

KITS COMMON TO HEATING AND COOLING EQUIPMENT

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

GUIDE TO THE M1-4 AND M1-5 INTEGRATED MODULAR CONTROL USED IN L SERIES 3 THROUGH 30 TON UNITS

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GENERAL

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

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

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

INTEGRATED MODULAR CONTROL (IMC) FEATURES

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

IMC AND ADD-ON BOARD LOCATION AND OPERATION

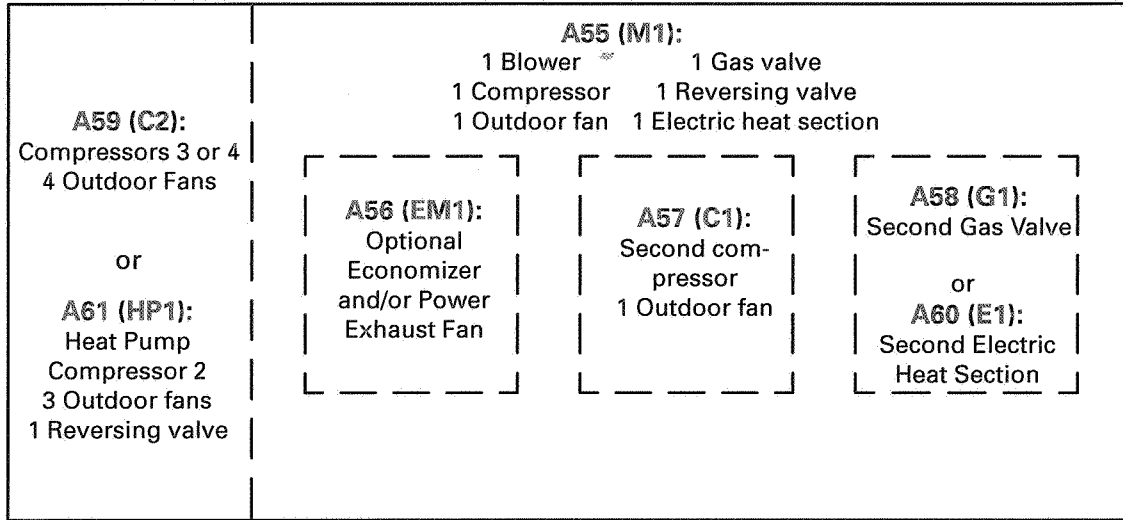


FIGURE 2

A55 (M1) MAIN CONTROL PANEL LOCATION BY UNIT

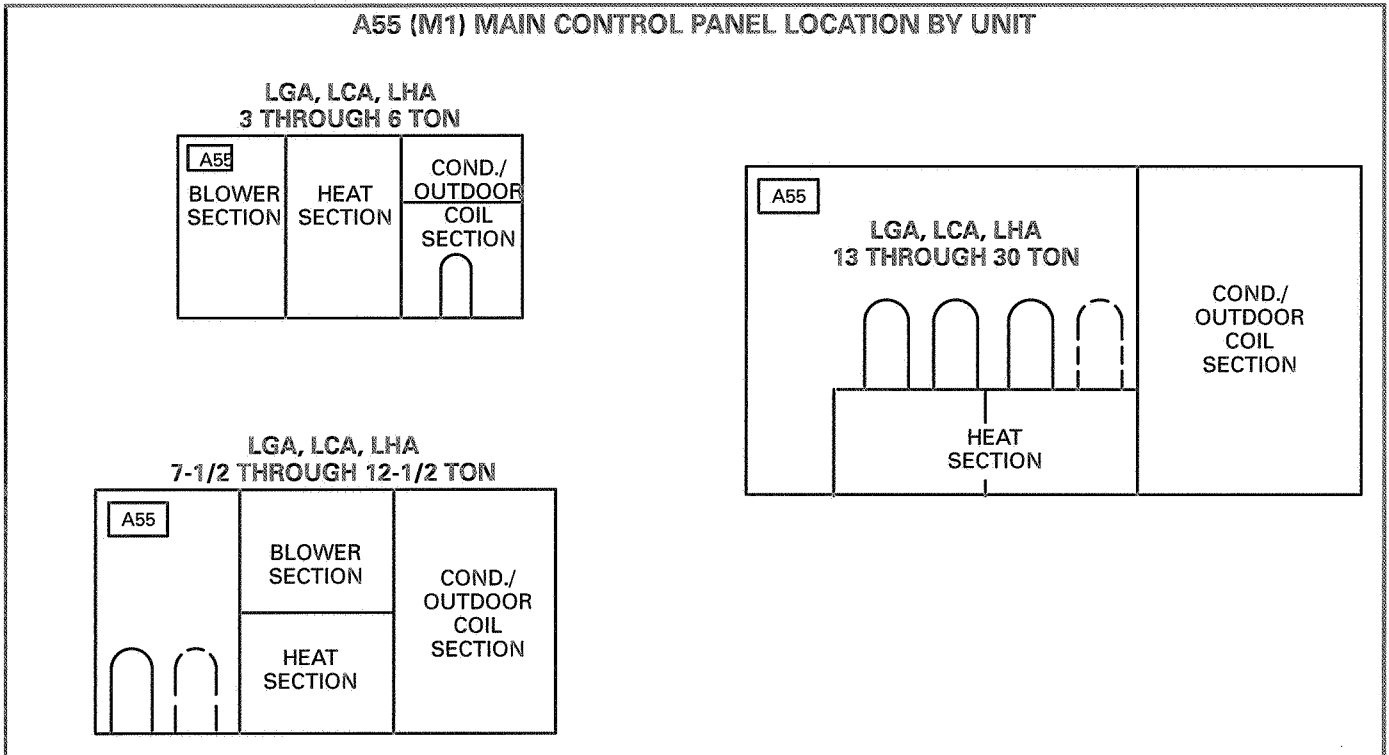
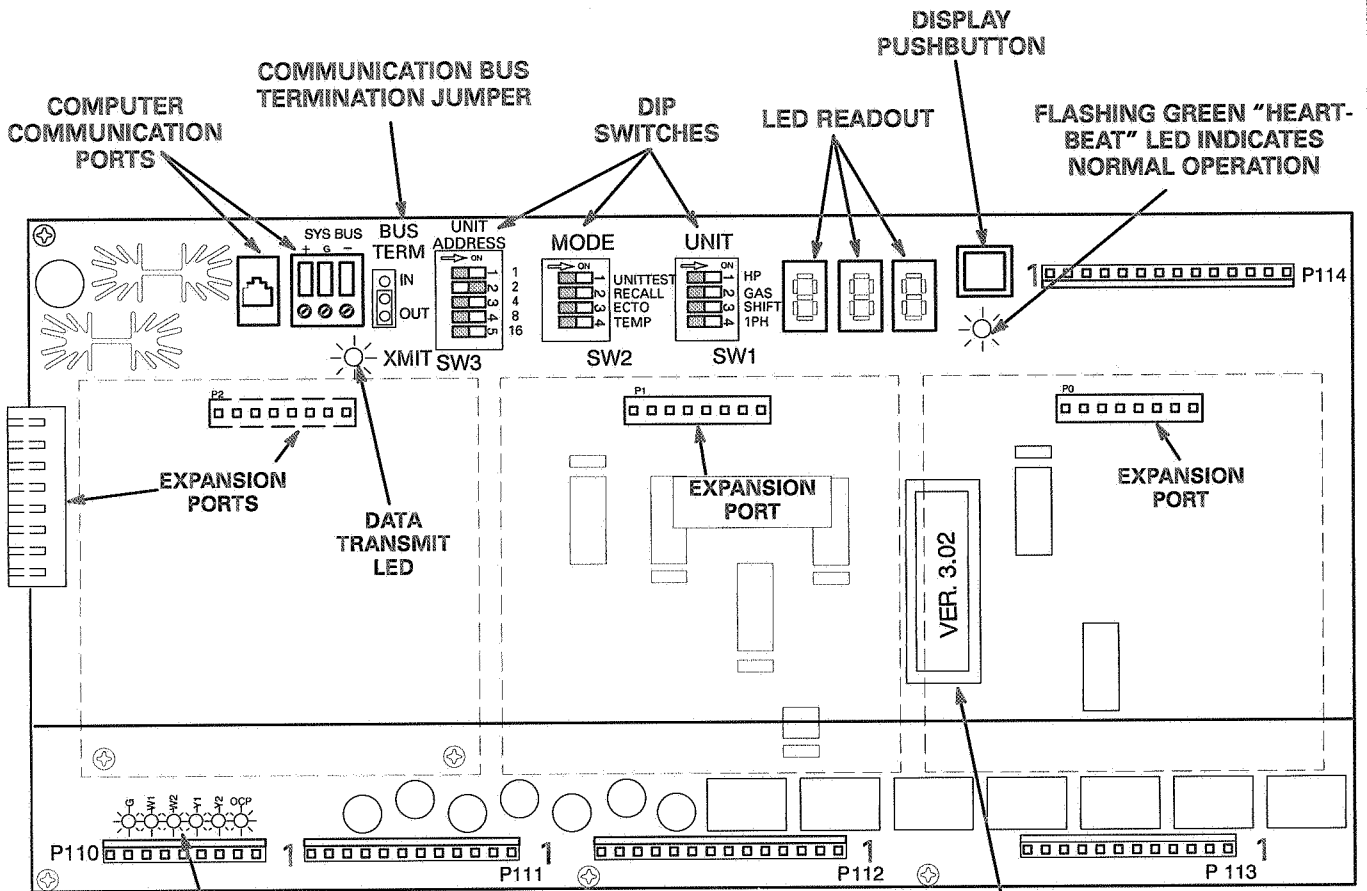


FIGURE 3

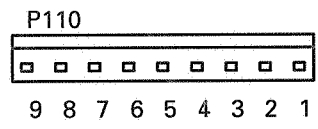
A55 (M1) MAIN CONTROL BOARD

NOTE-CONNECTOR NOMENCLATURE ON BOARD DENOTES GAS UNIT FUNCTIONS.



UNIT MODE INDICATORS (THERMOSTAT INPUTS)

MAIN CONTROL BOARD SOFTWARE VERSION PRINTED ON U12 CHIP



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

UNIT START-UP

VERIFY IMC BOARD FUNCTIONS

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

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

- 1- Heartbeat LED on each board will flash.
- 2- LED readout will flash "8.8.8" and turn off.
- 3- Thermostat input indicating LED's will appropriately turn on.

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

UNIT OPERATION

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

UNIT START-UP WITH IMC BOARD

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

UNIT START-UP WITH TB1 JUMPERS

Use figure 10 to check unit operation.

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

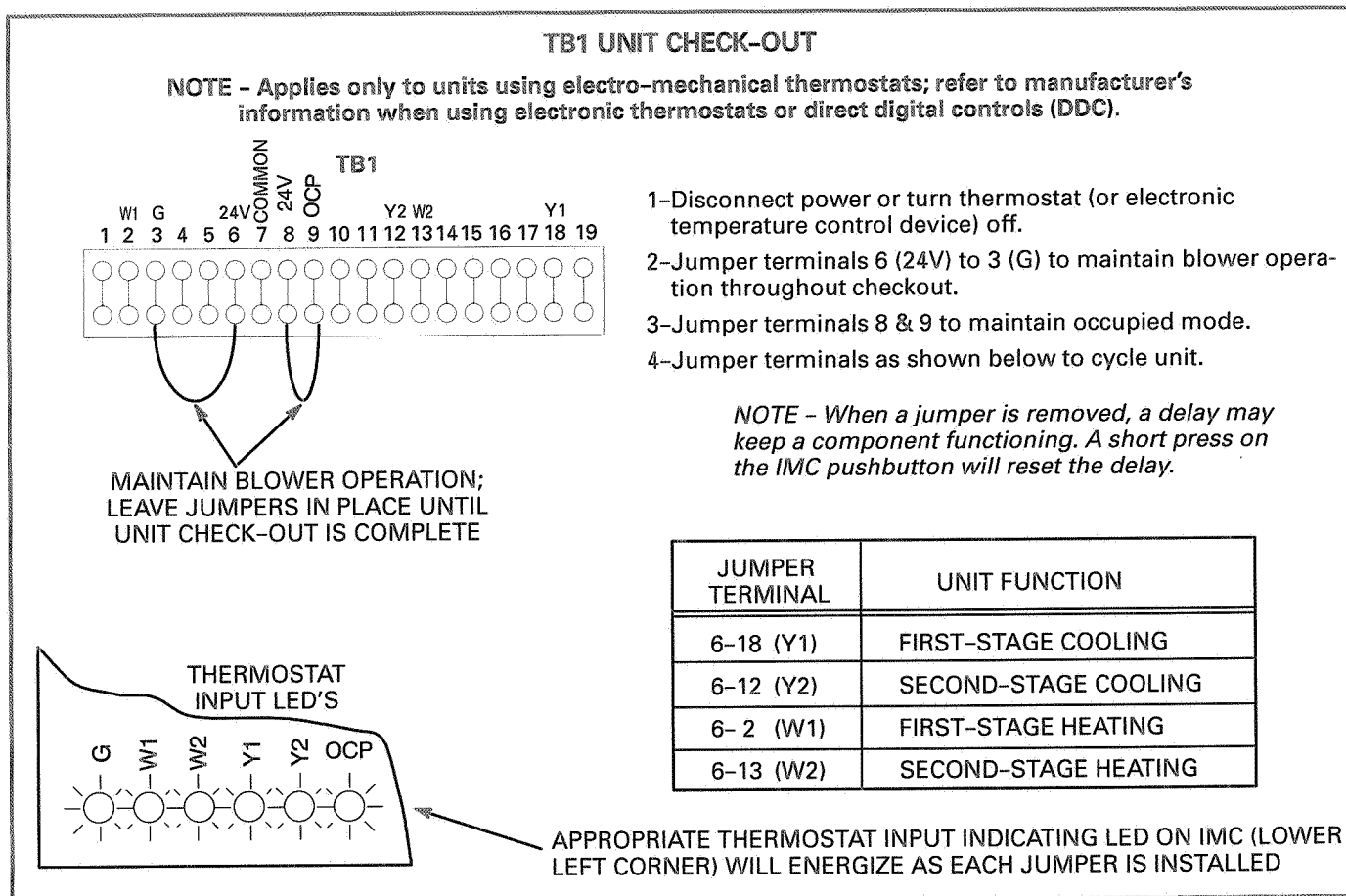


FIGURE 10

**TABLE 3
IMC ERROR CODES**

Error #	PROBLEM	ACTION
1	Power loss for two cycles. This may indicate that the unit power is "dirty" or is of low quality.	None
2	ECTO access error. This may indicate a problem with the ECTO memory chip and parameters may not be changeable.	Control will operate with the factory ECTO defaults.
3	Reserved.	
4*	A17 input indicates smoke alarm.	Defined by ECTO 5.01. Default action unit off.
5*	S52 (Air Flow Switch) This indicates no blower air 16 seconds after blower demand.	Unit off.
6*	S27 (Dirty Filter Switch) This indicates a dirty filter.	None
7-9	Reserved.	
10*	24 VAC power loss at TB35-1 on A55 (M1) board. P111 pin 11.	Unit off.
11*	24 VAC power loss 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 during a demand. ECTO 5.08.	Unit off
22	S87 (Low Press. 1) is open.	Compr.1 off.
23*	S87 (Low Press. 1) has opened 3 (default) times during a demand. The number of times is defined in ECTO 1.13 or 4.15.	Compr 1 locked off. Requires a reset or two short pushes of pushbutton to restore.
24	S88 (Low Press. 2) is open.	Compr. 2 off.
25*	S88 (Low Press. 2) has opened 3 (default) times during a demand. The number of times is defined in ECTO 1.13 or 4.15.	Compr 2 locked off. Requires a reset or two short pushes of pushbutton to restore.
26	S98 (Low Press. 3) is open.	Compr. 3 off.
27*	S98 (Low Press. 3) has opened 3 (default) times during a demand. The number of times is defined in ECTO 1.13 or 4.15.	Compr 3 locked off. Requires a reset or two short pushes of pushbutton to restore.
28	S97 (Low Press. 4) is open.	Compr.4 off
29*	S97 (Low Press. 4) has opened 3 (default) times during a demand. The number of times is defined in ECTO 1.13 or 4.15.	Compr 4 locked off. Requires a reset or two short pushes of pushbutton to restore.
30-31	Reserved.	
32	S49 (Freeze stat 1) is open.	Compr. 1 off.
33*	S49 (Freeze stat 1) has opened 3 (default) times during a demand. The number of times is defined in ECTO 4.04.	Compr. 1 off.
34	S50 (Freeze stat 2) is open.	Compr. 2 off.

*Service relay contacts are energized.

+ Not stored in memory.

DIAGNOSTICS

IMC ERROR CODES

68	Gas valve 2 not energized two minutes after demand. Check gas supply, ignition control, and wiring (GV3).	Only action taken is storing code in memory.
69*	Gas valve 2 not energized 3 (default) times (2 minutes after demand). Check gas supply, ignition control and wiring. ECTO 3.09. (GV3).	Only action taken is storing code in memory.
70-73	Reserved.	
74*	Zone sensor (A2) problem. Check sensor and wiring.	IMC will switch over to the backup mode option set with ECTO 6.01. If no backup mode is selected, the unit will shut down.
75	Outdoor Temperature (RT17) Sensor Problem. Check wiring and sensor.	The control defaults to a high outdoor temp. operation.
76	Reserved	
77*	Discharge (Supply) Air Temperature Sensor (RT6) problem. Check wiring and sensor.	No free cooling. Economizer damper will close. All economizer modes.
78*	Return Air Temperature Sensor (RT16) problem. Check wiring and sensor.	No free cooling if economizer is in TMP (temperature) mode, dampers will close.
79*	A major communication problem between the main board and add-on boards has occurred.	Main control has locked out all add-on boards. Reset control to restore.
80	A communication problem between the main board and add-on board has occurred.	Main board has reset the communications to the add-on boards.
81	Reserved.	
82	Main board reset or power outage has occurred.	Only action taken is store code in memory. Note – This code is always recorded at power up and is only displayed in error recall mode.
83*	IMC configuration error. The add-on boards plugged into the main control don't agree with the UNIT DIP switch settings. I.E. Switch is set for gas, but main board detects an electric heat board. Check UNIT DIP switch setting and add-on boards types.	Unit is off.
84*	An add-on board did not respond when polled by main control during system power-up. Add-on board with problem will have flickering heartbeat.	Main control has locked out all add-on boards. Reset control to restore.
85	Reserved	
86*	Thermostat input conflict. Simultaneous heat and cool demands. Check thermostat wiring.	Unit is off.
87*	UNIT (equipment type) DIP switch has changed while unit is energized. Check UNIT DIP switch setting and reset. control. Make sure the UNIT DIP switch settings agree with the unit type.	Unit is off.
88	This may indicate a problem with the ECTO chip.	Control will operate with the factory default ECTO settings.
89	No address is set on unit address DIP switch SW3. Any one switch on SW3 must be in "on" position. SW3 is factory set with switch #2 in on position.	Unit is off.
90	Reserved.	
91*	Outdoor enthalpy sensor (A7) problem. Check sensor and wiring. (Only available if the A56 board is software version 1.06 or later.)	No economizer free cooling operation if economizer mode is set to ODE or DIF.
92*	Indoor enthalpy sensor (A52) problem. Check sensor and wiring. (Only available if the A56 board is software version 1.06 or later.)	No economizer free cooling operation if economizer mode is set to DIF.
93*	The control has changed the system mode because an error with the controlling sensor has occurred.	IMC has switched over to the backup mode option set with ECTO 6.01.
94	Reserved	
95	ECTO parameter has been changed by the pushbutton.	For information only. Indicates that someone has made a ECTO change.
96-126	Reserved.	
127	Error buffer overflow.	This means multiple errors occurred and some may not have been stored.
128-255	Reserved.	

*Service relay contacts are energized.

+ Not stored in memory.

COMPRESSOR MINIMUM RUN TIME
(Three phase units only)

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

COMPRESSOR OFF DELAY
(Single phase units only)

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

BLOWER ON DELAY

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

BURNER CONTROL - LGA Units
Primary or Secondary Limits
(S10, S21, S99, S100)

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

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

Roll-Out Switch (S47, S69)

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

Combustion Air Switch (S18, S45)

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

Gas Valve Sense

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

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

GAS VALVE DELAYS

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

FREEZESTATS (S49, S50, S53, S59)

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

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

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

AIR FLOW SWITCH (S52-Optional)

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

DIRTY FILTER SWITCH (S27-Optional)

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

SMOKE DETECTOR (A17-Optional)

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

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

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

LOSS OF POWER DETECTION
(Single phase units only)

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

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

Defrost Cycle

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

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

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

Economizer dampers close during a defrost cycle.

Defrost Readout

The readout will display IDF11 when the first stage is operating in defrost mode, IDF21 will display when the second stage is operating in defrost mode, and IDF-I will display when both stages are operating in defrost mode.

Supplemental Heat Lock Out

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

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

Test Supplemental Electric Heat Operation

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

Thermostats With Emergency Heat Function

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

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

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

- 1- De-energizes the compressor for five minutes (default) if the low pressure switch trips (once the ignore time period is elapsed).
- 2- Ignores the low pressure switch for a specified period of time after thermostat demand.
- 3- Locks out the compressor stage if the low pressure switch trips three times within the same thermostat demand (once the ignore time period is elapse).

Low Pressure Switch Off

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

Ignore Or Shunt Time Period

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

Control De--Energizes Unit

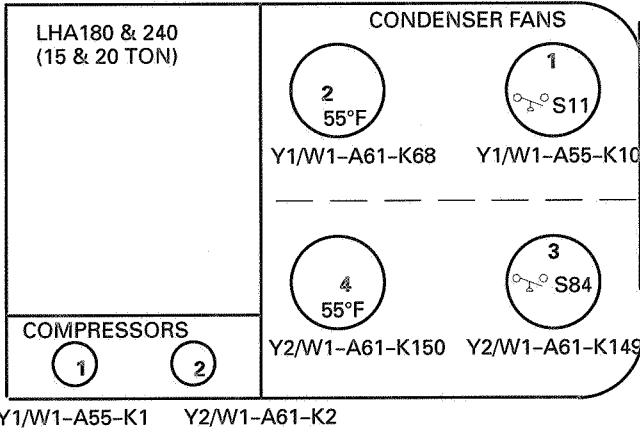
If the low pressure switch trips three times (default) during a thermostat demand, the IMC will lock out the compressor. The number of times required to de-energize the unit is adjustable. (ECTO 1.13, 4.13).

CHART 1
LOW PRESSURE IGNORE DEFAULT TIME PERIOD

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

COMPRESSOR AND FAN OPERATION

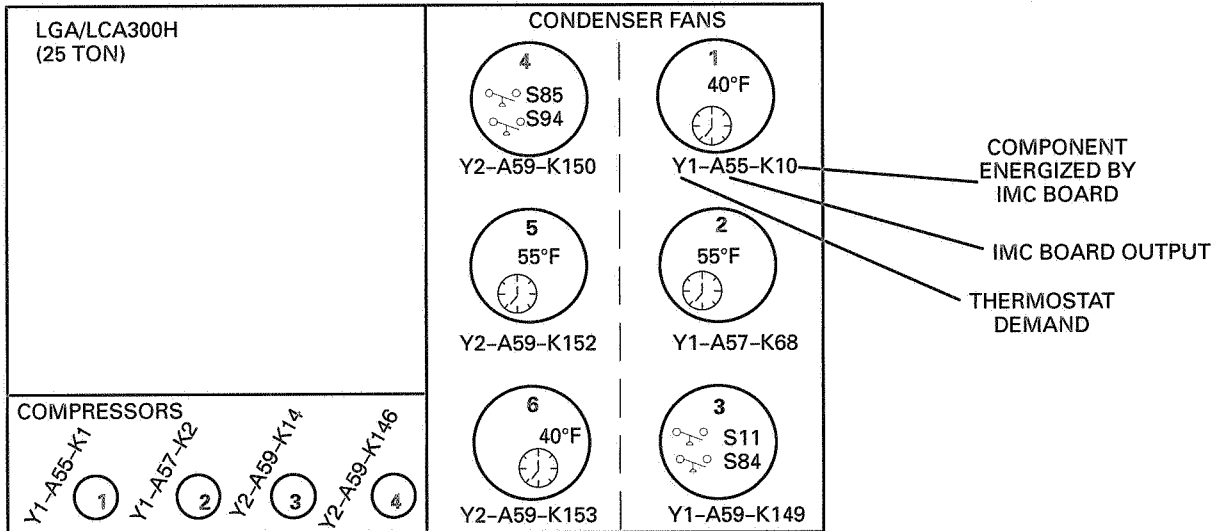
C BOX



SYMBOL	DESCRIPTION
	FAN ENERGIZED WHEN LIQUID PRESSURE IS HIGHER THAN 275 PSIG (1965 KPA) AND DE-ENERGIZED WHEN LIQUID LINE PRESSURE LESS THAN 150 PSIG (965 KPA) NOTE - A BOX UNIT FANS ARE DE-ENERGIZED AT 140 PSIG (960 KPA).
55°F	IMC (TP2) DE-ENERGIZES FAN BELOW 55°F/13°C DEFAULT
40°F	IMC (TP1) DE-ENERGIZES FAN BELOW 40°F/4.4°C DEFAULT
	IMC DELAYS FAN 75 SECONDS (DEFAULT) AFTER THERMOSTAT DEMAND ON SOFTWARE VERSIONS 1.03, 1.04, 1.05 (ECTO 4.14). DELAYS 2 SECONDS ON VERSION 1.06 AND HIGHER.

1-IMC DE-ENERGIZES ALL COMPRESSORS BELOW 0°F (-18°C) DEFAULT.
 2-LOW AMBIENT PRESSURE SWITCHES ARE BY-PASSED IN THE HEATING MODE ON HEAT PUMP UNITS.
 3-MULTIPLE LOW AMBIENT SWITCHES ON SAME FAN MUST ALL BE OPEN TO DE-ENERGIZE FAN.

D BOX



D BOX

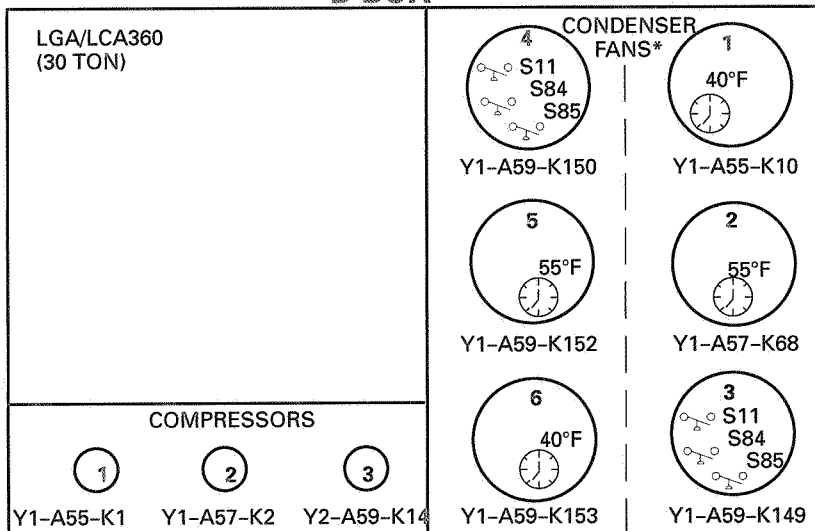


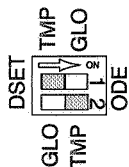
FIGURE 14

A56 (EM1) DIP SWITCH SETTINGS

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

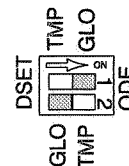
TMP (SENSIBLE TEMPERATURE)

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



GLO (GLOBAL)

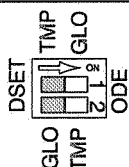
Switches set to read global enthalpy. Multiple unit installations use only one enthalpy sensor to determine outdoor air suitability (rather than one enthalpy sensor per unit). This setting is also used for motorized outdoor air damper applications.



DSET (DAMPER SET)

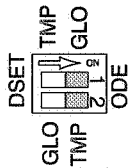
Switches set to make damper minimum position and humidity selections, to test damper motor and to set damper linkage.

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.



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

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

DIF (DIFFERENTIAL ENTHALPY)

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

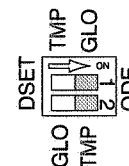
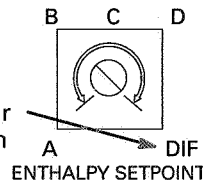


FIGURE 16

DAMPER MINIMUM POSITION POTENTIOMETER

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

Rotate MIN POS SET potentiometer to approximate desired damper position.

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

DAMPER MAXIMUM POSITION

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

EXHAUST FAN OPERATION

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

ECONOMIZER OPERATION

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

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

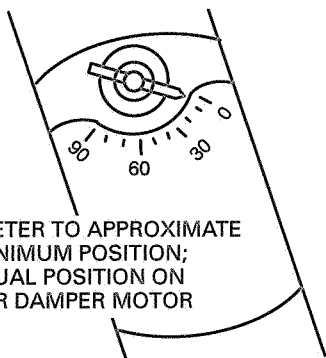
Both tables show the occupied and unoccupied time period. The occupied time period is determined by the thermostat or energy management system.

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

MOTORIZED OUTDOOR AIR DAMPER

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

ECONOMIZER DAMPER MINIMUM POSITION (NOTE: MOTOR ROTATES SLOWLY)



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

FIGURE 17

ECONOMIZER

ECONOMIZER CHECKOUT

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

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

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

STEP 1

A56 ECONOMIZER BOARD OUTPUT VOLTAGE

- 1- Set the A56 DIP switch to DSET.
- 2- Adjust the MIN POS SET potentiometer (on A56 board) to the 0% position (fully counterclockwise). The motor will slowly modulate to the closed position.
- 3- Adjust the MIN POS SET potentiometer to the 100% position (fully clockwise). The motor will slowly modulate to the fully opened position.
- 4- If the motor does not respond, go to step 2. If the motor does respond properly, go to the appropriate mode of operation checkout.

STEP 2 "DSET" OPERATION

- 1- Disconnect J115 from P115 on A56 EM1 board.
- 2- Set the DIP switch to the "DSET" position.
- 3- Adjust the MIN POS SET potentiometer to the 0% position (fully counterclockwise).
- 4- Measure the voltage on P115 between pin 2 (VOT) and pin 1 (TB34-2) using pin 1 as common. Voltage should read approximately 2 volts DC on EM1 (A56) software version 1.02 and higher; voltage should read approximately zero on EM1 (A56) software version 1.00 and 1.01.
- 5- Adjust the MIN POS SET potentiometer to the 100% position (fully clockwise).

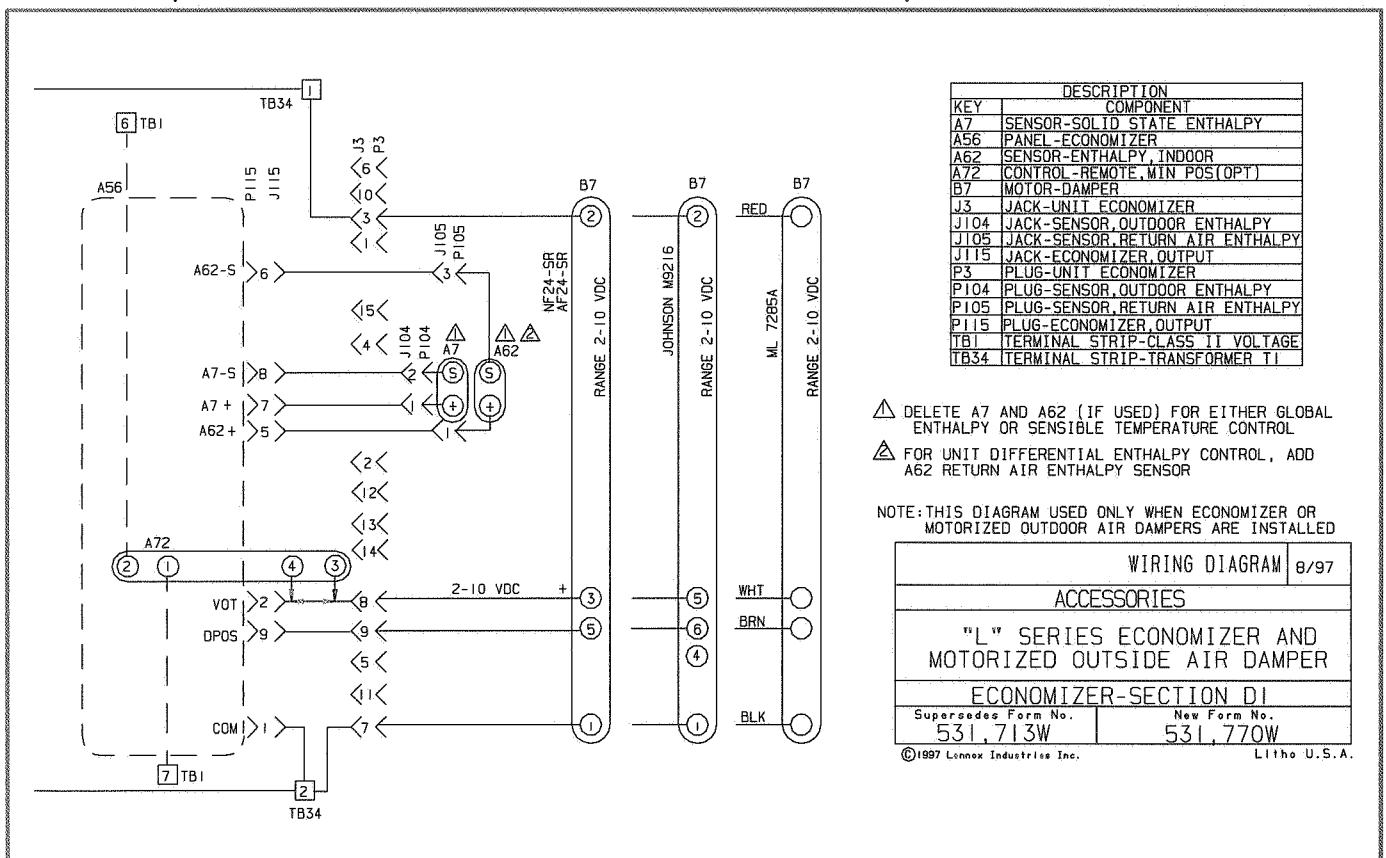
NOTE - Allow approximately 30 seconds for voltage to react.

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

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

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

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



ECONOMIZER

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

NOTE - The global input turns on the blower.

- 1- Change ECTO 5.24 option to 1. See ECTO section.
- 2- Set the A56 DIP switch to GLO.
- 3- The damper will energize to the minimum position set on the potentiometer on the A56 (EM1) board.
- 4- Connect a jumper between TB1-6 (24vac) and TB1-1 (global). The blower will be energized and the damper will open to maximum position. Maximum position may be adjusted in ECTO 5.23. Default is 100%.

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

- 4- Disconnect 24vac to TB1-1. The blower will turn off and the damper will close.
- 5- If the damper does not actuate check all connections and wiring between J115 and J3.

STEP 8

ENTHALPY SENSOR OPERATION (A7 AND A62)

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

- 2- The reading will be between 4 and 20 ma. depending on outdoor temperature and humidity. Refer to table 8 to approximate reading.
- 3- If the meter reads zero, check sensor wiring harness for continuity and/or check polarity of sensor wiring.

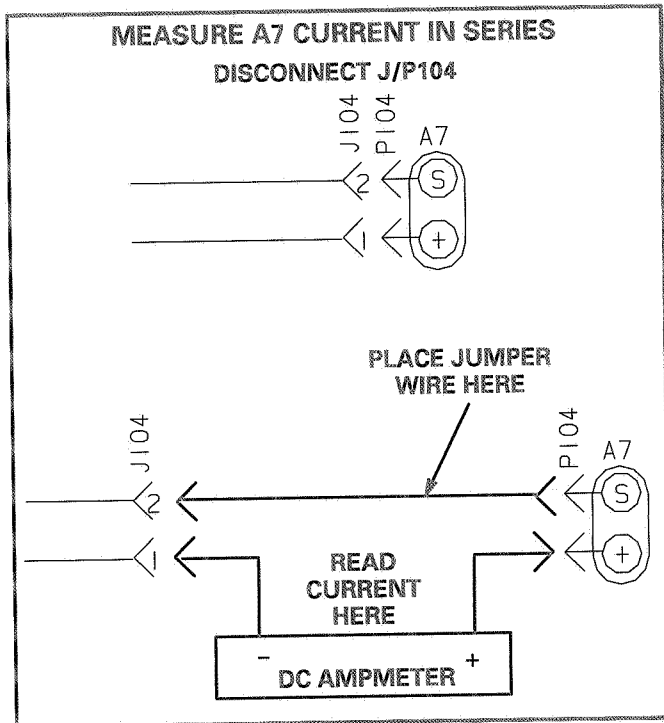


FIGURE 18

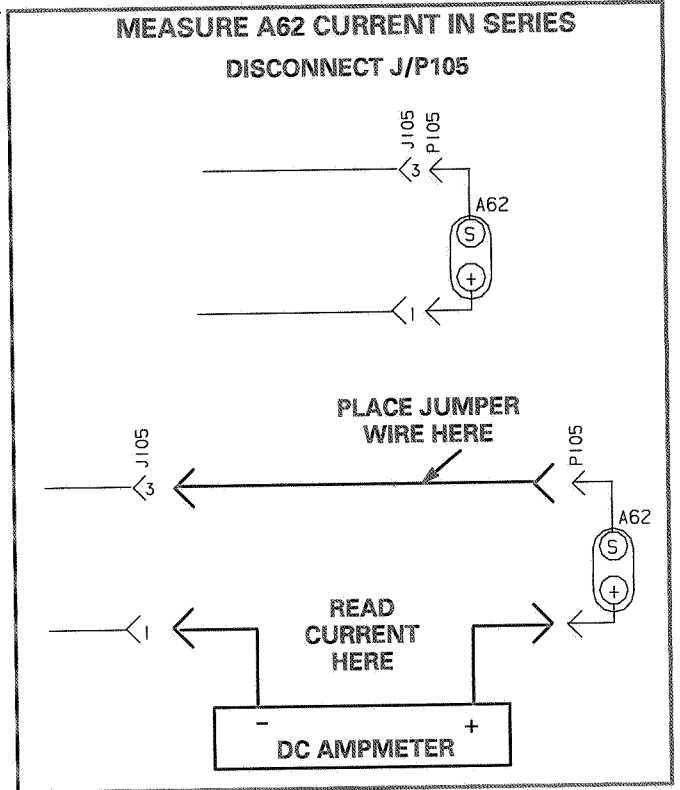
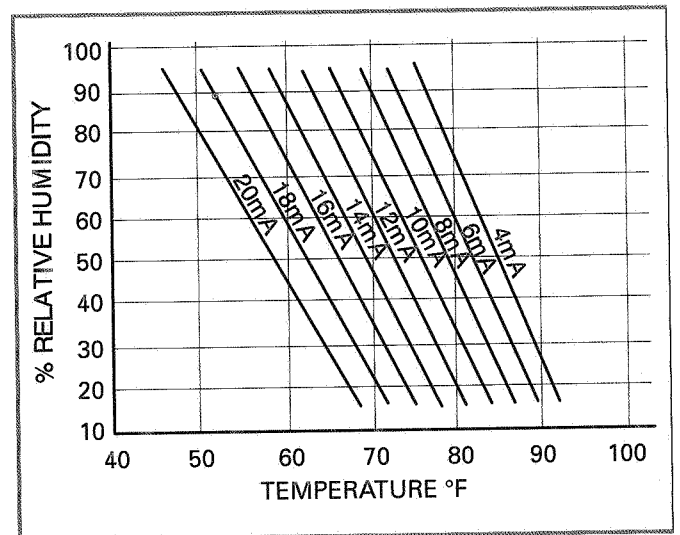


FIGURE 19

TABLE 8
ENTHALPY SENSOR OUTPUT CURRENT
HONEYWELL C7400



ECONOMIZER

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 CO₂ levels, set the "full open" (ECTO 5.17) setpoint higher than the "start open" (ECTO 5.18) setpoint. The dampers will drive to fully-open position immediately. Figure 21 shows the setpoint control option.

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

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

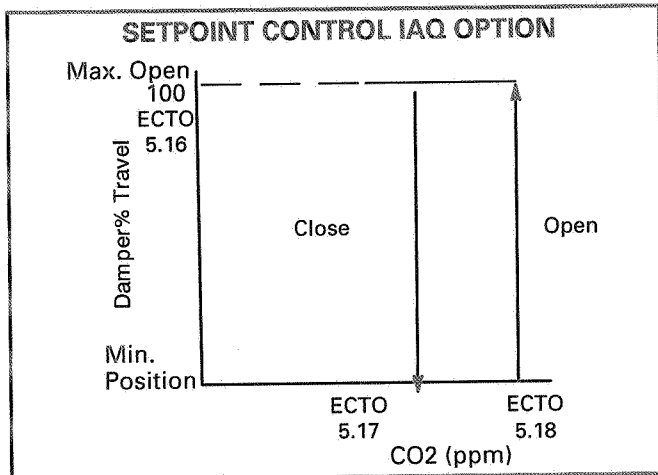


FIGURE 21

Determine IAQ Input

Check IAQ input (ppm) as follows:

- 1- Set the TEMP dip switch to ON.
- 2- Toggle the pushbutton to .4. The display will alternate between .4 and the IAQ input.
- 3- Use the following formulas or table 9 to determine DC voltage or CO₂ ppm. Divide the reading (counts) by 255 to determine DC voltage. Multiply the reading (counts) by 7.843 to determine the CO₂ ppm.

$$\text{Counts} \div 255 = \text{DC Voltage}$$

$$\text{Counts} \times 7.843 = \text{CO}_2 \text{ ppm}$$

TABLE 9

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

ECONOMIZER

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

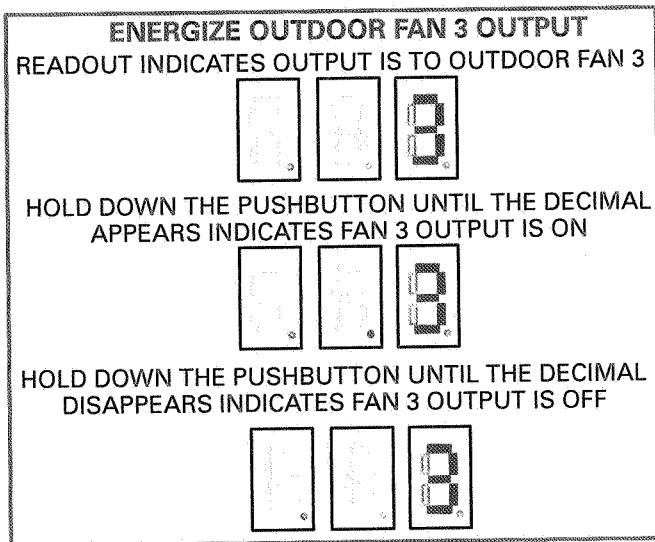


FIGURE 26

IMC BOARD THERMOSTAT SIMULATION TEST

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

Move the UNIT DIP "SHIFT" switch #3 to ON. Make sure the decimal point is to the right of the readout. Move the MODE DIP "UNIT TEST" switch #1 to "ON". See figure 27.

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

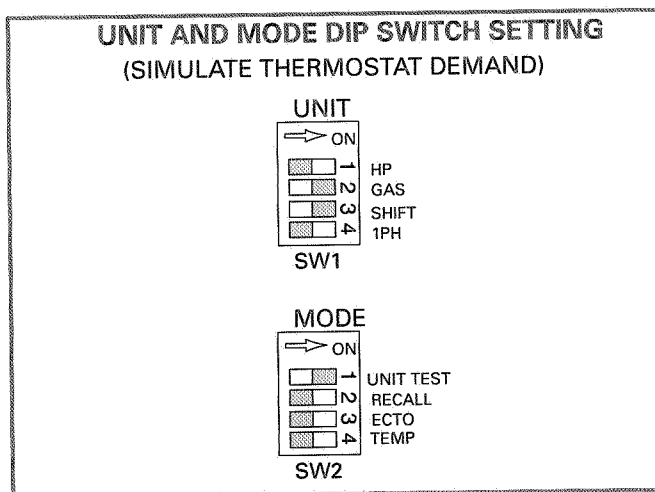


FIGURE 27

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

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

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

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

TABLE 11
TESTING INPUTS (TWO-STAGE)

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

TABLE 12
TESTING INPUTS (THREE-STAGE)

READ-OUT	INPUT ENER-GIZED	THERMO-STAT INPUT SIMULATION	FUNCTION
c01	c01.	Y1 & G	1ST STAGE COOLING
c10	c1.0	Y2 & G	1ST & 2ND STAGE COOLING
c11	c1.1.	Y1, Y2, & G	3RD STAGE COOLING
h01	h01.	W1	1ST STAGE HEATING
h10	h1.0	W2	LGA/LCA - 1ST & 2ND STAGE HEATING
			LHA - EMERGENCY HEAT
h11	h1.1.	W1 & W2	1ST & 2ND STAGE HEATING
S01	S01.	SMOKE	UNIT OFF (DEFAULT)

An input may be turned "ON" by pressing down on the pushbutton until a decimal appears. The output may be turned "OFF" by pressing down on the pushbutton until the decimal disappears. See figure 28.

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

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

Example:

To check compressor operation:

- 1-Set UNIT DIP switch #3 to "SHIFT". Set MODE DIP switch #1 to "UNIT TEST".
- 2-With a short push, toggle pushbutton until "c11" is indicated.

TEST

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 CO₂ levels are high. The IAQ input is compatible with IAQ sensors which have a 0-10VDC output and a CO₂ 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 CO₂ ppm.

Example:

1-Set MODE DIP "TEMP" switch #4 to "ON".

2-Toggle pushbutton until .4 reading is alternately flashing with an output reading. Figure 31 shows an output reading of 100.

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

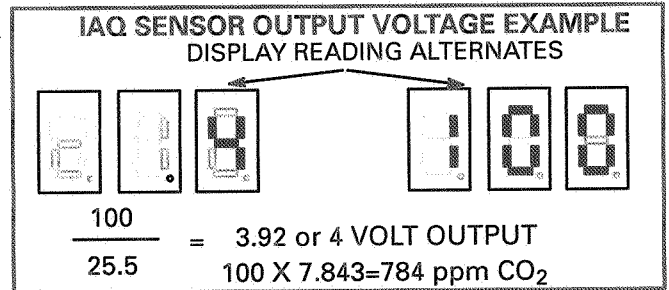


FIGURE 31

ECONOMIZER DAMPER POSITION

Readout .6 displays the damper motor feedback in percent open. The feedback range for the economizer motor is 2-10vdc. Units with EM1 (A56) economizer software versions 1.02 and later board will display a range of 20-100% (20% is damper closed). Units with the EM1 (A56) economizer software versions 1.00 and 1.01 will display a range of 0-100% (0% is damper closed). See table 14.

TABLE 14
DAMPER POSITION

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

TEST

shown in Control Parameter Table (Table 15) for number of counts to adjust control value to.

7-Short push the pushbutton until readout displays "172".

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

RESET TO FACTORY ECTO PARAMETERS

To replace the factory ECTO parameters:

1-Turn on the SHIFT switch.

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

3-The display will read "---" and then "0".

4-Turn off ECTO and DIP switches.

**TABLE 15
IMC ECTO CONTROL PARAMETERS**

BLOCK 1 LHA HEATING PARAMETERS						
Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
1.01	Warm-Up Delay	28 15	56 30	255 136	Code D Minutes	Warm-up time delay. The time that the supplemental heat is held off during the first demand of warm-up. This parameter is only used if the parameter 1.17 is set to option 1.
1.02	Blower On Delay	0 0	0 0	15 60	Code B Seconds	Blower on delay. The time before the blower turns on after a heating demand.
1.03	Blower Off Delay	0 0	5 20	75 300	Code B Seconds	Blower off delay. The time the blower stays on after the heating demand is lost
1.04	Max. Heating Limit Occurrences	1	5	15	Code B Counts	Service relay activation. Maximum Primary and Secondary Limit occurrences stored before service relay is energized. If max value is set, service output is disabled. Note: Heating stage is not locked out.
1.05	Supplemental Heat Stage Delay	3 12	3 12	15 60	Code B Seconds	Time delay between 1 & 2 stage of supplemental heat.
1.06	Supplemental Heat 2 Lockout Temperature	113 60	160 30	175 20	Code Y Deg. F	Temperature setpoint for lockout for the second bank of supplemental heat. Note: This parameter must be less than or equal to ECTO1.07.
1.07	Supplemental Heat 1 Lockout Temperature	113 60	144 40	175 20	Code Y Deg. F	Temperature setpoint for lockout of first bank of supplemental heat. Note: This parameter must be equal to or greater than ECTO1.06.
1.08	Compressor 1 Low Temperature Lockout	81 80	255 Dis-abled	254 -30	Code Y Deg. F	Low ambient lockout for compressor 1. 254 value equals -30 °F (-34°C). A value of 255 (-31°F) will disable low ambient lockout function. Note: This lockout is for heating only.
1.09	Compressor 2 Low Temperature Lockout	81 80	255 Dis-abled	254 -30	Code Y Deg. F	Low ambient lockout for compressor 2. 254 value equals -30 °F (-34°C). A value of 255 (-31°F) will disable low ambient lockout function. Note: This lockout is for heating only.
1.10	Compressor Minimum Off Delay	30 60	150 300	255 510	Code A Seconds	Compressor minimum off delay. Used on 1 PH units. Also used on all units after an error occurs.
1.11	Compressor Minimum Run Time	30 60	120 240	255 510	Code A Seconds	Compressor minimum run time. Used on 3 PH units.
1.12	Max. High Pressure Occurrences	1	3	8	Counts	Maximum High Pressure occurrences that are stored before control locks off compressor stage and energizes the service relay. If max value is set, service output is disabled.
1.13	Max. Low Pressure Occurrences	1	3	8	Counts	Maximum Low Pressure occurrences that are stored before control locks off compressor stage and energizes the service relay. If max value is set, service output is disabled.
1.14	Defrost Supplemental Heat Option	0	1	1	Option	Defrost options: 0: No supplemental heating during defrost. 1: Supplemental heating on during defrost.
1.15	Minimum Time Between Defrost	1 32	2 64	3 96	Option Minutes	Minimum time allowed between defrost cycles.
1.16	Maximum Defrost Time	2 10	3 15	5 25	Code Minutes	Maximum defrost time allowed. Minutes = Value x 5.

BLOCK 3 LCA HEATING PARAMETERS

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

BLOCK 4 LGA HEATING 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 Set-point Temp. 1	113 60	144 40	191 10	Code Y Deg. F	Low ambient outdoor air limit temp. 1. Parameters 4.06 and 4.07 are used to shed fans. See Operation section.
4.07	Low Ambient Set-point Temp. 2	113 60	120 55	191 10	Code Y Deg. F	Low ambient outdoor air limit temp. 2. Parameters 4.06 and 4.07 are used to shed fans. See Operation section.
4.08	Compressor 1 Low Temperature Lock-out	81 80	207 0	254 -30	Code Y Deg. F	Low ambient lockout for compressor 1. 254 value equals -30 °F (-34°C). A value of 255 (-31°F) will disable low ambient lockout function. Parameter value must be less than or equal to 4.09.
4.09	Compressor 2 Low Temperature Lock-out	81 80	207 0	254 -30	Code Y Deg. F	Low ambient lockout for compressor 2. 254 value equals -30 °F (-34°C). A value of 255 (-31°F) will disable low ambient lockout function. Parameter value must be equal to or greater than 4.08 .
4.10	Compressor 3 Low Temperature Lock-out	81 80	207 0	254 -30	Code Y Deg. F	Low ambient lockout for compressor 3. 254 value equals -30 °F (-34°C). A value of 255(-31°F) will disable low ambient lockout function. Parameter value must be equal to or greater than 4.08 and 4.09.

BLOCK 5 MISCELLANEOUS PARAMETERS

Control Parameter		Control Value			Units	Description
No.	Name	Min	Default	Max.		
5.04	Thermostat Staging Options	1	2	3	Option	Staging option for thermostat input. 1: Two cooling stages. Units with Economizers Y1=Free Cooling, Y2=adds all mechanical stages. 2: Two cooling stages. Units with Economizers Y1=Free Cooling, Y2= adds first stage of mechanical. 3: Three cooling stages. Y1 only = first stage, Y2 only = second stage, Y1+Y2 = third stage. Units with Economizers Y2 only adds first stage of mechanical, Y1+Y2 adds first and second stage of mechanical. See operation section for more information.
5.05	Return Air Temp. Limit Option	0	0	1	Option	Return air temperature limit option enable. Set to 1 to use 5.06 or 5.07. Return air limits may be used for limiting zone temperatures.
5.06	Return Air Temp. Heating Limit	95 100	95 100	124 80	Code X Deg. F	Return air limit for heating. 5.05 MUST BE SET TO 1 TO ENABLE. If the return air heating limit is exceeded, the heating demands are interrupted.
5.07	Return Air Temp. Cooling Limit	124 80	154 60	154 60	Code X Deg. F	Return air limit for cooling. 5.05 MUST BE SET TO 1 TO ENABLE. If the return air cooling limit is exceeded, the cooling demands are interrupted.
5.08	A42 Input Occurrences	1	3	15	Counts	A42 input occurrences before service relay is energized. (PI10-9)
5.09	Exhaust Fan On Setpoint	0	50	100	% Damper Travel	This parameter determines when the exhaust fan is energized. The default of 50 means that the exhaust fan will turn on when the economizer damper is at 50% travel.
5.10	Low Pressure Strike Three Run Time 1	0 0	60 8	255 34	Code C Minutes	Ignore LP trip when compressor run time less than this. LONG/HOT condition. See chart 1 in Operation section.
5.11	Low Pressure Strike Three Run Time 2	0 0	113 15	255 34	Code C Minutes	Ignore LP trip when compressor run time less than this. LONG/COLD condition. See chart 1 in Operation section.
5.12	Low Pressure Strike Three Run Time 3	0 0	15 2	255 34	Code C Minutes	Ignore LP trip when compressor run time less than this. SHORT/HOT condition. See chart 1 in Operation section.
5.13	Low Pressure Strike Three Run Time 4	0 0	38 5	255 34	Code C Minutes	Ignore LP trip when compressor run time less than this. SHORT/ COLD condition. See chart 1 in Operation section.
5.14	Low Pressure Strike Three Off Time	28 1	113 4	169 6	Code E Hours	Compressor off time breakpoint for LONG/SHORT evaluation.
5.15	Low Pressure Strike Three Temp. Setpoint	50 100	97 70	191 10	Code Y Deg.F	Outdoor air temperature breakpoint for HOT/COLD evaluation. See chart 1 in Operation section.
5.16	IAQO - Max. Damper Open	0	100	100	% Travel	Maximum allowed IAQ damper open. (Set to 0 to disable IAQ)
5.17	IAQ 1 - Damper Start Open Setpoint	0 0	64 500	255 1992	PPM	Damper "start open" IAQ setpoint. CO ² level (ppm) where economizer damper begins to open.
5.18	IAQ2 - Damper Full Open Setpoint	0 0	128 1000	255 1992	PPM	Damper "full open" IAQ setpoint. CO ² level (ppm) where economizer damper is opened to maximum.
5.19	IAQ 3 - Damper Full Closed Setpoint	0 132	191 10	255 -31	Code Y Deg.F	Low outdoor air temp. where IAQ damper is completely closed.
5.20	IAQ 4 - Low Temp. Start Closing	0 132	144 40	255 -31	Code Y Deg.F	Low outdoor air temp. where IAQ damper begins to close. Set IAQ 4 = 255 and IAQ 5 = 0 to disable the outdoor tempering of IAQ operation.
5.21	IAQ 5 - High Temp. Start Closing	0 132	89 75	255 -31	Code Y Deg.F	High outdoor air temp. where IAQ damper begins to close. Set IAQ 4 = 255 and IAQ 5 = 0 to disable the outdoor tempering of IAQ operation.
5.22	IAQ 6 - High Temp. Full Close	0 132	42 105	255 -31	Code Y Deg.F	High outdoor air temp. where IAQ damper is completely closed.
5.23	Free Cooling Max. Damper	0	100	100	% Travel	The maximum allowed damper opening for FREE COOLING.
5.24	Economizer Global Option	0	0	1	Option	Global control option. 0: Free Cooling when Global input is present 1: Global input absent -- Damper position = Minimum Damper Setpoint (Set on A56) Global input present -- Damper position = Maximum Damper Setpoint (ECTO 5.23) Available only on economizer (A56) board software versions 1.07+

ECTO

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

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

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

TABLE 16
 ECTO PARAMETER CODE CONVERSION TABLE

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

IMC BOARD INPUTS AND OUTPUTS

When necessary, individual inputs and outputs may be read at the IMC board connectors. IMC boards are shown on wiring diagrams as dashed boxes. See shaded areas in figure 33. Parts of the IMC boards will be located in all wiring diagram sections. See figure 34 to find the jack/plug connector on the IMC board(s). Use table 17 in this section for a description of each pin number, a description of the input or output, and the type of input or output.

Example:

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

- 1-Using the unit wiring diagram and figure 34, locate K3 and identify appropriate IMC board and jack/plug. (A55 main board and J/P113-11.)
- 2-Find the I&O table for P113. Pin 11 shows a 24 volt output to the blower.

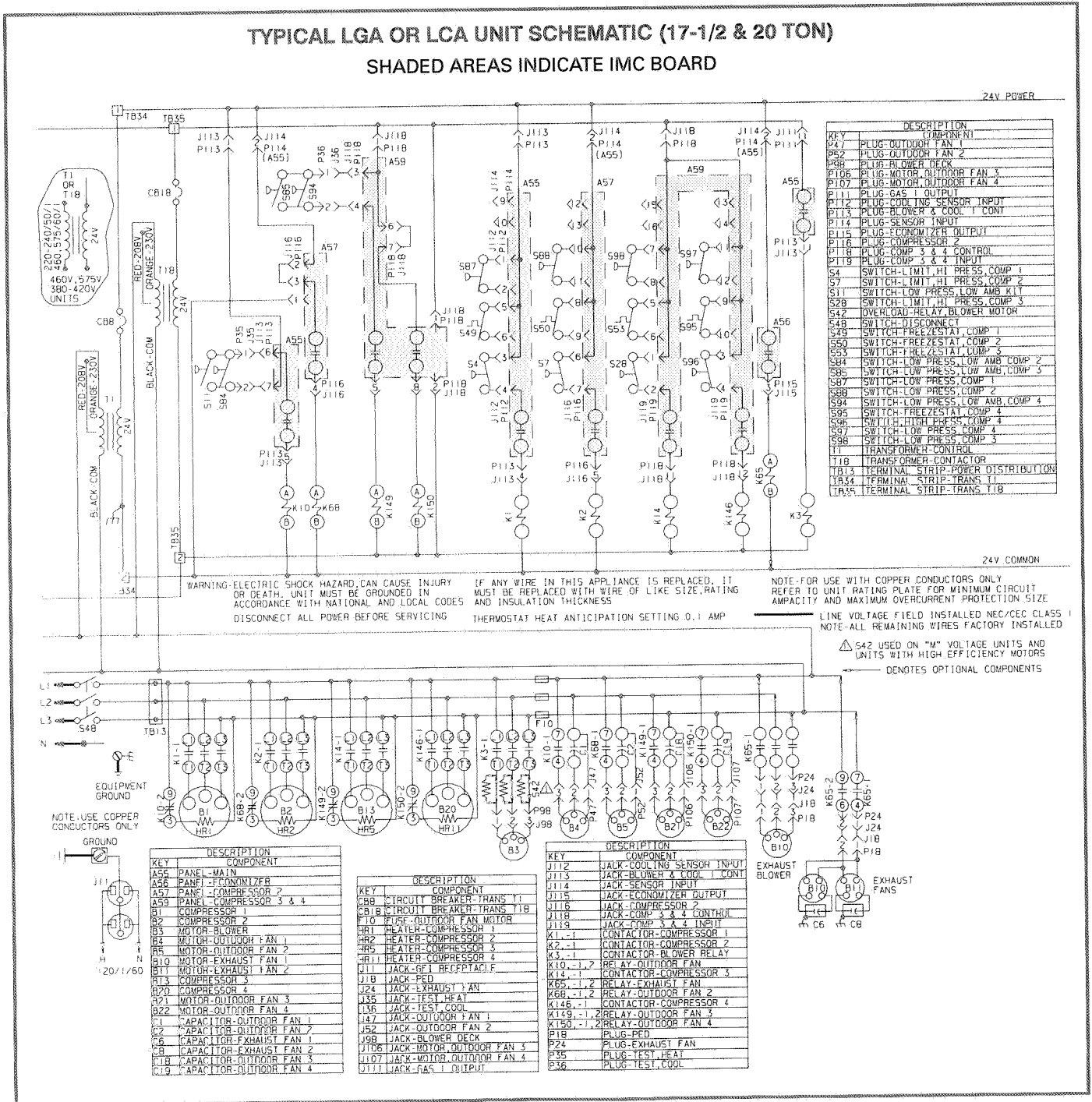


FIGURE 33

**TABLE 17
IMC BOARD INPUTS AND OUTPUTS (CONTINUED)**

PLUG #P111 HEAT SAFETY

PIN #	NAME	DESCRIPTION	TYPE
1	S10-C	PLT1-C (PRI. LIMIT 1)	SW (24VAC)
2	S10-NC	PLT1-NC (PRI. LIMIT1)	
3	S10-NO	PLT1-NO (PRI. LIMIT1)	
4	S21-C	SLT1-C (SEC. LIMIT1)	SW (24VAC)
5	S21-NC	SLT1-NC (SEC. LIMIT1)	
6	S47	ROS1 (ROLL OUT SWITCH 1)	SW (24VAC)
7			
8	S18	CAB1(COMB. AIR PROOF 1 SWITCH)	SW (24VAC)
9			
10	GV1	GV1 (GAS VALVE 1 SENSE)	24VAC BI
11	TB35-1	24 VAC (FOR HEATING OUTPUTS & BLOWER)	24VAC POWER
12	TB35-2	RETURN (FOR TRANS. PROT.)	24VAC POWER

PLUG #P112 COOLING SAFETY

1	S87	LP1 (LOW PRESS. 1)	SW (24VAC)
2			
3	S4	HP1 (HIGH PRESS. 1)	SW (24VAC)
4			
5	S49	FRZ1 (FREEZE STAT 1)	SW (24VAC)
6			
7	S6	DFT1 (DEF. TEMP. STAT 1)	SW (24VAC)
8			
9	S46	DFP1 (DEF. PRESS. 1)	SW (24VAC)
10			
11	S27	DFS (DIRTY FILTER SWITCH)	SW (24VAC)
12			
13	S52	AFS (AIR FLOW SWITCH)	SW (24VAC)
14			

PLUG #P113 OUTPUTS

1	TB34-1	24VAC (FOR RELAY OUTS)	24VAC POWER
2	TB34-2	RETURN (FOR TRANS. PROT.)	24VAC POWER
3	SR	SERVICE. RELAY (24VAC OUT)	24VAC BO
4	K1-A	COMPRESSOR 1	24VAC BO
5	K10-A	FAN 1	24VAC BO
6	S11	LOW PRESS. (LOW AMB. CONTROL FAN 1)	SW (24VAC)
7	S11		
8	L1	RV1 (REVERSING VALVE 1)	24VAC BO
9	K13-A	CAB 1 (COMBUSTION AIR BLOWER RELAY 1)	24 VAC BO
10	W2	H2/E2 (HEAT2/ELECTRIC HEAT 2)	24 VAC BO
11	K3-A	BLOWER	24 VAC BO
12	A3-1	H1/E1 (HEAT1/ ELECTRIC HEAT 1)	24 VAC BO

**TABLE 17
IMC BOARD INPUTS AND OUTPUTS (CONTINUED)**

PLUG #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		