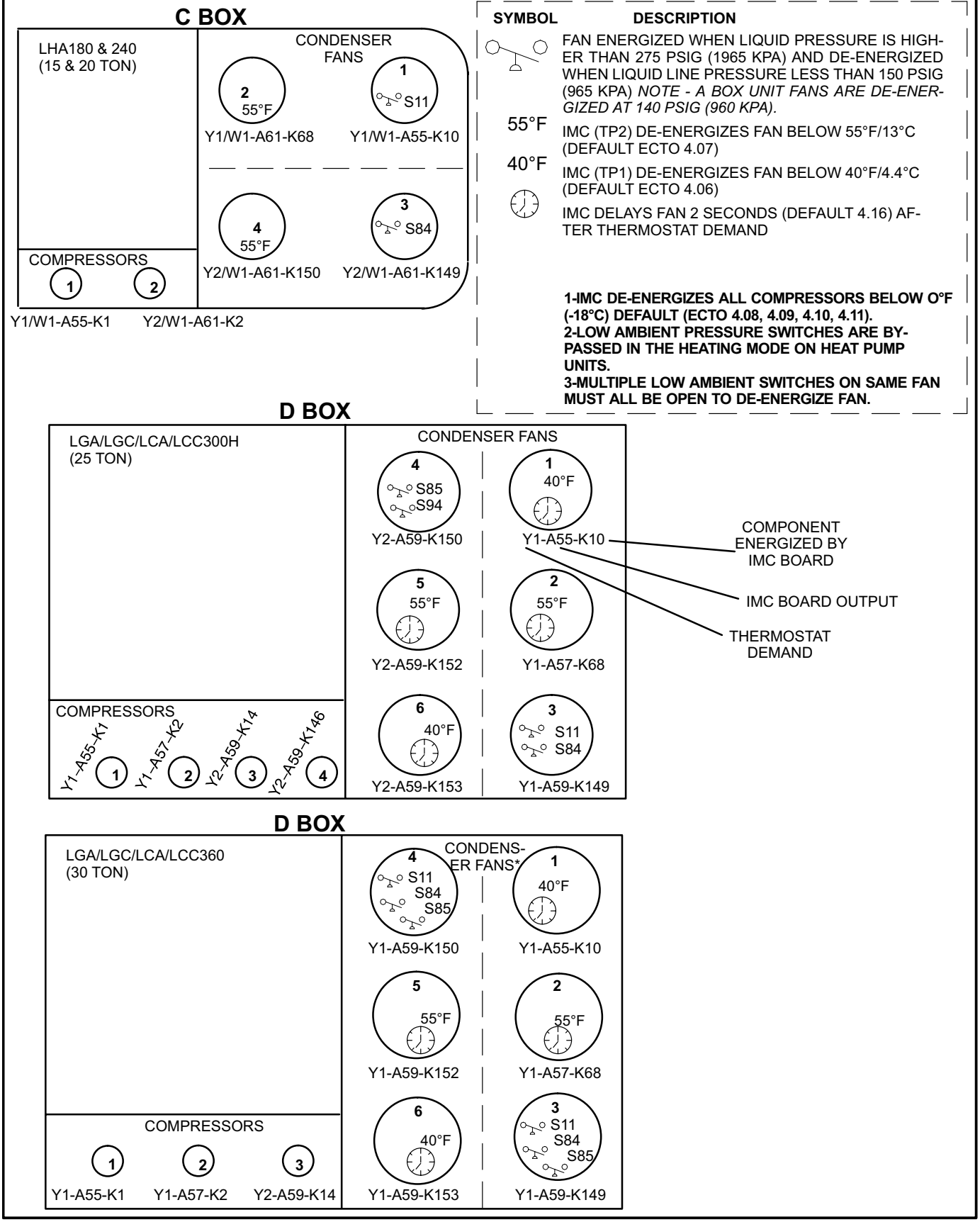


FIGURE 18

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 19.

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 20. 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 8 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 8
ENTHALPY CONTROL SETPOINTS

CONTROL SETTING	ENTHALPY CONTROL SETPOINT AT 50% RELATIVE HUMIDITY APPROXIMATE DEGREES 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.

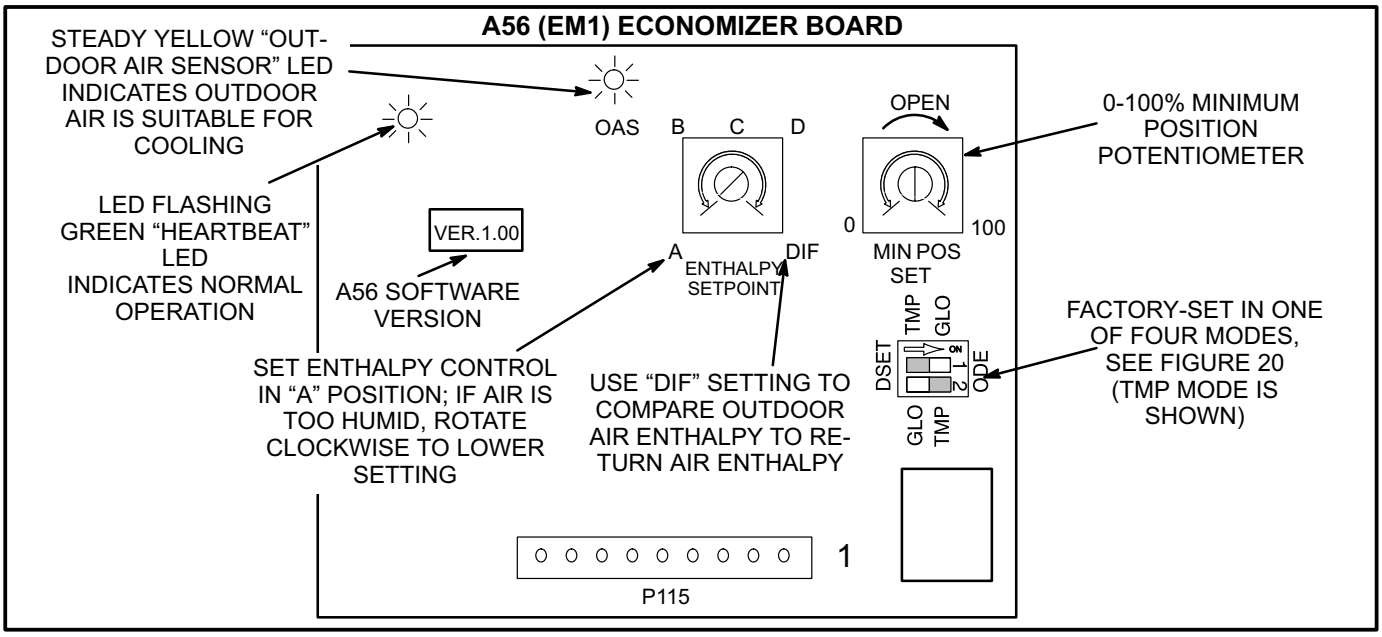


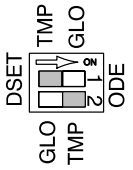
FIGURE 19

A56 (EM1) DIP SWITCH SETTINGS

Note-All economizer mode of operation, except DSET, will modulate dampers to 55°F (13°C) supply air (ECTO 6.23).

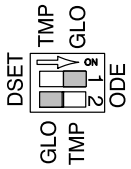
TMP (SENSIBLE TEMPERATURE)

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.



GLO (GLOBAL)

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

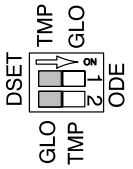


NOTE - Used with Energy Management Systems and global enthalpy sensor. The global input (P115-4) is a free cooling demand which energizes the blower and modulates the damper.

DSET (DAMPER SET)

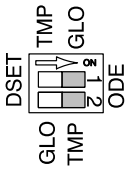
Switches set to make damper minimum position and humidity selections, to test damper motor and to set damper linkage.

NOTE - "Damper set" mode locks economizer into minimum position.



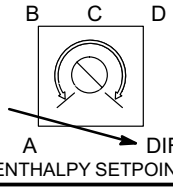
ODE (OUTDOOR ENTHALPY)

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.



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.



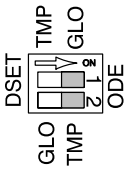


FIGURE 20

FREE COOLING SUPPLY AIR SETPOINT

When outdoor air conditions are suitable and economizer is operating in free cooling, dampers will modulate to achieve a supply air temperature of 55°F (13°C) default. This setpoint can be adjusted between 45° and 65°F as required for the application. ECTO 6.23.

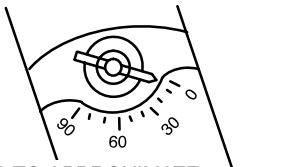
DAMPER MINIMUM POSITION POTENTIOMETER

Set economizer DIP switch to "DSET" position as shown in figure 20.

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 21.

ECONOMIZER DAMPER MINIMUM POSITION
(NOTE: MOTOR ROTATES SLOWLY)



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

FIGURE 21

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 9 for economizer operation with a standard two-stage thermostat

Table 10 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 20.

TABLE 9
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 RT6 supply air to 55°F (13°C) default (ECTO 6.23).

(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 default setting will operate stage 1 only. ECTO 5.04 may be adjusted to change the cooling stages; see tables 4, 5, and 6.

TABLE 10
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 RT6 supply air to 55°F (13°C) default (ECTO 6.23).

NOTE - In Global Min/Max mode dampers open to minimum when table 10 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) -- The default setting will operate stage 1 only. ECTO 5.04 may be adjusted to change the cooling stages; see tables 4, 5, and 6.

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 fans will be functional. To prevent operation of gravity exhaust fans, 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).

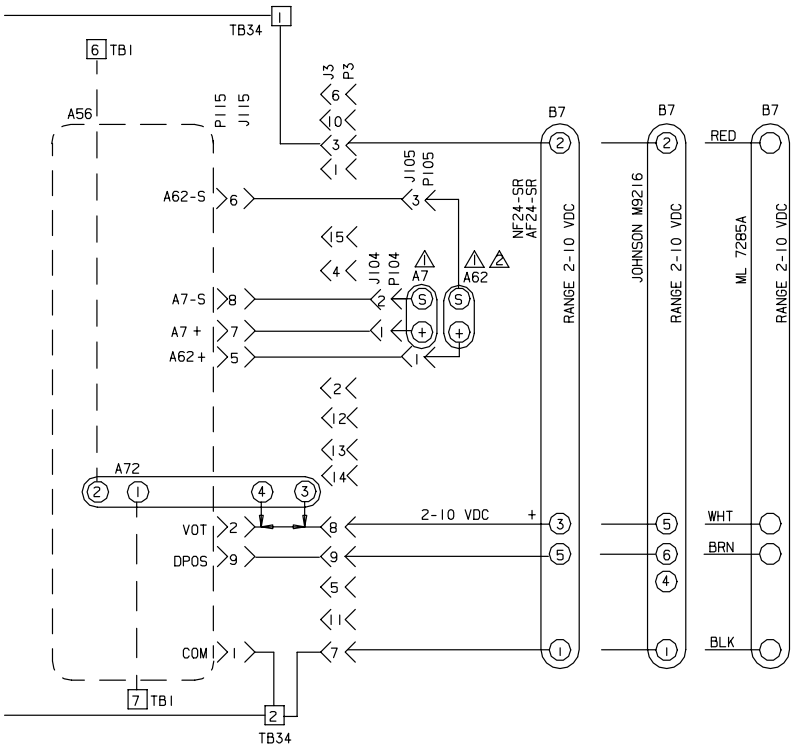
NOTE - Allow approximately 30 seconds for voltage to react.

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 P115 pin 2 and 1 remains 10 volts, 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 11.

TABLE 11

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 non-heat pump units. RT17 is located on the right front corner mullion of heat pump 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 greater than 55°F (13°C).

NOTE - On A56 software version 1.00, OAS LED is not used in global enthalpy mode. On A56 software versions 1.01 and higher, OAS LED is on if the global input is on.

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

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

STEP 7

ENTHALPY SENSOR OPERATION (A7 AND A62)

1- Connect a DC ampmeter as shown in figures 22 and/or 23.

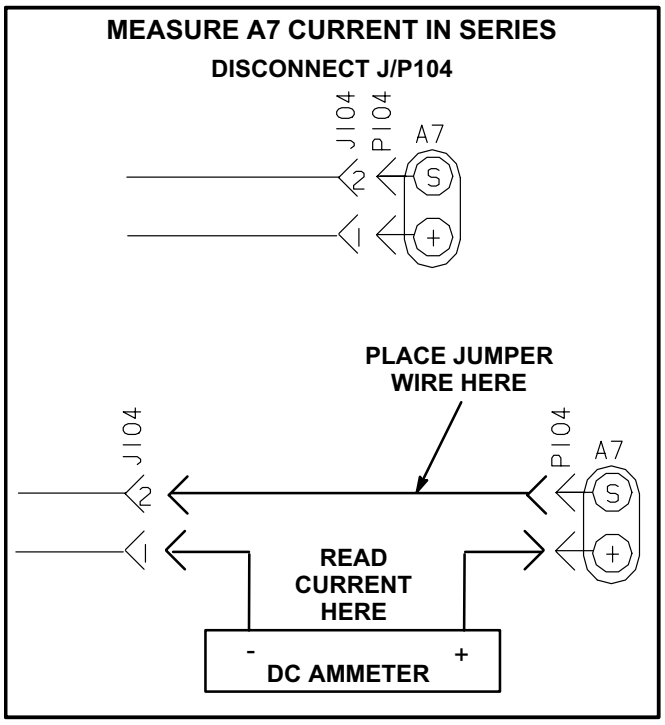


FIGURE 22

2- The reading will be between 4 and 20 ma. depending on outdoor temperature and humidity. Refer to table 12 to approximate reading.

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

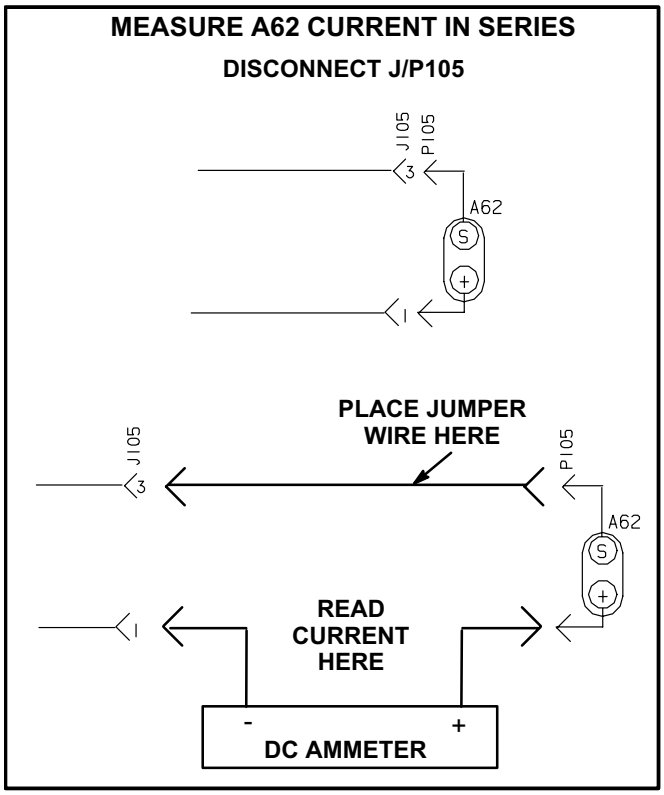
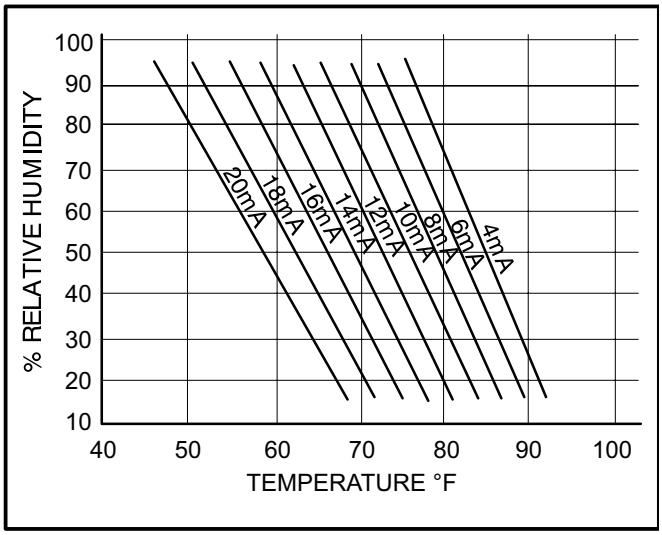


FIGURE 23

TABLE 12
ENTHALPY SENSOR OUTPUT CURRENT
HONEYWELL C7400



IAQ SENSOR

General

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

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

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

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

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

Default Operation

The IMC has a 0-10VDC IAQ input for a standard 0-2000ppm CO_2 sensor. The economizer starts opening at a CO_2 level of 500 ppm ("start open" setpoint) and reaches full open at a CO_2 level of 1000ppm ("full open" setpoint). The damper opens to 100%. Determine damper travel position using the following formula. Use "Displaying Sensor Inputs" section to read CO_2 ppm. Figure 24 shows default or proportional operation.

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

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

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

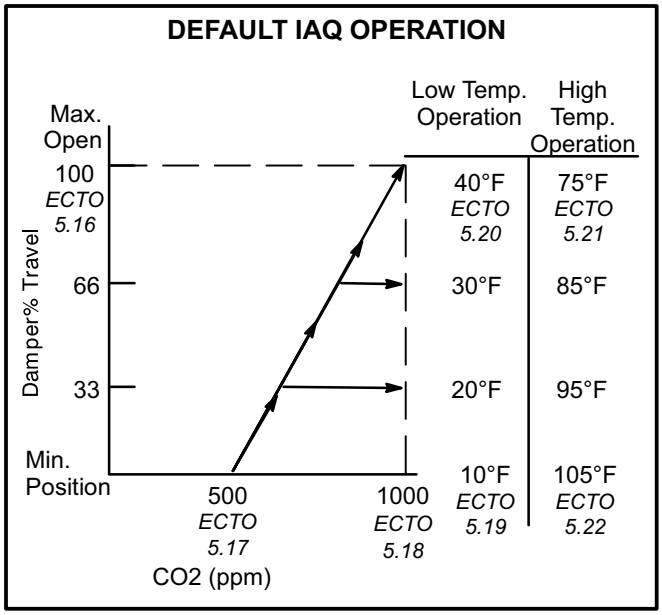


FIGURE 24

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.

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

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 “start open” (ECTO 5.17) setpoint higher than the “full open” (ECTO 5.18) setpoint. The dampers will drive to fully-open position immediately. Figure 25 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.

SETPOINT CONTROL IAQ OPTION

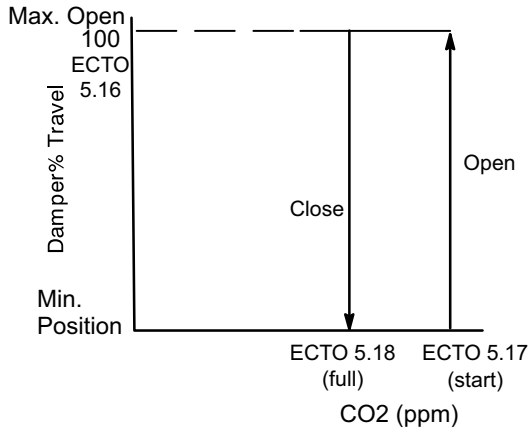


FIGURE 25

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 13 to determine DC voltage or CO_2 ppm. Divide the reading (counts) by 25.5 to determine DC voltage. Multiply the reading (counts) by 7.843 to determine the CO_2 ppm.

$$\frac{\text{Counts}}{25.5} = \text{DC Voltage}$$

$$\text{Counts} \times 7.843 = CO_2 \text{ ppm}$$

TABLE 13

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

Testing Unit Function

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 26.

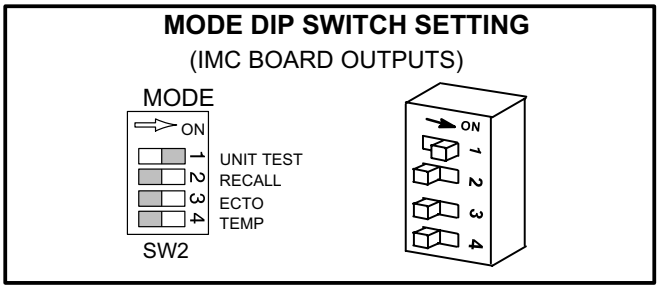


FIGURE 26

For a few seconds only a decimal point will be displayed. Then a "0" will be displayed indicating an IMC board output. See figure 27.

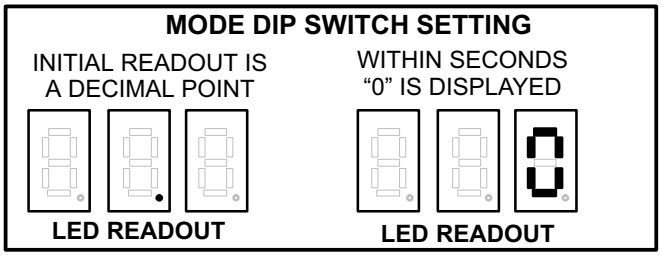


FIGURE 27

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

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 28.

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 29.

TABLE 14
TESTING OUTPUTS

READ-OUT	OUTPUT ENERGIZED	OUTPUT	
0	.0	Blower	K3-A
1	.1	Fan 1 (1)	K10A
2	.2	Fan 2 (2)	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)
10	1.0	Reheat Solenoid L14	
11	1.1	Reheat Solenoid L30	
12	1.2	Exhaust Fan K65	

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

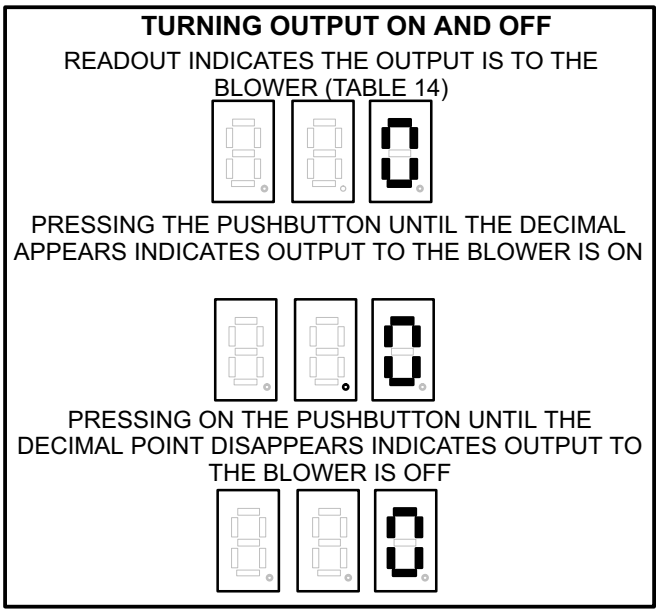


FIGURE 28

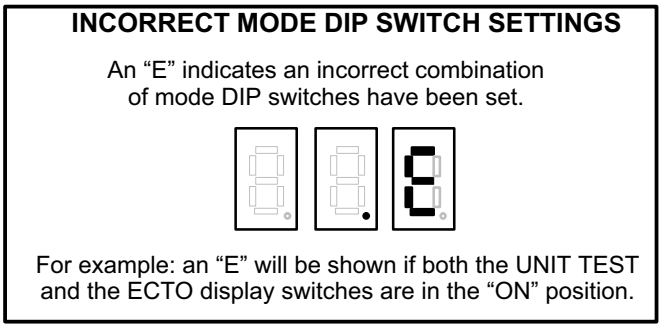


FIGURE 29

TEST

Example:

To check fan 3 operation (see figure 30):

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.

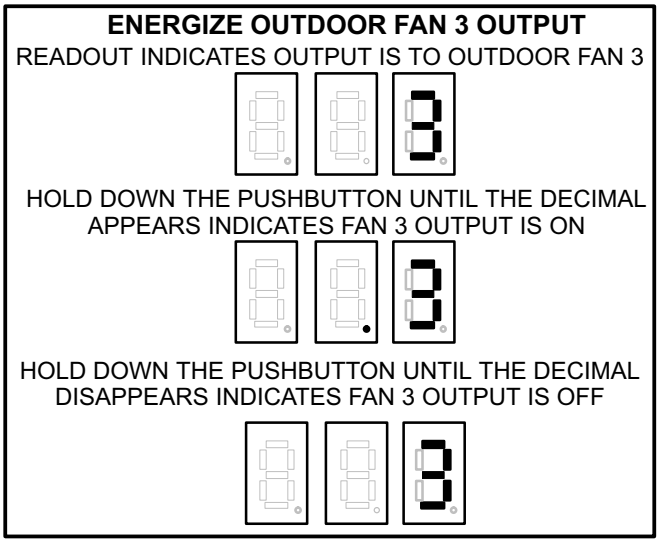


FIGURE 30

IMC BOARD THERMOSTAT SIMULATION TEST

The IMC board simulates thermostat inputs to check unit operation. In the test mode thermostat inputs and zone sensor control 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 31.

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

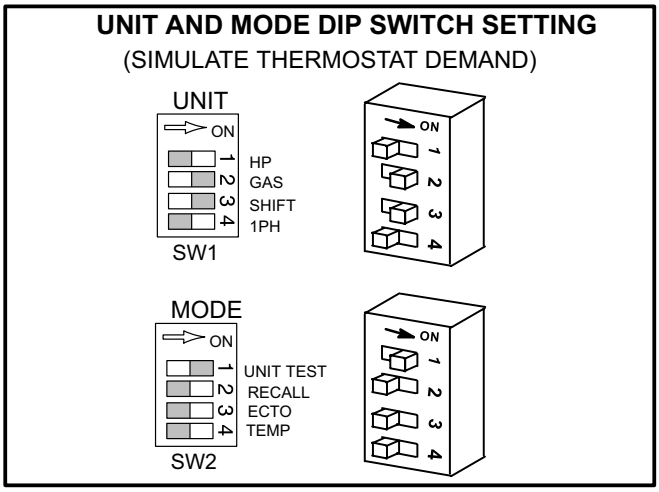


FIGURE 31

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 15 shows test inputs on two-stage units (ECTO 5.04 set to 1 or 2). Table 16 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 15

TESTING INPUTS (TWO-STAGE)

READ-OUT	INPUT ENER-GIZED	THERMOSTAT INPUT SIM-ULATION	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/LGC/LCA/LCC - 1ST & 2ND STAGE HEATING
			LHA - EMERGENCY HEAT
h11	h1.1.	W1 & W2	1ST & 2ND STAGE HEATING
S01	S01.	SMOKE	UNIT OFF (DEFAULT)

TABLE 16

TESTING INPUTS (THREE-STAGE)

READ-OUT	INPUT ENER-GIZED	THERMOSTAT INPUT SIM-ULATION	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/LGC/LCA/LCC - 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 32.

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.

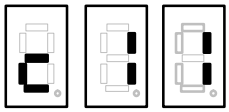
NOTE - Units may have more than one compressor per stage of cooling. Refer to unit wiring schematic to determine which compressors are energized by first- and second-stage cooling demands.

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.

Reset power to digital temperature control modules once tests are complete. This will reset any alarms which may have been caused by testing.

TURNING INPUT ON AND OFF

c11 READOUT INDICATES THE INPUT IS TO FIRST- AND SECOND-STAGE COOLING (TABLE 15)



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

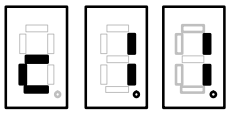


FIGURE 32

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 33, to read the outputs shown in table 17.

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 34.

A single push on the pushbutton will toggle the readout upward from .0 to .7, incrementally, as shown in table 17. A double push will toggle the readout downward from .7 to .0 incrementally.

DISPLAY SENSOR INPUT DIP SWITCH SETTING

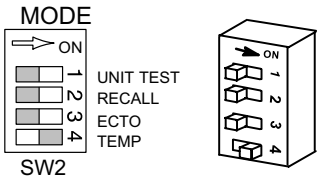
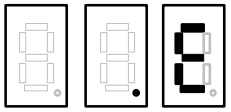


FIGURE 33

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 34

TABLE 17
READ SENSOR OUTPUT

READ-OUT	OUTPUT
.0	Outdoor Air Temperature - °F (RT17)
.1	Return Air Temperature - °F (RT16)
.2	Supply Air Temperature - °F (RT6)
.3	Zone Air Temperature - (A2 - Optional)
.4	IAQ Sensor Output - Counts (A63 - Optional)
.5	IAQ Economizer Damper Position - % (Optional)
.6	Economizer Damper Position - % (Optional)
.7	Indoor Relative Humidity - % (A91 - Optional)

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 35 shows an output reading of 100.

3- Divide output reading by 25.5 to get IAQ sensor output voltage. See figure 35.

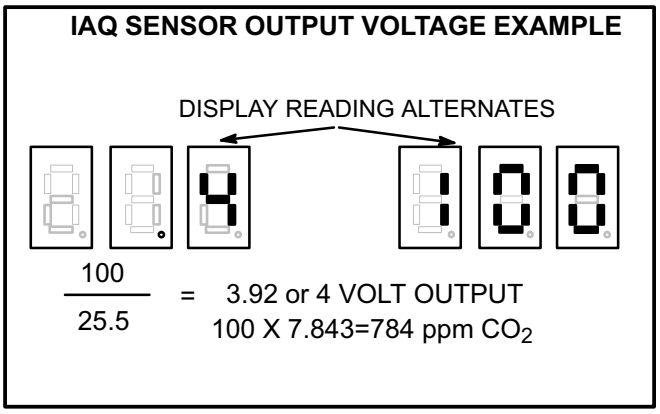


FIGURE 35

ECONOMIZER DAMPER POSITION

Readout .6 displays the damper motor feedback in percent open. The feedback range for the economizer motor is 2-10vdc. Voltage is read at P115 pins 1 and 9.

TABLE 18
DAMPER POSITION

Voltage Feedback	Damper % Open
2.00	0
3.00	13
4.00	25
6.00	38
6.00	50
7.00	63
8.00	75
9.00	88
10.00	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 19.

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 36.

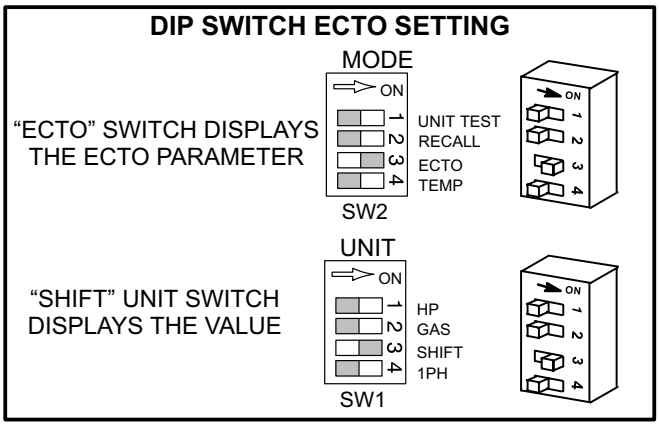


FIGURE 36

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

1-LHA Heating Parameters
2-LCA/LCC Heating Parameters
3-LGA/LGC Heating Parameters
4-Cooling Parameters
5-Miscellaneous Parameters
6-System 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/LGC unit will skip LHA block 1 and LCA/LCC block 2 readouts. An IMC board with DIP switches set for an LCA/LCC 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/LCC block 2 and LGA/LGC 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 36.

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 DIP switch, waiting for the parameter number to reappear, and turning off the ECTO DIP switch. 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 20 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: SECONDS	=	16 x COUNTS
CODE V: TEMP. (F)	=	0.6792 x COUNTS
CODE W: TEMP. (F)	=	0.25 x COUNTS
CODE X: TEMP. (F)	=	164.45 - (.6792 X COUNTS)
CODE Y: TEMP. (F)	=	131.56 - (.6360 x COUNTS)
CODE Z: TEMP. (F)	=	100- (.25 X COUNTS)
IAQ:	CO_2 (PPM)	= 0.7834 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-Single push increases the value by 1; double push decreases the value by 10.

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

6-Wait for the parameter number to reappear. Turn off ECTO 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 "4.12".

4- Set the UNIT DIP "SHIFT" switch #3 to "ON".

5- The display will read "150.". The ECTO Control Parameter Table (Table 19) shows a default of 150 counts or 300 seconds. The table also shows a range of 30 counts (60 seconds) to 255 counts (510 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 20 Column A) as shown in Control Parameter Table (Table 19) for number of counts to adjust control value to.

7- Short push the pushbutton until readout displays "180".

8- To store the new ECTO control parameter, turn off the SHIFT switch. Wait for the parameter number to reappear. Turn off the 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 DIP switch.

2-Turn on the ECTO DIP switch.

3-The display will read "---."

4- Hold down the pushbutton for approximately five seconds.

5-The display will read alternating bright and dim "0" during the transfer. When reset is complete, the display will read a bright "0".

6-Turn off ECTO and SHIFT DIP switches. The IMC will automatically reset.

TABLE 19
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	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: Temperature must be < or = to ECTO 1.07.**
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: Temperature must be = to or > 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.** Temperature must be < or = 1.09.
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.** Temperature must be > or = 1.08.
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, lock-out and service output features are 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, lock-out and service output features are 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 (Continued)

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 1 differential. Used in zone sensor applications. **Note: Differential temperature must be = to or < ECTO 1.19**.
1.19	Supplemental Heat 2 Differential	0 0	12 3	15 3.75	Code W Deg F	Supplemental heat stage 2 differential. Used in zone sensor applications. **Note: Differential temperature must be = to or > 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. Disabled if set to 0.
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. Disabled if set to 0.
1.24	Stage Down Timer	0 0	19 5	225 60	Code F Minutes	Time delay before a lower stage turns off following a higher stage termination.

BLOCK 2 LCA/LCC 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. Disabled if set to 0.
2.08	Stage Down Timer	0 0	0 0	225 60	Code F Minutes	Time delay before a lower stage turns off following a higher stage termination.

BLOCK 3 LGA/LGC 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.
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. Disabled if set to 0.
3.12	Stage Down Timer	0 0	0 0	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. **Temperature setting must be < or = 4.07.**
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. **Temperature setting must be > or = 4.06.**
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. **Temperature setting must be < or = 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. **Temperature setting must be > or = 4.08 AND < or = 4.10.**

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BLOCK 4 COOLING PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
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. **Temperature setting must be > or = 4.09 AND < or = 4.11.**
4.11	Compressor 4 Low Temperature Lockout	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. **Temperature setting must be > or = 4.10.**
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, lock-out and service output features are 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, lock-out and service output features are 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. Disabled if set to 0.
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. Disabled if set to 0.
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. Disabled if set to 0.
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	0	0	4	Option	0: No reheat and no RH sensor. 1: Supermarket reheat (LGA/LGC only) with de-humidistat. 2: Supermarket reheat (LGA/LGC only) with RH sensor. 3: Humiditrol reheat with RH sensor (Humiditrol units only) 4-RH measurement/display (no reheat)
4.25	Reheat Setpoint	0	60	100	%RH	Percent relative humidity where supermarket or Humiditrol reheat demand is energized. Reheat is de-energized at setpoint - 3%. A setting of 100% will disable reheat. An optional RH sensor must be installed and Reheat Control ECTO 4.24 must be set to option 2 in supermarket applications or option 3 in Humiditrol applications.

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 on, 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. Off delay for error codes 5, 10, 11, 20, 21, 44, 48, 83, 86 and 87.

BLOCK 5 MISCELLANEOUS PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
5.03	Celsius Temperature Option	0	0	1	Option	Degrees Celsius option. 0: Displays degrees Fahrenheit 1: Displays degrees Celsius
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	117 85	154 60	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	146 65	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	IAQ 0 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	64 502	255 2000	Count PPM	Damper "start open" IAQ setpoint. CO^2 level (ppm) where economizer damper begins to open.
5.18	IAQ 2 - Damper Full Open Setpoint	0 0	128 1004	255 2000	Count PPM	Damper "full open" IAQ setpoint. CO^2 level (ppm) where economizer damper is opened to maximum.
5.19	IAQ 3 - Low Temp Full Closed	0 132	191 10	255 -31	Code Y Deg.F	Low outdoor air temp. where IAQ damper is closed to minimum position.
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 closed to minimum position.
5.23	Free Cooling Max. Damper	0	100	100	% Travel	The maximum allowed damper opening for **FREE COOLING.**
5.24	Reserved	-	-	-	-	Reserved.

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BLOCK 6 SYSTEM PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
6.01	System Mode	0	0	3	Option	System mode of operation. **Control Value** **System 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
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 EMS. Used only with IMC zone sensor applications. **Setpoint temperature must be < or = (6.04 - 6.15).**
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 EMS. Used only in IMC zone sensor applications. **Setpoint temperature must be < or = (6.05 - 6.15).**
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 EMS. Used only with IMC zone sensor applications. **Setpoint temperature must be > or = (6.02 + 6.15).**
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 EMS. Used only in IMC zone sensor applications. **Setpoint temperature must be > or = (6.03 + 6.15).**
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. **Deadband must be < or = 6.15 - 6.08.**
6.08	Cooling Deadband	4 1	4 1	15 3.75	Code W Deg. F	Cooling deadband. Used only with zone sensor applications. **Deadband must be < or = 6.15 - 6.07.**
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. D**ifferential temperature must be < or = 6.11.**
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. **Differential temperature must be < or = 6.12.**
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. **Differential temperature must be > or = 6.09.**
6.12	Stage 2 Cooling Differential	0 0	4 1	12 3	Code W Deg. F	Cooling stage 2 differential. Used only with IMC zone sensor applications. **Differential temperature must be > or = 6.10 AND < or = 6.13.**
6.13	Stage 3 Cooling Differential	0 0	6 1.5	12 3	Code W Deg. F	Cooling stage 3 differential. Used only with IMC zone sensor applications. **Differential temperature must be > or = 6.12 AND < or = 6.14.**
6.14	Stage 4 Cooling Differential	0 0	8 2	12 3	Code W Deg. F	Cooling stage 4 differential. Used only with IMC zone sensor applications. **Differential temperature must be > or = 6.13.**
6.15	Autochangeover Deadband	8 2	12 3	40 10	Code W Deg. F	Autochangeover deadband temperature. **Deadband must be > or = (6.07 + 6.08).**
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	Option	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	Counts Deg. F	IMC zone sensor calibration offset. Counts :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)
6.19	Free Cooling Lock-Out Setpoint	112 60	161 Disabled	160 30	Code Y Deg. F	Free cooling is locked out when outdoor temperature is below the default value. Default value 161 disables free cooling lockout.
6.20	Fresh Air Tempering (FAT) Setpoint	139 70	138 Disabled	183 40	Code X Deg. F	Low heat “on” when discharge air temperature (RT6) is below this setpoint. If set to 138 (default), FAT is disabled.
6.21	Fresh Air Tempering (FAT) Deadband	15 10	29 20	29 20	Code V Deg. F	Temperature above setpoint (ECTO 6.20) where low heat turns off.
6.22	Fresh Air Tempering (FAT) Min Cycle Time	15 2	60 8	225 30	Code C Min.	Minimum time between start of FAT on-cycles.
6.23	Free Cooling Supply Setpoint	146 65	161 55	176 45	Code X Deg. F	Economizer modulates dampers to maintain supply air temperature (RT6) at this setpoint during free cooling.

ECTO

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: SECONDS = 16 x COUNTS

CODE V TEMP. (F) = .6792 x COUNTS
CODE W: TEMP. (F) = 0.25 x COUNTS
CODE X: TEMP. (F) = 164.45 - (.6792 x COUNTS)
CODE Y: TEMP. (F) = 131.56 - (.6360 x COUNTS)
CODE Z: TEMP. (F) = 100 - (.25 X COUNTS)
IAQ CO_2 (PPM) = 7.843 x COUNTS

TABLE 20
ECTO PARAMETER CODE CONVERSION TABLE

Count	Time						Temperature					IAQ
	A	B	C	D	E	F	V	W	X	Y	Z	CO_2
	Sec.	Sec.	Min.	Min.	Hrs.	Min.	°F (°C)	°F (°C)	°F (°C)	°F (°C)	°F (°C)	PPM
0	0	0	0.00	0.00	0.00	0.00	0 (0)	0 (-17.8)	164 (74)	132 (55.3)	100 (37.8)	0
5	10	20	0.67	2.67	0.18	1.33	3 (1.9)	1 (-17.1)	161 (72)	128 (53.5)	99 (37.1)	39
10	20	40	1.33	5.33	0.36	2.67	6 (3.8)	3 (-16.4)	158 (70)	125 (51.8)	98 (36.4)	78
15	30	60	2.00	8.00	0.53	4.00	10 (5.7)	4 (-15.7)	154 (68)	122 (50.0)	96 (35.7)	118
20	40	80	2.67	10.67	0.71	5.33	13 (7.5)	5 (-15.0)	151 (66)	119 (48.2)	95 (35.0)	157
25	50	100	3.33	13.33	0.89	6.67	17 (9.4)	6 (-14.3)	148 (64)	116 (46.5)	94 (34.3)	196
30	60	120	4.00	16.00	1.07	8.00	20 (11.3)	8 (-13.6)	144 (62)	112 (44.7)	93 (33.6)	235
35	70	140	4.67	18.67	1.24	9.33	-	9 (-12.9)	141 (60)	10 (42.9)	91 (32.9)	275
40	80	160	5.33	21.33	1.42	10.67	-	10 (-12.2)	137 (59)	106 (41.2)	90 (32.3)	314
45	90	180	6.00	24.00	1.60	12.00	-	1 (-11.5)	134 (57)	103 (39.4)	89 (31.6)	353
50	100	200	6.67	26.67	1.78	13.33	-	13 (-10.8)	131 (55)	100 (37.6)	88 (30.9)	392
55	110	220	7.33	29.33	1.96	14.67	-	14 (-10.1)	127 (53)	97 (35.9)	86 (30.2)	431
60	120	240	8.00	32.00	2.13	16.00	-	15 (-9.4)	124 (51)	93 (34.1)	85 (29.5)	421
65	130	260	8.67	34.67	2.31	17.33	-	16 (-8.8)	120 (49)	90 (32.3)	84 (28.8)	510
70	140	280	9.33	37.33	2.49	18.67	-	18 (-8.1)	117 (47)	87 (30.6)	83 (28.1)	549
75	150	300	10.00	40.00	2.67	20.00	-	19 (-7.4)	114 (45)	84 (28.8)	81 (27.4)	588
80	160	320	10.67	42.67	2.84	21.33	-	20 (-6.7)	110 (44)	81 (27.0)	80 (26.7)	627
85	170	340	11.33	45.33	3.02	22.67	-	21 (-6.0)	107 (42)	78 (25.3)	79 (26.0)	667
90	180	360	12.00	48.00	3.20	24.00	-	23 (-5.3)	103 (40)	74 (23.5)	78 (25.4)	706
95	190	380	12.67	50.67	3.38	25.33	-	24 (-4.6)	100 (38)	71 (21.7)	76 (24.7)	745
100	200	400	13.33	53.33	3.56	26.67	-	25 (-3.9)	97 (36)	68 (20.0)	75 (24.0)	784
105	210	420	14.00	56.00	3.73	28.00	-	26 (-3.2)	93 (34)	65 (18.2)	74 (23.3)	824
110	220	440	14.67	58.67	3.91	29.33	-	28 (-2.5)	90 (32)	62 (16.4)	73 (22.6)	863
115	230	460	15.33	61.33	4.09	30.67	-	29 (-1.8)	86 (30)	58 (14.7)	71 (21.9)	902
120	240	480	16.00	64.00	4.27	32.00	-	30 (-1.1)	83 (28)	55 (12.9)	70 (21.2)	941
125	250	500	16.67	66.67	4.44	33.33	-	31 (-0.4)	80 (26)	52 (11.1)	69 (20.5)	980
130	260	520	17.33	69.33	4.62	34.67	-	33 (0.3)	76 (25)	49 (9.4)	68 (19.8)	1020
135	270	540	18.00	72.00	4.80	36.00	-	34 (1.0)	73 (23)	46 (7.6)	66 (19.1)	1059
140	280	560	18.67	74.67	4.98	37.33	-	35 (1.7)	69 (21)	43 (5.8)	65 (18.5)	1098
145	290	580	19.33	77.33	5.16	38.67	-	36 (2.4)	66 (19)	39 (4.1)	64 (17.8)	1137
150	300	600	20.00	80.00	5.33	40.00	-	38 (3.1)	63 (17)	36 (2.3)	63 (17.1)	1176
155	310	620	20.67	82.67	5.51	41.33	-	39 (3.8)	59 (15)	33 (0.5)	61 (16.4)	1216
160	320	640	21.33	85.33	5.69	42.67	-	40 (4.4)	56 (13)	30 (-1.2)	60 (15.7)	1255

Count	Time						Temperature					IAQ
	A	B	C	D	E	F	V	W	X	Y	Z	CO_2 PPM
	Sec.	Sec.	Min.	Min.	Hrs,	Min	°F (°C)	°F (°C)	°F (°C)	°F (°C)	°F (°C)	
165	330	660	22.00	88.00	5.87	44.00	-	41 (5.1)	52 (11)	27 (-3.0)	59 (15.0)	1294
170	340	680	22.67	90.67	6.04	45.33	-	43 (5.8)	49 (9)	23 (-4.8)	58 (14.3)	1333
175	350	700	23.33	93.33	6.22	46.67	-	44 (6.5)	46 (8)	20 (-6.5)	56 (13.6)	1373
180	360	720	24.00	96.00	6.40	48.00	-	45 (7.2)	42 (6)	17 (-8.3)	55 (12.9)	1412
185	370	740	24.67	98.67	6.58	49.33	-	46 (7.9)	39 (4)	14 (-10.1)	54 (12.2)	1451
190	380	760	25.33	101.33	6.76	50.67	-	48 (8.6)	35 (2)	11 (-11.8)	53 (11.6)	1490
195	390	780	26.00	104.00	6.93	52.00	-	49 (9.3)	32 (0)	8 (-13.6)	51 (10.9)	1529
200	400	800	26.67	106.67	7.11	53.33	-	50 (10.0)	29 (-2)	4 (-15.4)	50 (10.2)	1569
205	410	820	27.33	109.33	7.29	54.67	-	51 (10.7)	25 (-4)	1 (-17.1)	49 (9.5)	1608
210	420	840	28.00	112.00	7.47	56.00	-	53 (11.4)	22 (-6)	-2 (-18.9)	48 (8.8)	1647
215	430	860	28.67	114.67	7.64	57.33	-	54 (12.1)	18 (-8)	-5 (-20.6)	46 (8.1)	1686
220	440	880	29.33	117.33	7.82	58.67	-	55 (12.8)	15 (-9)	-8 (-22.4)	45 (7.4)	1725
225	450	900	30.00	120.00	8.00	60.00	-	56 (13.5)	12 (-11)	-12 (-24.2)	44 (6.7)	1765
230	460	920	30.67	122.67	8.18	61.33	-	58 (14.2)	9 (-13)	-15 (-25.9)	43 (6.0)	1804
235	470	940	31.33	125.33	8.36	62.67	-	59 (14.9)	5 (-15)	-18 (-27.7)	41 (5.3)	1843
240	480	960	32.00	128.00	8.53	64.00	-	60 (15.6)	1 (-17)	-21 (-29.5)	40 (4.7)	1882
245	490	980	32.67	130.67	8.71	65.33	-	61 (16.3)	-2 (-19)	-24 (-31.2)	39 (4.0)	1922
250	500	1000	33.33	133.33	8.89	66.67	-	63 (16.9)	-5 (-21)	-27 (-33.0)	38 (3.3)	1961
255	510	1020	34.00	136.00	9.07	68.00	-	64 (17.6)	-9 (-23)	-31 (-34.8)	36 (2.6)	2000

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 37. Parts of the IMC boards will be located in all wiring diagram sections. See figure 38 to find the jack/plug connector on the IMC board(s). Use table 21 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:

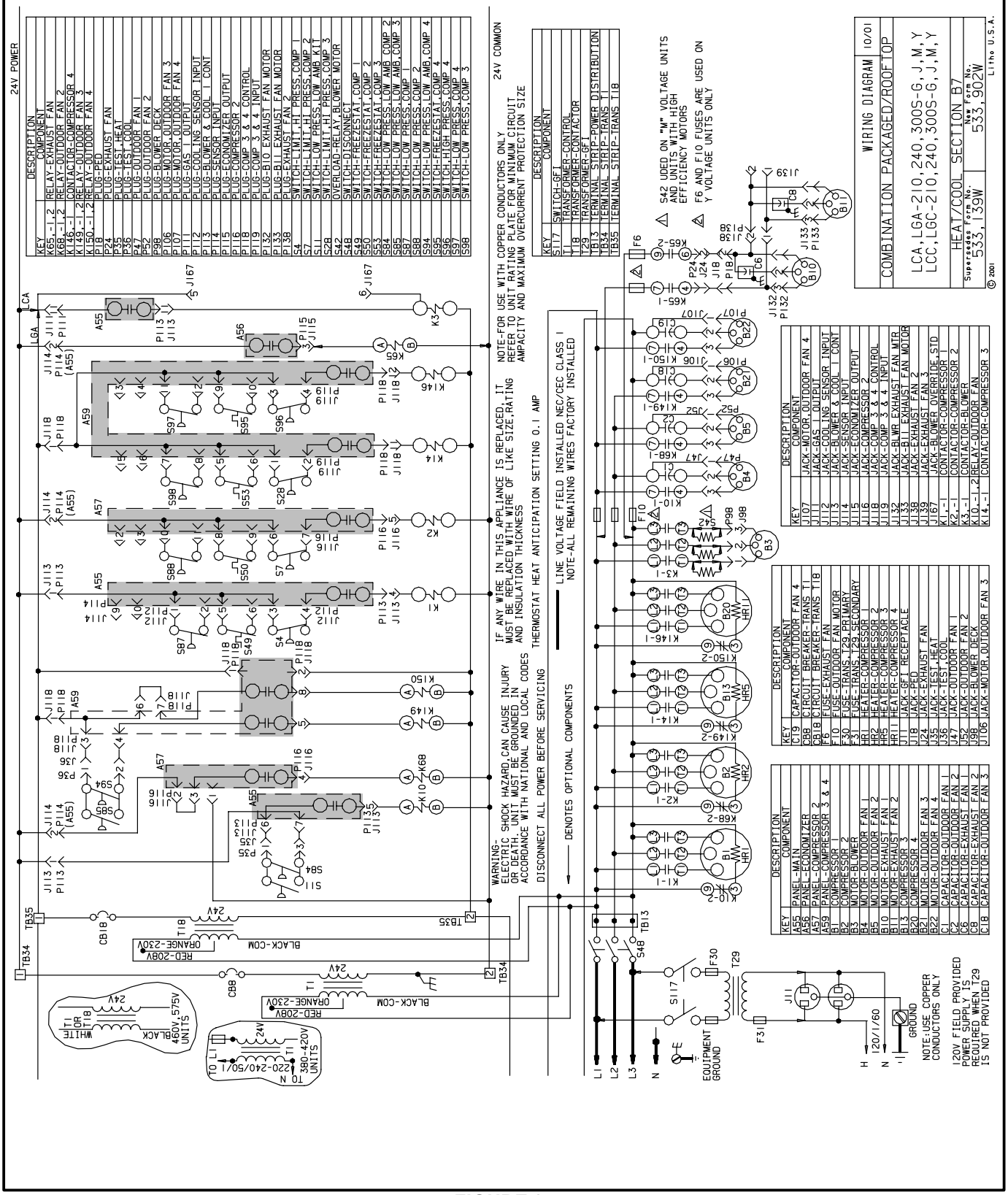
1-Using the unit wiring diagram and figure 38, locate K3 and identify appropriate IMC board and jack/plug. (A55 main board and J/P113-11.)

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

ECTO

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

SHADED AREAS INDICATE IMC BOARD



KEY	DESCRIPTION COMPONENT
K65-1,2	RELAY-EXHAUST FAN
K68-1,2	RELAY-OUTDOOR FAN 2
K146-1,2	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
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 CONTROL
P118	PLUG-COMP 3 & 4 CONTROL
P119	PLUG-COMP 3 & 4 INPUT
P132	PLUG-B11 EXHAUST FAN MOTOR
P133	PLUG-B11 EXHAUST FAN
S1	SWITCH-LIMIT,HI PRESS COMP 1
S4	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

KEY	DESCRIPTION COMPONENT
S117	SWITCH-GFI
T1	TRANSFORMER-CONTROL
T18	TRANSFORMER-CONTACTOR
T29	TRANSFORMER-GFI
TB13	TERMINAL STRIP-POWER DISTRIBUTION
TB34	TERMINAL STRIP-TRANS T1
TB35	TERMINAL STRIP-TRANS T18

KEY	DESCRIPTION COMPONENT
J107	JACK-MOTOR,OUTDOOR FAN 4
J111	JACK-GAS 1 OUTPUT
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
J132	JACK-B11 EXHAUST FAN MTR
J133	JACK-B11 EXHAUST FAN
J138	JACK-EXHAUST FAN 2
J139	JACK-EXHAUST FAN 3
J167	JACK-BLOWER OVERRIDE,STD
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3,-1	CONTACTOR-BLOWER
K10,-1,2	RELAY-OUTDOOR FAN
K14,-1	CONTACTOR-COMPRESSOR 3

KEY	DESCRIPTION COMPONENT
C19	CAPACITOR-OUTDOOR FAN 4
CB8	CIRCUIT BREAKER-TRANS T1
CB18	CIRCUIT BREAKER-TRANS T18
F6	FUSE-EXHAUST FAN
F10	FUSE-OUTDOOR FAN MOTOR
F30	FUSE-TRANS T29,PRIMARY
F31	FUSE-TRANS T29,SECONDARY
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
HR5	HEATER-COMPRESSOR 3
HR11	HEATER-COMPRESSOR 4
J1	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

KEY	DESCRIPTION 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

FIGURE 37

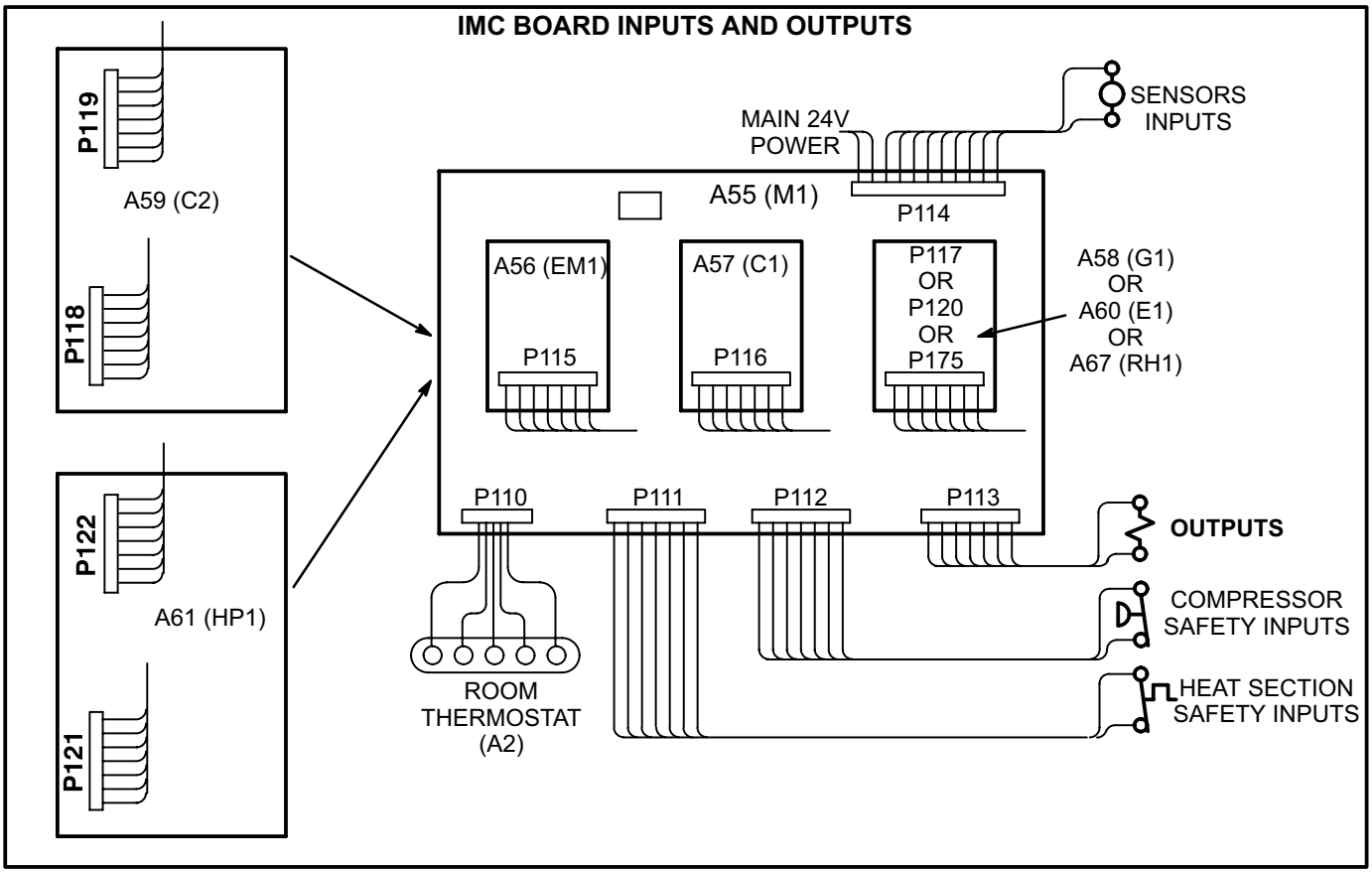


FIGURE 38

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

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

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

TABLE 21
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

TABLE 21 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 21 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	A91 (-)	RH SENSOR (0-10VDC = 0-100% RH)	0-10VDC AI
10	A91 (+)		
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	2-10 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	2-10VDC AI
PLUG #P116 A57 C1			
1	TB34-2	RETURN (FOR TRANS. PROT.)	COM (24VAC)
2	S84	LOW PRESS (LOW AMB. CONTROL, FAN 2)	SW (24VAC)
3	S84		
4	K68	FAN 2	24VAC BO
5	K2	COMPRESSOR 2	24VAC BO
6	S7	HP2 (HIGH PRESS. 2)	SW (24VAC)
7	S7		
8	S50	FRZ2 (FREEZE STAT 2)	SW (24VAC)
9	S50		
10	S88	LP2 (LOW PRESS. 2)	SW (24VAC)
11	S88		
12	RT13	RESERVED	RES (0-5VDC)
13	RT13		

I/O

TABLE 21 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 21 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		

PLUG #P175 A67 HUMIDITY CONTROL BOARD			
1	TB34-C	COMMON	24VAC POWER
2	TB34-H	24VAC	24VAC POWER
3	L14	REHEAT SOLENOID #1	24VAC BO
4	L30	REHEAT SOLENOID #2	24VAC BO
5	--	DIGITAL INPUT 1 (RESERVED FOR FUTURE USE)	24VAC BI
6	--	DIGITAL INPUT 2 (RESERVED FOR FUTURE USE)	24VAC BI

IMC M1-6 Version 4.01 Summary Sheet

Pushbutton Basics

Short press - To by-pass delays

Hold - To reset control

UNIT DIP Switch

HP - "ON" for LHA Unit

GAS - "ON" for LGA/LGC Unit

HP & GAS - "OFF" for LCA/LCC Unit

SHIFT - "OFF" during normal unit operation.

1PH - "ON" for single phase units. Fig. 6

Unit Diagnostic Codes

To recall stored codes:

RECALL DIP - "ON"

Last code will display

Tap button to toggle to previous codes

To erase: Hold button until "0"

RECALL DIP - "OFF" Fig. 12

Display Sensor Readings

TEMP DIP -"ON"

0-Outdoor Temp. (RT17)

1-Return Air Temp. (RT16)

2-Supply Air Temp. (RT6)

3-Zone Temp. (A2)

4-CO_2 (0 - 255 counts = 2000 ppm)(A63)

5-Demand Ventilation Damper Position

6-Free Cooling Damper Position

7-Indoor Relative Humidity (A91)

Tap button to toggle 0 to 7

TEMP DIP - "OFF" Table 17

M1 Software Version

UNIT TEST DIP - "ON"

RECALL DIP - "ON" Fig. 9

ADDRESS DIP Switch

Address DIP is used for setting the unit address when connected to the L Connection network.

Switches add for a total of 31 addresses (1 to 31).

A switch setting of "0" is not valid, even when unit is not networked.

IMC must be reset after changing an address.

Thermostat Input Tests

SHIFT DIP - "ON"
Wait 2 seconds
UNIT TEST DIP - "ON"

Two stage cooling option
c01 = Y1 demand
c10 = c11=Y2 demand

Three stage cooling option
c01 = Y1 demand
c10 = Y2 demand
c11 = Y3 demand

Heat
h01 = W1 demand
h10 = h11=W2 demand

S01 = Smoke Alarm

Tap button to toggle demand option.
Hold button to turn on and off demand.

UNIT TEST - "OFF"
SHIFT - "OFF" Fig. 31

BUS Termination Jumper

Set the "BUS TERM" jumper in the "out" position (or remove jumper) for all units connected to the L Connection network.

To Change ECTO Parameters

ECTO DIP - "ON"

Press button to desired parameter #.
Short press advances parameter #.
Long press advances block #.

SHIFT DIP - "ON" to read value.

Push button once to increase value by 1.
Push button twice to decrease value by 10.

SHIFT DIP - "OFF"

Wait until the parameter # is displayed.

ECTO DIP - "OFF" Fig. 36

Lights

Green blinking (HB) LED is the control "Heartbeat"; indicates normal operation.

Yellow "XMIT" LED is the "Data Transmit" indicator.

Other yellow LED's indicate external thermostat demands G, Y1, Y2, W1, W2, OCP.

Yellow LED on EM1-1 (economizer board - A56) indicates outdoor air is suitable for free cooling. LED blinks if control is in the DCV (IAQ) mode.

Test Control Outputs

UNIT TEST DIP - "ON"
0=Blower
1=Fan 1
2=Fan 2
3=Fan 3
4=Fan 4
5=Fan 5
6=Fan 6
7=Reversing Valve 1
8=Reversing Valve 2
9=Service Relay
10=Reheat Solenoid L14
11=Reheat Solenoid L30
12=Exhaust Fan K65

Tap button to toggle output option.
Hold button to turn output on and off.

UNIT TEST - "OFF" Table 14

Defrost Test

UNIT TEST DIP - "ON"
RECALL DIP - "ON"

Start test - Hold pushbutton for long push (5 seconds).

Terminate Test - Press pushbutton.

Note: Defrost will occur on each stage that is operating in heating.

Displayed "E"

An "E" display indicates an incorrect combination of DIP switches. Fig. 29

EM1 (Economizer Board)

MIN POS SET - Sets the damper minimum position (0-100% travel).

ENTH SET POINT - Sets the outdoor enthalpy setpoint.

At 50% outdoor RH -
A=73°F, B=70°F, C=67°F, D=63°F

To set or test damper, set both DIP switches "OFF" (DSET). Use MIN POS SET pot to adjust.

For outdoor enthalpy mode, set both DIP switches "ON" (ODE). Fig. 20

IMC Temperature Thermistors

(RT6, RT16, RT17)

Temp. °F	Resistance
30	34,566
40	26,106
50	19,904
60	15,313
70	11,884
80	9,298
90	7,332
100	5,826

All values are +/- 2%.