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## CONTROLS

505.230M  
10/2006  
Supersedes 504,459M

# NETWORK THERMOSTAT CONTROLLER NTC1-1 KIT

## INSTALLATION INSTRUCTIONS FOR NETWORK THERMOSTAT CONTROLLER KIT (LB-100354; 17M10) USED WITH UNITS NOT EQUIPPED WITH AN IMC

### Shipping and Packing List

#### Package 1 of 1 contains:

- 1- NTC1-1 controller (A1) Version 1.10
- 1- Bag assembly containing:
  - 4-#6 - 32X1/2" TFS screws

*IMPORTANT - Make sure any sensors used are compatible with the L Connection® Network. Refer to L Connection engineering handbook for part numbers.*

### ⚠ WARNING

**Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a qualified installer, service agency or the gas supplier**

### ⚠ CAUTION

**Danger of sharp metallic edges. Can cause injury. Take care when servicing unit to avoid accidental contact with sharp edges.**

### ⚠ WARNING



**Electric shock hazard and danger of explosion. Can cause injury, death or product or property damage. Turn off gas and electrical power to unit before performing any maintenance or servicing operations on the unit. Follow lighting instructions attached to unit when putting unit back into operation and after service or maintenance.**

### Application

The NTC unit controller is used on units not equipped with an IMC M1 controller to allow access to the L Connection® Network. The NTC may be used to control rooftop packaged equipment or split systems and is compatible with the Network Control Panel (NCP) versions 2.00 or later and Unit Controller (UC) software versions 2.08 or later. The NTC can control up to 3 stages of cooling, 2 stages of heating, the blower, and outdoor air dampers.

10/06



### Installation

Install the NTC1-1 inside the unit if space is available. Install in a remote location no further than 100 feet from the unit. Installation site must be dry and free of harmful vapors and gases. Make sure there is space for the wiring and that controller is accessible for servicing.

If required, an optional rainproof NEMA hinged enclosure is available.

- 1- Disconnect all electrical power to unit.
- 2- Use NTC1 base as template to mark location of four mounting holes at desired installation site. See figure 1. The NTC1-1 may be installed in any direction.

*IMPORTANT - Do not remove the NTC1-1 baseplate.*

- 3- Drill holes and secure NTC1 in place with four screws provided in kit.

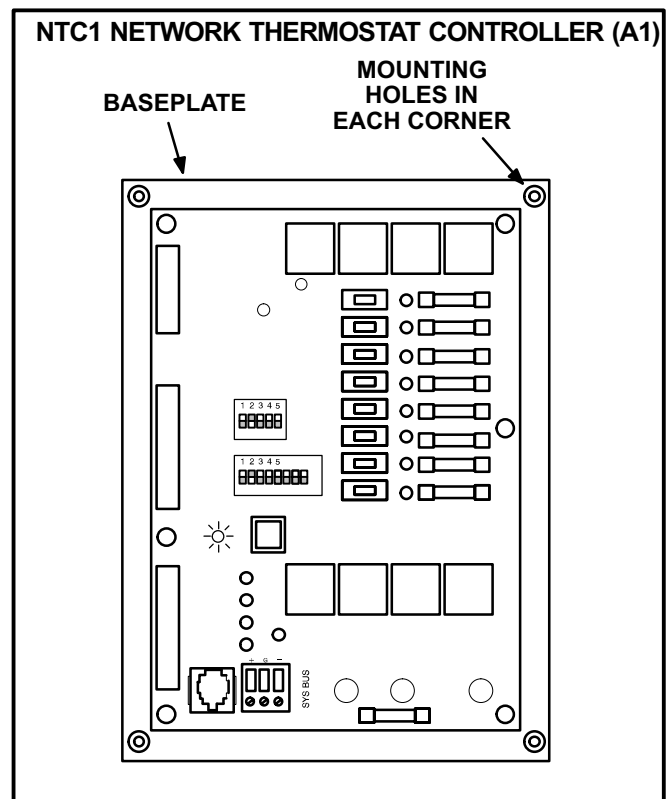


FIGURE 1

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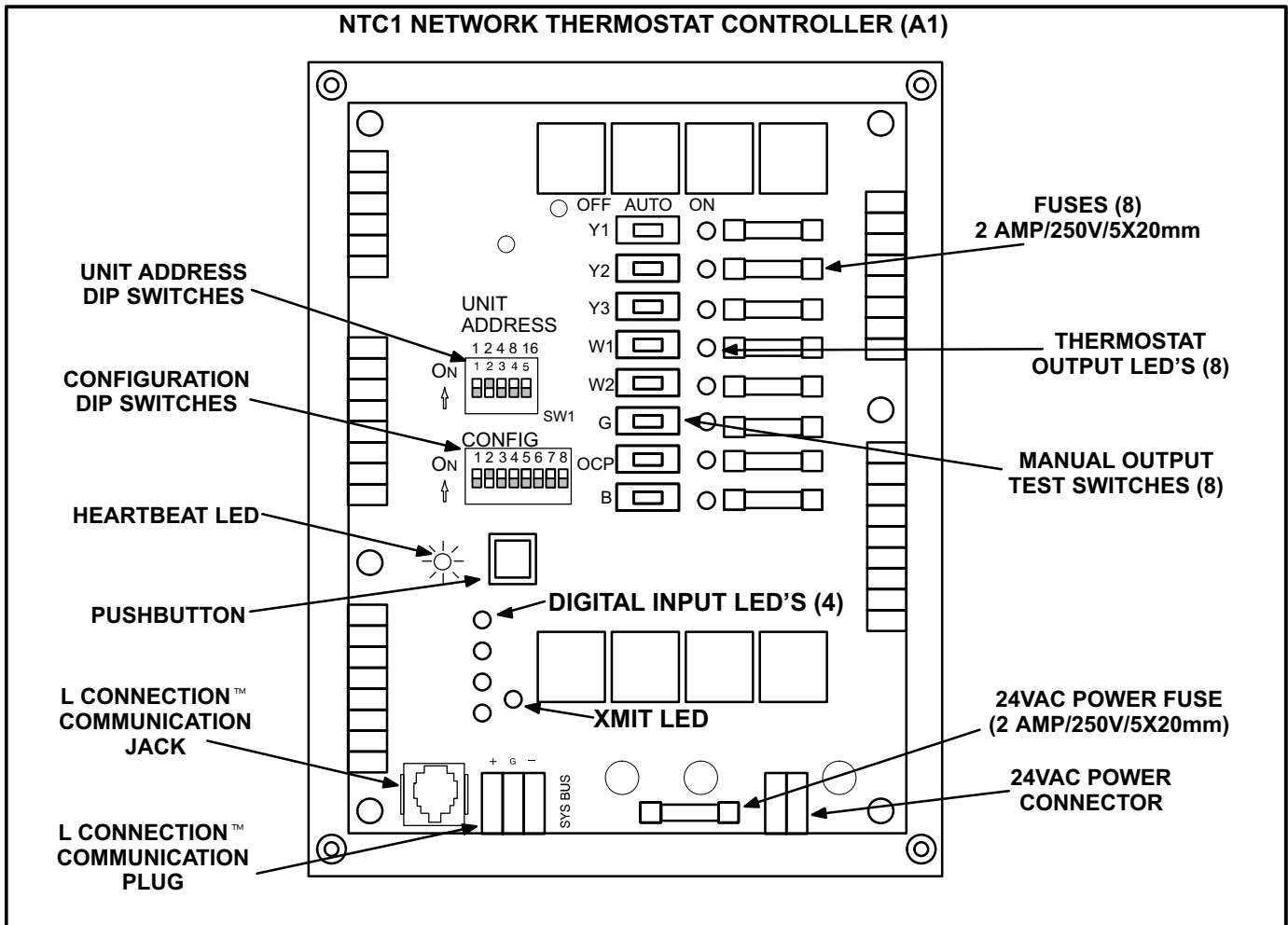


FIGURE 2

### Heartbeat LED

See table 1 for LED function and figure 2 for location.

TABLE 1

LED	Indicates
Green on for 1 second, off for 1 second	Normal operation.
Green on for 3 seconds, off for 3 seconds	Delay initiated
Red on for 1 second, off for 1 second	No run lockout

### Pushbutton

A short push of the pushbutton by-passes on/off delays. The heartbeat LED indicates when the delay is initiated. See table 1. To reset the controller, press and hold the pushbutton.

### Manual Output Test Switches

Manual switches simulate a thermostat demand to confirm proper unit operation. Switches have three positions: **on**, **off**, and **auto**. Place switches in the **auto** position for normal unit operation. Place switch in the **off** position to disable the output and in the **on** position to test unit function. See figure 3.

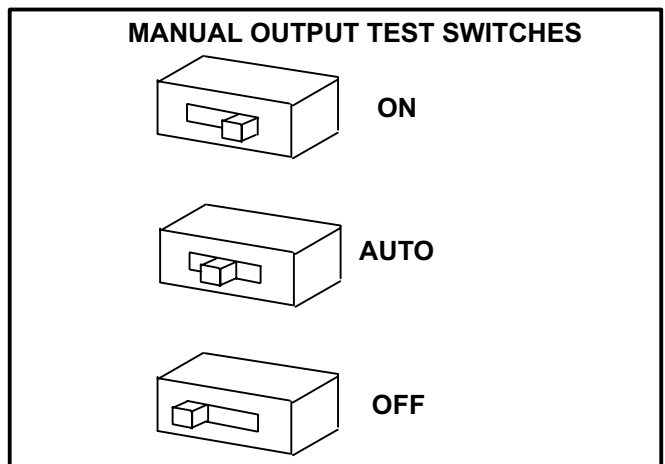


FIGURE 3

## Unit Address DIP Switches

Assign a different address to each rooftop unit. Individual switches on the DIP unit address switch are labeled 1, 2, 4, 8, or 16. See figure 2. The unit address is the sum of the switches set to the ON position. See figure 4.

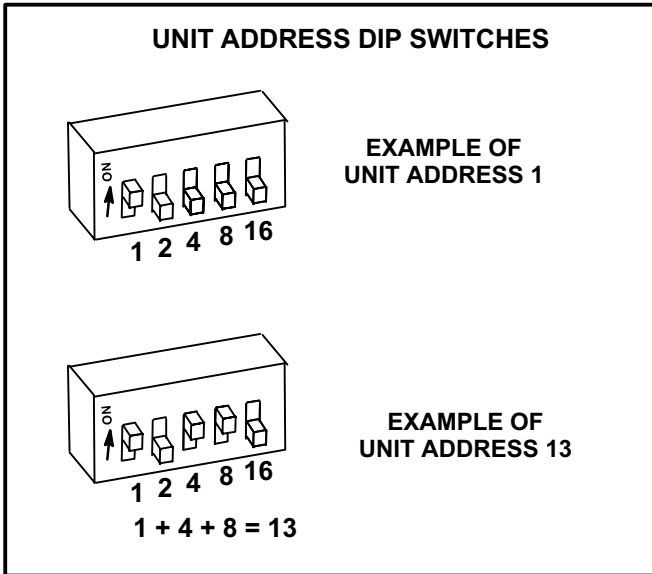


FIGURE 4

## Configuration DIP Switches

Set configuration DIP switches 1 and 2 to identify the type of unit. See table 2 and figure 5.

*Note - Switches 7 and 8 should be OFF.*

TABLE 2

Switch 1	Switch 2	Type of Unit
Off	Off	Electric Cool/Electric Heat
On	Off	Heat Pump Type 1 Unit
Off	On	Heat Pump Type 2 Unit
On	On	Electric Cool/Gas Heat

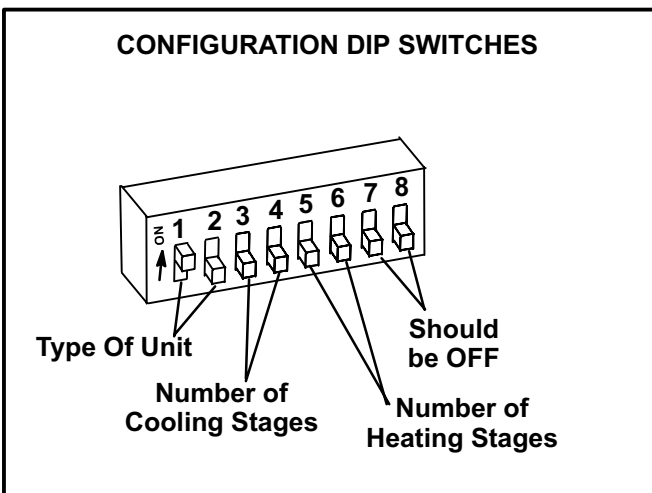


FIGURE 5

## Type Of Unit - Switches 1 and 2

Electric Heat / Electric Cool Units -  
Standard electric heat / electric cool unit.

Heat Pump Type 1 Units -  
Heat pump units which internally energize the reversing valve. Lennox commercial heat pumps operate in this manner.

Heat Pump Type 2 Units -  
Heat pumps units which require a thermostat signal to energize the reversing valve. Most residential heat pumps operate in this manner. Connect Lennox residential heat pumps to "O" output.

Electric Cool / Gas Heat Units -  
Standard electric cool / gas heat unit.

Air Handling Only Units -  
Switches 1 and 2 may be set in any position for air handling units, but switches 3 through 6 must be set to OFF.

## Number Of Cooling Stages - Switches 3 and 4

Set switches 3 and 4 to identify the number of cooling stages. See table 3 and figure 5.

TABLE 3

Switch 3	Switch 4	Number of Cooling Stages
Off	Off	None
On	Off	1 Stage
Off	On	2 Stages
On	On	3 Stages

## Number Of Heating Stages - Switches 5 and 6

Set switches 5 and 6 to identify the number of heating stages. See table 4 and figure 5.

TABLE 4

Switch 5	Switch 6	Number of Heating Stages
Off	Off	None
On	Off	1 Stage
Off	On	2 Stages

## Local or Remote System Mode

NTC ECTO A4.07 is factory-set to option 0 (local). In this system mode, the NTC will operate the unit based on input from a local sensor. See figure 6. A two-wire, thermistor-type sensor is wired to NTC P178 terminals 1 and 2.

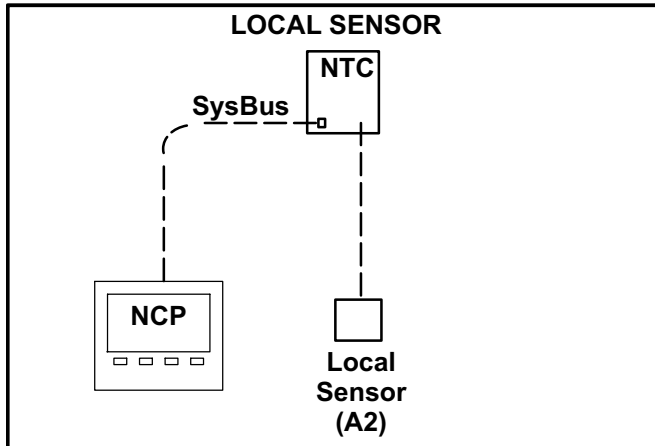


FIGURE 6

If an L Connection communication-ready sensor, such as the Comfort Sensor, is specified, ECTO A4.07 must be set to option 1 (remote). In this system mode, the NTC will operate the unit based on input from the Comfort Sensor. See figure 7. Connect the Comfort Sensor to the L Connection SysBus.

*Note - The Comfort Sensor-Zoning is also an L Connection communication-ready sensor but is designed for use in L Connection zoning applications.*

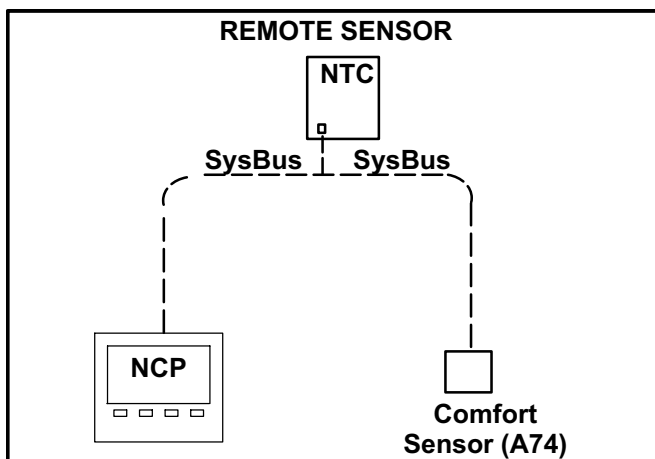


FIGURE 7

### Sensor Back-Up Operation

Optional return air sensor RT16 is used as a back-up if the A2 or A74 sensor fails or is disconnected. If RT16 fails or is not installed, unit heating and cooling operation stops.

*NOTE - The RT16 has a lower resolution than the A2 local sensor or the A74 remote sensor and should only be used as back-up.*

### Operation

In local or remote sensor mode, default operation, the NTC controls up to 2 stages of heating and 3 stages of cooling. See figure 8.

The number of stages achieved is dependent on the configuration DIP switch setting. See tables 3 and 4.

Use ECTO stage differential and deadband options to adjust desired operation.

### Blower Operation

In default operation, the NTC cycles the blower with a heat/cool demand. ECTO A4.01 can be changed to allow continuous blower operation.

### Network Control Panel (NCP) Setpoints

The setpoints can also be adjusted using the optional NCP Network Control Panel. When an NCP is installed, the setpoints are determined by the NCP schedule. The NCP communicates with the NTC via the L Connection network bus. Internal NTC setpoints are used only if network communication is interrupted.

### L Connection Network Setpoints

The default NTC internal heating and cooling setpoints are:

Cooling setpoint: 75°F (ECTO A2.01)

Heating setpoint: 70°F (ECTO A1.01)

NTC ECTO A1.01 and A2.01 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 NTC will reset and start using the back-up setpoints.

### Remote Sensor Data Interruption

The NTC will use data from the local sensor if data from the remote sensor is interrupted or if data is not updated every 5 minutes. An error code will also be recorded. If a local sensor has failed or is not installed, RT16 is used as a back-up.

If data is updated while the unit is operating on NTC internal setpoints, the NTC will immediately use remote sensor data. The remote sensor update interval should be 2 minutes to prevent back-up operation in the event of a single missed data update.

### Off Delay

In Local or Remote Sensor Mode, the NTC 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. This delay may be adjusted to stagger the start of each unit, reducing the initial power demand. (ECTO A4.06).

## ZONE SENSOR STAGES FOR GAS / ELECTRIC UNITS Default Values Shown

Units With Economizer:

C1=Free Cooling  
C2=Compressor 1  
C3=Compressor 2

C1=Cooling Stage 1  
C2=Cooling Stage 2  
C3=Cooling Stage 3

H1=Heating Stage 1  
H2=Heating Stage 2

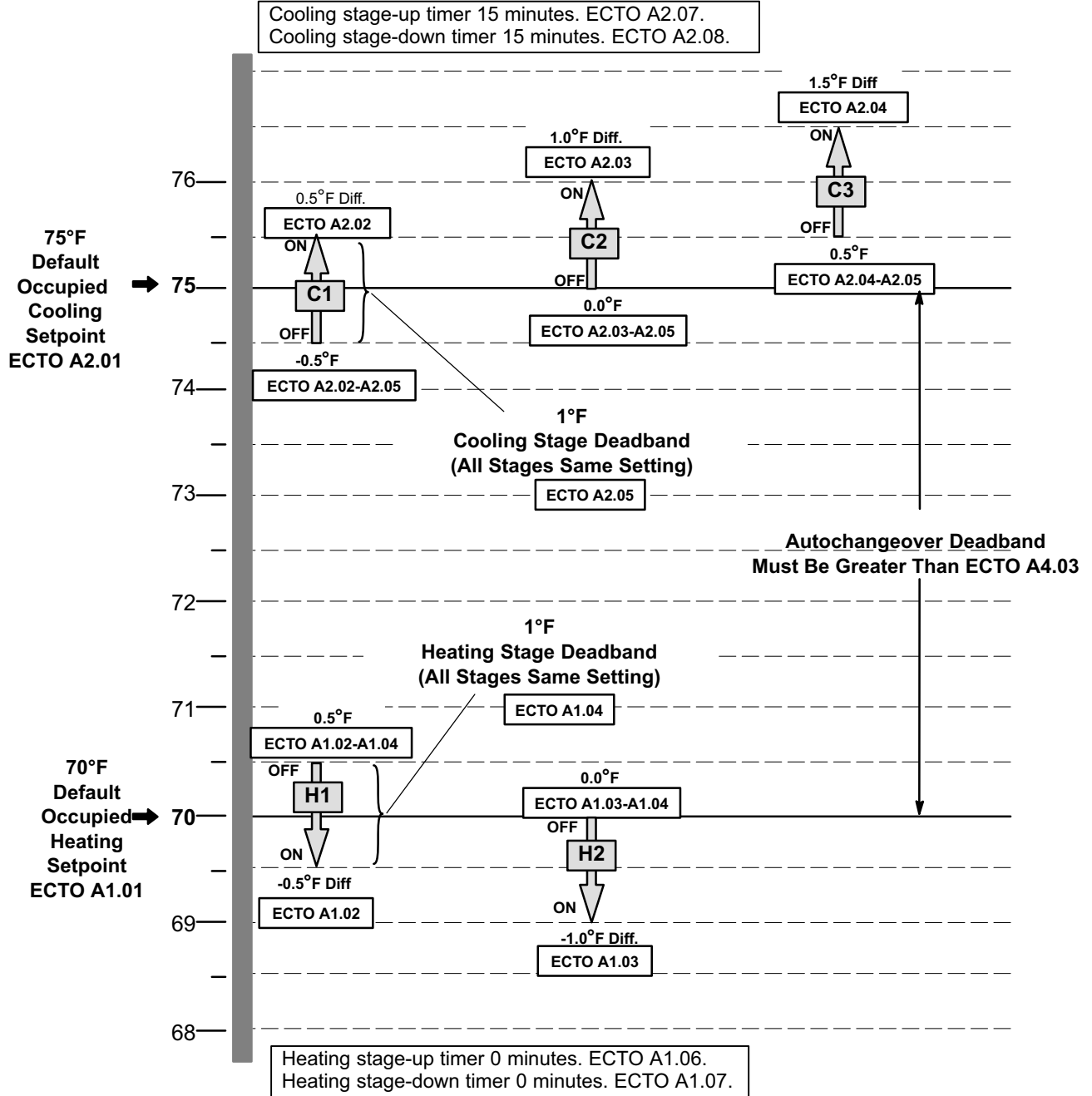


FIGURE 8

## Discharge Air Control System Mode

The NTC will operate in Discharge Air Control (DAC) system mode only when used with a Lennox Zone Link as part of a zoning system. Refer to the Zone Link installation instruction.

Set ECTO 4.07 to option 2 to initiate Discharge Air Control system mode. Discharge Air Control Cooling (DACC) allows the NTC to automatically cycle up to 3 stages of cooling. Discharge Air Control Heating (DACH) allows the NTC to automatically cycle up to 2 stages of heating. An additional thermostat or Energy Management System is not required.

When an economizer is installed, adjust free cooling setpoint approximately 2 degrees lower than DACC

setpoint. This will allow free cooling to operate before DACC energizes compressors.

Refer to figure 9 for DACC cooling stages.

Refer to figure 10 for DACH heating stages.

**IMPORTANT - Field-provided discharge air sensor RT6 must be installed in the supply air duct, preferably after a 90 degree branch of the main duct.**

DACC is initiated by an L Connection Network command.

### Back-Up Operation

Optional return air sensor RT16 is used as a back-up if the SysBus connection fails.

If RT6 discharge air sensor fails or is not connected, unit heating and cooling operation stops.

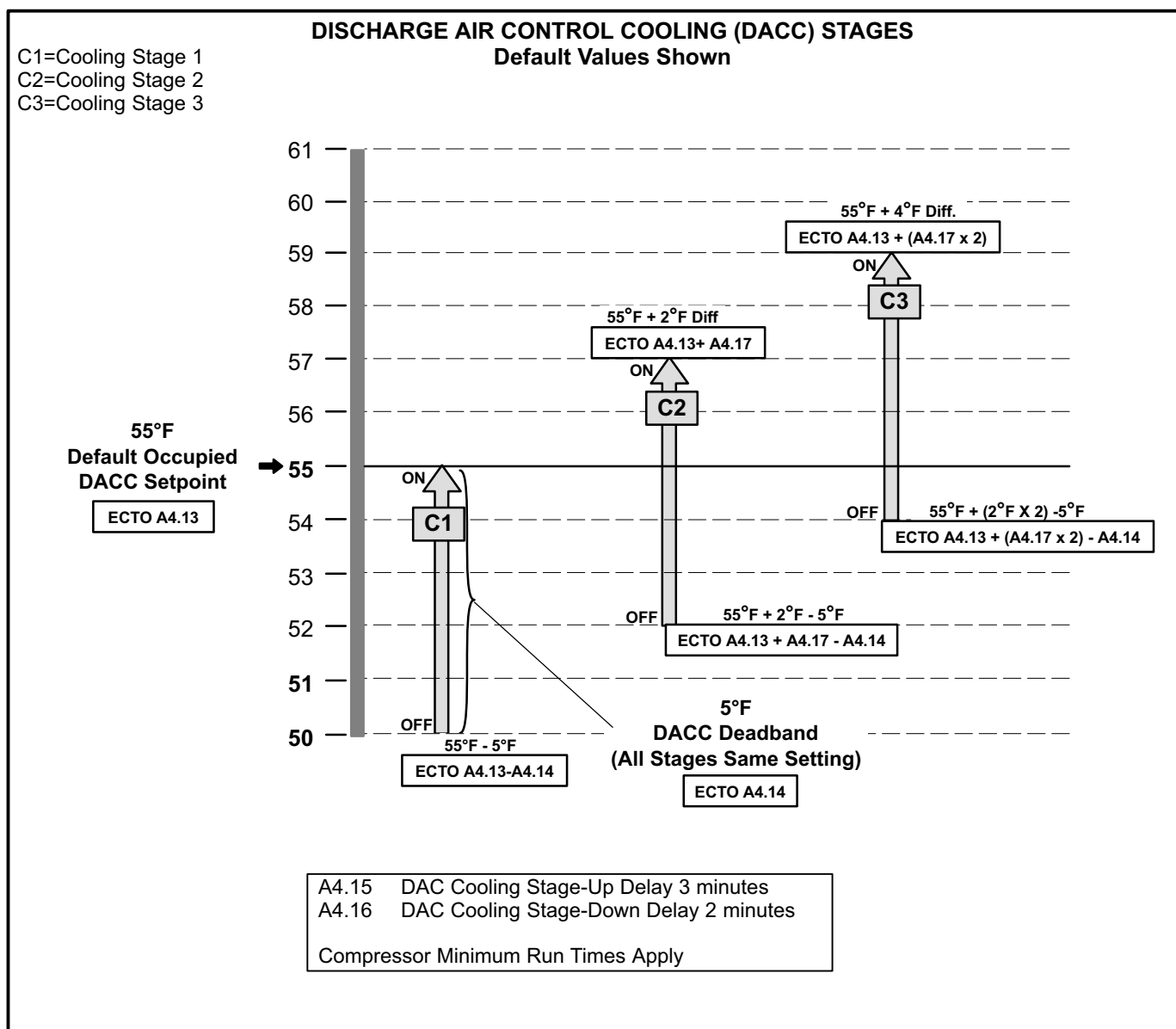
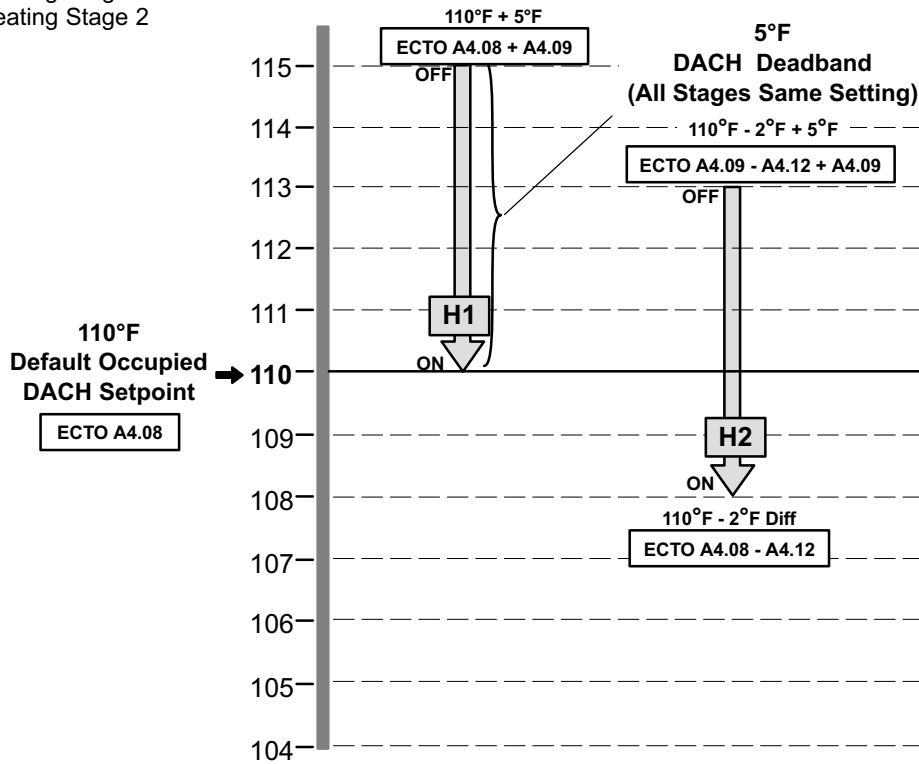


FIGURE 9

**DISCHARGE AIR CONTROL HEATING (DACH) STAGES**  
Default Values Shown

H1=Heating Stage 1  
H2=Heating Stage 2



A4.10	DACH Stage-Up Delay 3 minutes
A4.11	DACH Stage-Down Delay 2 minutes
Compressor Minimum Run Times Apply	

**FIGURE 10**

## Digital Outputs - P181 and P182

Each output is a fused, dry contact and is rated for 24VAC, 2 amp maximum.

Refer to the appropriate unit in tables 5 through 8 to determine the digital output resulting at different thermostat inputs. The appropriate digital output LED will be energized at the same time. The output can also be read with a voltmeter at P181 and P182. Configuration DIP switches should be set as shown in tables 2 through 4 for each type of unit. When an air handling unit is installed, the “G” output is energized during the occupied time period. See system parameter A4.01.

All output tables show the G blower output during the unoccupied time period. During the occupied time period blower operation will be continuous. If A4.01 system parameter is changed to option 0, the blower will operate as shown in tables regardless of time period.

Output tables do not show blower on/off delays.

**IMPORTANT** - The NTC will energize only the stages of heating or cooling specified by the configuration switches. For example, the NTC will not energize a cooling output when DIP switches 3 and 4 are set to **OFF**, regardless of the number of cooling stages available on that unit.

**TABLE 5  
ELECTRIC COOL / GAS HEAT UNITS**

T'Stat Demand	NTC Digital Output							
	P181				P182			
	Y1	Y2	Y3	W1	W2	O	B	G
1st Cool	On	Off	Off	Off	Off	NA	NA	On
2nd Cool	On	On	Off	Off	Off	NA	NA	On
3rd Cool	On	On	On	Off	Off	NA	NA	On
Low Heat	Off	Off	Off	On	Off	NA	NA	Off
High Heat	Off	Off	Off	On	On	NA	NA	Off

**TABLE 6  
ELECTRIC COOL / ELECTRIC HEAT UNITS**

T'Stat Demand	NTC Digital Output							
	P181				P182			
	Y1	Y2	Y3	W1	W2	O	B	G
1st Cool	On	Off	Off	Off	Off	NA	NA	On
2nd Cool	On	On	Off	Off	Off	NA	NA	On
3rd Cool	On	On	On	Off	Off	NA	NA	On
Low Heat	Off	Off	Off	On	Off	NA	NA	On
High Heat	Off	Off	Off	On	On	NA	NA	On

**TABLE 7  
HEAT PUMP UNITS TYPE 1**

T'Stat Demand	NTC Digital Output							
	P181				P182			
	Y1	Y2	Y3	W1	W2	O	B	G
1st Cool	On	Off	Off	Off	Off	NA	NA	On
2nd Cool	On	On	Off	Off	Off	NA	NA	On
3rd Cool	On	On	On	Off	Off	NA	NA	On
Low Heat	Off	Off	Off	On	Off	NA	NA	Off
High Heat	Off	Off	Off	On	On	NA	NA	Off

**TABLE 8  
HEAT PUMP UNITS TYPE 2**

T'Stat Demand	NTC Digital Output							
	P181				P182			
	Y1	Y2	Y3	W1	W2	O	B	G
1st Cool	On	Off	Off	Off	Off	On	Off	On
2nd Cool	On	On	Off	Off	Off	On	Off	On
3rd Cool	On	On	On	Off	Off	On	Off	On
Low Heat	On	On	On	Off	Off	Off	On	On
High Heat	On	On	On	On	Off	Off	On	On

## Temperature Sensors - P178

Sensors are wired to P178 using communication wiring. Connect the shield drain wire as shown in field wiring.

**IMPORTANT** - Make sure any sensors used are compatible with the L Connection network. Refer to L Connection engineering handbook for part numbers.

### Local Zone Sensor A2

The local zone sensor is required for system operation unless the NTC is installed:

- In an air handling unit or other appliance which has no heating or cooling functions.
- With a Zone Link as part of a zoning system.
- With a remote zone sensor.

### Return Air Sensor RT16

The return air sensor is optional and is used to monitor or to limit heating or cooling. See A1.09, A1.10, A2.10, A2.11 to set controller for return air temperature limit option.

### Discharge Air Sensor RT6

The discharge air sensor is optional and is used to monitor discharge air temperature.

### Outdoor Air Sensor RT17

The outdoor air sensor is optional and is used to monitor outdoor air temperature and to control HP supplemental heat lock-out and low ambient control. See A1.13, A1.14., A1.15.



## Analog Inputs - P179

Analog inputs are wired to P179 using communication wiring. Connect the shield drain wire as shown in field wiring.

*IMPORTANT - Make sure any sensors used are compatible with the L Connection network. Refer to the L Connection engineering handbook for part numbers.*

### CO<sub>2</sub> And Relative Humidity Sensor

The CO<sub>2</sub> and RH sensors are optional and are used for reporting and displaying to the Network Control Panel only.

### Damper Feedback

The Damper FB input is optional and used for reporting and displaying to the Network Control Panel only. The input is designed for a 2 to 10 VDC damper feedback signal; 2 volts = closed and 10 volts = 100% open.

## Digital Inputs - P177

Wire digital inputs to P177 using standard 18AWG thermostat wire. Refer to figure 13. Each input is isolated and rated for 24VAC. Digital inputs are optional, but air flow switch and n.c. inputs must be jumpered to 24VAC if not used.

### Air Flow Switch

The airflow switch is used to de-energize heating, cooling, and blower outputs if there is a loss of blower air. The input must be energized within 20 seconds (ECTO A4.05) of a blower (G) demand or the outputs will be shut off and the controller will issue an alarm code 5 (airflow switch). The NTC will retry every five minutes. After three retries with no blower air, the controller will lockout and alarm code 205 will be issued. A reset is required after lockout.

*Note - Connect 24VAC and common wiring to airflow switch terminals when switch is not installed.*

### Service Input

This input is used to indicate the unit may require service. If the input is energized for longer than 1 minute (ECTO A3.01), the controller will issue an alarm code 200 (service). This alarm is for information only and does not interrupt operation.

The input can be used to indicate a dirty filter. Set ECTO A3.01 to option 1. A dirty filter switch must be installed. If the dirty filter switch is on for 1 minute (ECTO A3.01), the controller will issue an alarm code 6 (dirty filter). This alarm is for information only and does not interrupt operation.

*Note - Leave this input open when not used.*

### N.C. Normally Closed Input

The N.C. input is used to de-energize all NTC outputs when it opens. The NTC will de-energize all outputs and issue an alarm code 202 (N.C. input is **OFF**). The NTC will retry the input every five minutes.

This input can be used to indicate a blower overload. Set ECTO A3.04 to option 1. A blower overload must be installed. If the blower overload trips, the NTC will de-energize all outputs and issue an alarm code 203 (blower overload trip). The NTC will retry the input every 5 minutes.

This input can also be used to indicate a loss of phase. Set A3.04 to option 2. A loss of phase device must be installed. If the loss of phase device trips, the NTC will de-energize all outputs and issue an alarm 204 (loss of phase). The NTC will retry every 5 minutes.

*Note - Connect 24VAC and common wiring to N.C. terminals when input is not used.*

### N.O. Normally Open Input

The N.O. input is used to de-energize all NTC outputs when it closes. The NTC will de-energize all outputs and issue an alarm code 201 (N.O. input is **ON**). The NTC will retry every 5 minutes.

This input can also be used by a smoke detector. Set A3.03 to option 1. A smoke detector must be installed. If the smoke detector trips, the NTC will de-energize all outputs and issue an alarm code 4 (smoke detector trip). The NTC will retry every 5 minutes.

*Note - Leave this input open when not used.*

## Wiring

All wiring must comply with local electrical code or as specified on the unit wiring diagrams. Refer to figure 13 for field wiring connections. Example wiring diagrams are provided in the back of this manual.

### 24VAC

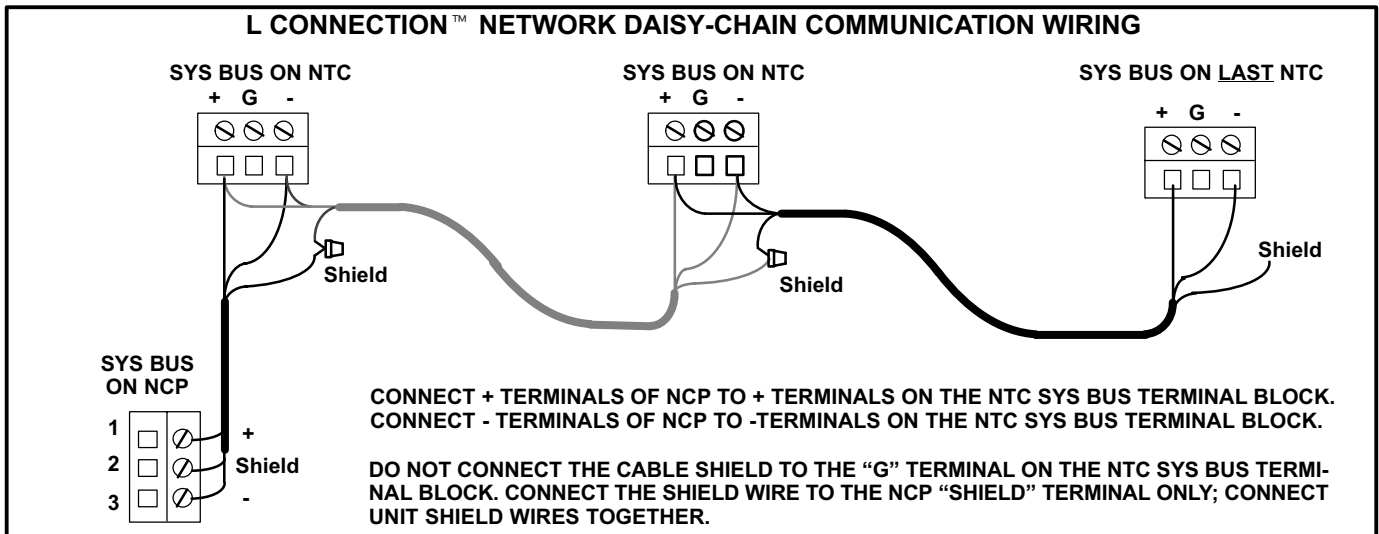
Connect 24VAC power to P176-1 and 2 from a class 2 transformer using standard 18AWG thermostat wiring. P176-2 (common) must be connected to earth ground.

### Communication Wiring

Cable type: Lennox P/N 94L63 or 27M19, Belden type 88761 or equivalent. (22AWG stranded or twisted pair, 100% aluminum shield with drain wire, Teflon jacket).

Daisy chain the communications cable between each NTC and NCP as shown in figure 11. Do not connect the shield drain wire to the NTC "G".

*Note - Make sure the total run of communications wiring does not exceed 4000 feet (1219 m).*



**FIGURE 11**

**Check-Out Procedure**

**Unit Operation**

Use the manual switches to simulate a thermostat demand and confirm proper unit operation.

**Wiring Between NTC And Unit**

- 1- Move all manual switches to the **OFF** position.
- 2- Apply power to unit.
- 3- Move the “G” switch to the **ON** position to energize the unit blower.
- 4- Move the “Y1” switch to the **ON** position and confirm the appropriate operation. Move the “Y1” switch to the **OFF** position and repeat for each heating and cooling stage. Proper operation of each function confirms that the wiring between the NTC and the unit is correct.

**IMPORTANT - Do not energize cooling and heating output switches at the same time.**

- 5- Move all switches back to the **AUTO** position. **All switches must be in the AUTO position to allow the NTC to control the unit.**

**NTC Operation**

- 1- Make sure the heartbeat LED is green, energized for one second and off for one second. This indicates normal NTC operation. If the LED is green, energized on for 3 seconds and off for 3 seconds, the NTC is in an off delay. Press the pushbutton to by-pass the delay.
- 2- Make sure the yellow “XMT” transmit light is blinking. This indicates that the NTC is transmitting to the NCP. If the transmit LED is not blinking, make sure communication wiring connections are correct and secure and that power is being supplied to the NCP.

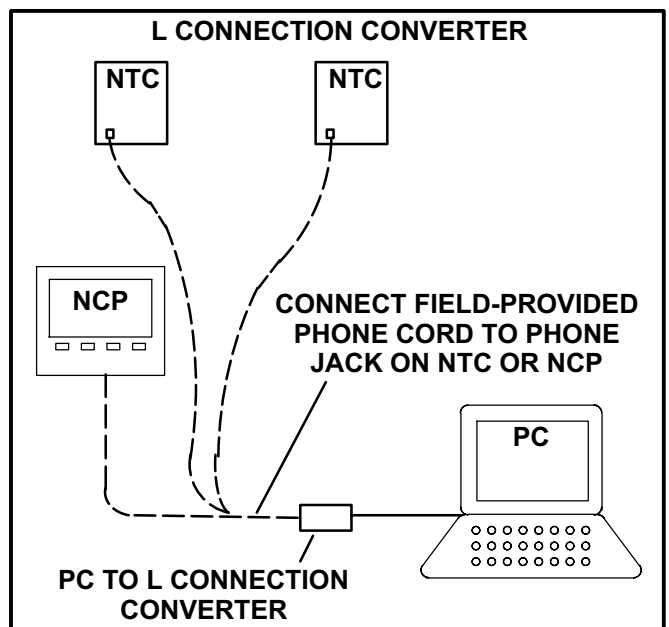
**NOTE - The transmit LED blinking rate depends on the number of units connected to the L Connection bus. The blink rate can be as slow as once every 30 seconds.**

- 3- If an NCP is not connected, the NTC will control the unit to default settings: 70°F (21°C) heating setpoint, 75°F (24°C) cooling setpoint, and occupied time period (continuous blower).
- 4- If the heartbeat is flashing red, the controller is locked out because of an alarm. Make sure all digital inputs (P177) are properly connected. The N.C. LED should be **ON**. If air flow switch is not used the input must be jumpered. The service input should normally be **OFF**.

**Adjustable Parameters**

The NTC default control parameters can be adjusted using a PC, Unit Controller PC software (version 2.02), and a PC to L Connection converter.

Connect the converter to either the NTC or the Network Control Panel (NCP). See figure 12. Refer to table 9 to adjust parameters.



**FIGURE 12**

## Reset NTC Parameters To Default

Restore the NTC controller parameters to default settings as follows:

- 1- Disconnect power to NTC (P176).
- 2- Move all DIP switches on the Unit Address DIP switch to **OFF**.
- 3- Move all switches on the Configuration DIP switch, except for switch 7, to **OFF**.
- 4 Connect controller power (P176). The heartbeat LED will cycle red, green, and off.
- 5- Press the pushbutton; the heartbeat LED will **display** red.
- 6- Wait until the LED cycles red, green, and off. Return Unit Address and Configuration DIP switches to the previous position.
- 7- Hold the pushbutton to reset controller to normal operation.

**TABLE 9  
NTC CONTROLLER PARAMETERS**

BLOCK 1 HEATING PARAMETERS						
Control Parameter		Control Value			Units	Description
No.	Name	Min	De- fault	Max		
A1.01	Heating Backup Setpoint	40	70	95	Deg.F	Backup heating setpoint. Used if the communications link is lost (after 5 mins.) <b>A1.10 &lt;=A2.01-A4.03</b>
A1.02	Stage 1 Heating Differential	0	0.5	3	Deg. F	Stage 1 heating differential. <b>A1.02&lt;=A1.03</b>
A1.03	Stage 2 Heating Differential	0	1	3	Deg. F	Stage 2 heating differential. <b>A1.03&gt;=A1.02</b>
A1.04	Heating Deadband	1	1	3.75	Deg. F	Heating stage deadband. <b>A1.04 &lt;=A4.03-A2.05</b>
A1.05	Upper Stage Heating Latch Option	0	0	1	Option	Option used to hold upper stage on until temperature reaches setpoint.
A1.06	Heating Stage-Up Timer	0	0	60	Min.	Optional timer used to call the upper demand if the lower stage runs for this time. Disabled if set to "0".
A1.07	Heating Stage Down Timer	0	0	30	Min.	Optional time delay that occurs before a lower stage turns off following a higher stage termination.
A1.08	Occupied Warm-Up Delay	0	30	120	Min.	The delay on OCP output for first heating demand in occupied period.
A1.09	Heating Return Air Limit Option	0	0	1	Option	Heating return air limit option enable.
A1.10	Heating Return Air Limit	60	85	100	Deg. F	Return air temp. limit. Heating outputs off if return air temp. exceeds limit. ECTO A1.09 must be set to 1 to enable this limit.
A1.11	Heating Blower On Delay	0	0	60	Sec.	Length of time before the blower turns on after a heating demand.
A1.12	Heating Blower Off Delay	0	0	300	Sec.	The time the blower stays on after the heating demand is lost.
A1.13	HP Supp. Heat Lockout Temp.	20	40	60	Deg.F	Outdoor temperature setpoint for lockout of supplemental heat on heat pump units. Outdoor sensor required (RT17).
A1.14	Heat Pump Compr. Low Temp. Lockout	-30	-30	50	Deg. F	Heat pump low ambient compressor lockout temperature. A value of - 31°F will disable the low ambient lockout function. Outdoor sensor required (RT17).

BLOCK 2 COOLING PARAMETERS						
Control Parameter		Control Value			Units	Description
No.	Name	Min	De- fault	Max		
A2.01	Cooling Backup Setpoint	40	75	95	Deg.F	Backup cooling setpoint. Used if the communications link is lost (after 5mins.) <b>A2.01&gt;= A1.01+A4.03</b>
A2.02	Y1 Cooling Differential	0	0.5	4	Deg. F	Y1 cooling differential. <b>A2.02&lt;= A2.03</b>
A2.03	Y2 Cooling Differential	0	1	4	Deg. F	Y2 cooling differential. <b>A2.03&gt;= A2.02 and &lt;=A2.04</b>
A2.04	Y3 Cooling Differential	0	1.5	4	Deg.F	Y3 cooling differential. <b>A2.04&gt;= A2.04</b>
A2.05	Cooling Deadband	1	1	3.75	Deg. F	Cooling stage deadband. <b>A2.05 &lt;=A4.03-A1.04</b>
A2.06	Upper Stage Cooling Latch Option	0	0	1	Option	Option used to hold upper stage on until lower stage demand is satisfied.
A2.07	Cooling Stage-Up Timer	0	15	60	Min.	Optional timer used to call the upper demand if the lower stage runs for this time. Disabled if set to "0".
A2.08	Cooling Stage Down Timer	0	15	30	Min.	Optional time delay that occurs before a lower stage turns off following a higher stage termination.
A2.09	Occupied Cool-Down Delay	0	30	120	Min.	The off delay on OCP output for first cooling demand in occupied period.
A2.10	Cooling Return Air Limit Option	0	0	1	Option	Cooling return air limit option enable.
A2.11	Cooling Return Air Limit	60	65	90	Deg. F	Return air temp. limit. Cooling outputs off if return air temp. exceeds limit. ECTO A2.10 must be set to 1 to enable this limit.
A2.12	Cooling Blower On Delay	0	0	60	Sec.	The time before the blower turns on after a cooling demand.
A2.13	Cooling Blower Off Delay	0	0	300	Sec.	The time the blower stays on after the cooling demand is terminated.
A2.14	Compr. Off Delay	60	300	510	Sec.	Compressor minimum off delay.
A2.15	Cooling Compr. Low Temp. Lockout	-30	0	80	Deg.F	Cooling low ambient compressor lockout temperature. A value of -31°F will disable the low ambient lockout function. Outdoor air sensor required (RT17).
BLOCK 3 MISCELLANEOUS PARAMETERS						
A3.01	Service Input Alarm Delay	0	1	10	Min.	The time delay used before alarm is generated.
A3.02	Service Input Alarm Description.	0	0	1	Option	The description option for the alarm associated with the Service Input. 0-Service Input energized 1-Dirty Filter
A3.03	Normally Open Input Alarm Description	0	0	1	Option	The description option for the alarm associated with the N.O. Input. 0-Normally Open Input energized 1-Smoke alarm
A3.04	Normally Closed Input Alarm Description	0	0	2	Option	The description option for the alarm associated with the N.C. Input. 0-Normally Closed Input energized 1-Blower overload trip 2-Loss of phase protector trip

BLOCK 4 SYSTEM PARAMETERS						
Control Parameter		Control Value			Units	Description
No.	Name	Min	De- fault	Max .		
A4.01	Continuous Blower Control	0	1	0	Option	Option for setting the blower to continuous during occupied period. 0=Blower cycles with demands 1=Continuous blower
A4.02	Zone Sensor Calibration	5	0	-5	Deg. F	Used for calibrating the zone sensor.
A4.03	Autochangeover Deadband	2	3	10	Deg. F	The temperature deadband between heating and cooling demands. Do not change this parameter when an NCP is used.
A4.04	Autochangeover Delay	1	5	15	Min.	The off delay used when moving from heating to cooling or cooling to heating demand.
A4.05	Air Proof Switch Delay	10	20	120	Sec	After G is energized, if the Air Proof Switch is not on after this delay, the controller will issue an alarm.
A4.06	Start-Up Demand Delay	2	2	30	Mins	The demand delay after power is applied to the NTC or after a controller reset. This delay may be adjusted to stagger unit demands when units are powered on.
A4.07	System_Mode	0	0	2	Option	0 – Local sensor (A2 wired to NTC P-178). 1 – Remote sensor (A74 Comfort Sensor connected to SysBus). 2 – Discharge air control remote demand (used only with L Connection zoning applications).
A4.08	DACH_SP	80	110	140	Deg. F	Discharge air control heating setpoint.
A4.09	DACH_Stg_DB	5	5	20	Deg. F	Discharge air control heating stage deadband.
A4.10	DACH_StgUp_Dly	0	180	900	Sec	Discharge air control heating stage-up time delay.
A4.11	DACH_StgDn_Dly	0	120	600	Sec	Discharge air control heating stage-down time delay.
A4.12	DACH_Stg_diff	2	2	20	Deg. F	Discharge air control heating stage differential.
A4.13	DACC_SP	40	55	80	Deg. F	Discharge air control cooling setpoint.
A4.14	DACC_Stg_DB	5	5	20	Deg. F	Discharge air control cooling stage deadband.
A4.15	DACC_StgUp_Dly	0	180	900	Sec	Discharge air control cooling stage-up time delay.
A4.16	DACC_StgDn_Dly	0	120	600	Sec	Discharge air control cooling stage-down time delay.
A4.17	DACC_Stg_diff	2	2	20	Deg. F	Discharge air control cooling stage differential.

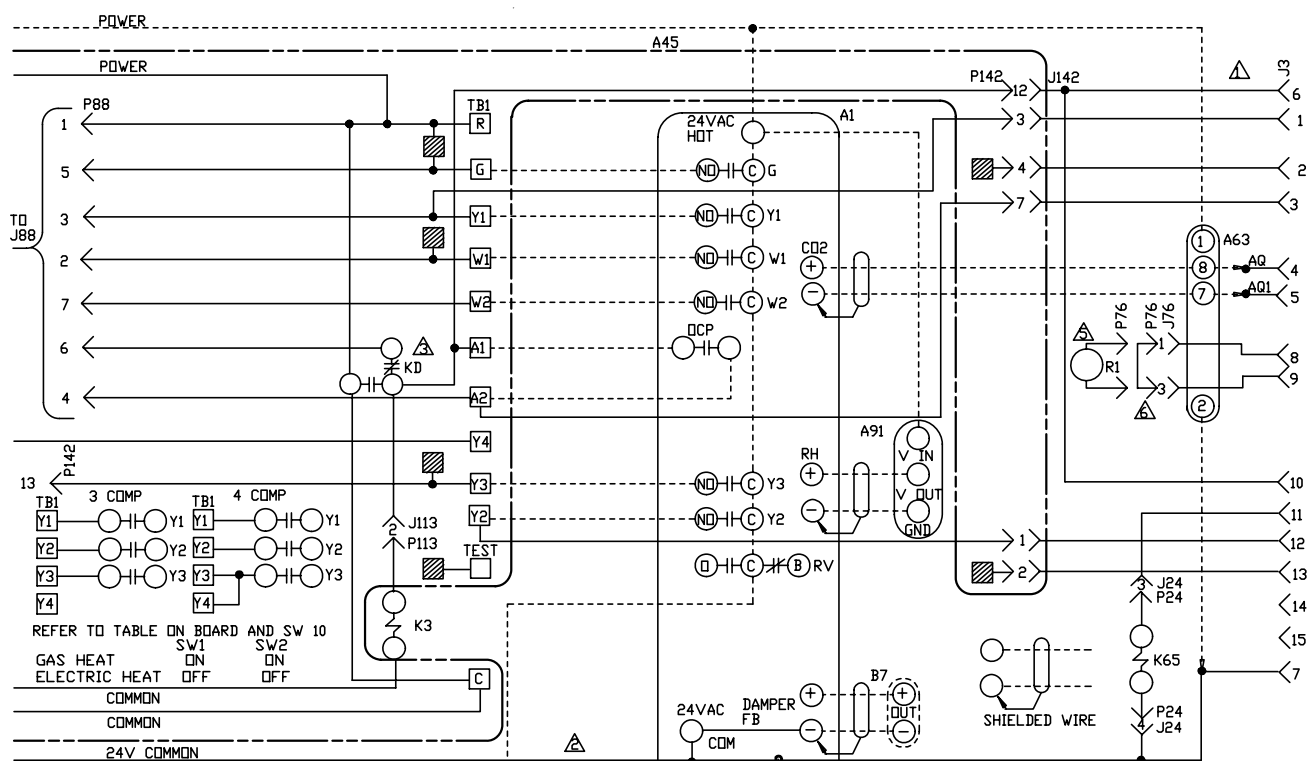
## Error Codes

The NTC error codes can be viewed using a PC, Unit Controller PC software (version 2.02), and a PC to L

Connection converter. Refer to “Adjust Parameters” section and table 10.

**TABLE 10  
NTC ERROR CODES**

Error #	PROBLEM	ACTION
2	ECTO access error. This may indicate a problem with the ECTO memory chip and parameters may not be changeable.	Controller will operate with factory ECTO defaults.
4	N.O. input indicates smoke alarm.	Unit is off for five minutes or until smoke alarm reset (N.O. input turns off)
5	Airflow switch. This indicates no blower air after 20 seconds (ECTO A4.05) after G output is energized.	Unit off. Will retry in 5 minutes.
6	Dirty filter. Service input indicates a dirty filter.	Alarm only. No other action taken.
40	Return air temperature exceeded heating limit set in ECTO A1.10.	Heating outputs off until RAT is back within limits.
41	Return air temperature cooling exceeded cooling limit set in ECTO A2.11.	Cooling outputs off until RAT is back within limits.
73	Network fails to send remote zone sensor data within 5 minute window. Cleared by reset or when missing network data is received.	Local zone sensor data is used if it is available. If a local sensor is not installed, the RAT sensor is used (if installed). If the local and RAT sensor data is not available the unit is off.
74	Zone sensor problem. Check wiring and sensor.	Controller will switch over to the return air sensor, if present. Otherwise unit off until sensor is back in range.
75	Outdoor air temperature sensor problem. Check wiring and sensor.	Compressor low ambient and HP supplemental heat lock-out functions are disabled until sensor is back in range.
77	Discharge (supply) air temperature sensor (RT6) problem. Check wiring and sensor. Can only occur when ECTO A4.07 is 2.	Unit off.
78	Return air temperature sensor problem. Check wiring and sensor.	Return air limit functions disabled until sensor is back in range.
82	Controller reset or power outage.	Indication only. No action taken.
87	Equipment configuration DIP switch has changed while unit is energized. Check DIP switch settings and reset controller. Make sure the DIP switch settings agree with the unit type.	Unit off until reset or DIP is changed back to original setting.
88	May indicate a problem with the ECTO chip.	Controller will operate with factory ECTO defaults.
90	RAM memory error.	Controller will reset.
94	Setpoint temperature is out of range.	Reverts to 65°F (18°C) heating and 80°F (27°C) cooling until setpoint is back in range.
110	Waiting for network zone sensor data for up to 5 minutes following reset. Clears when network data is received.	Unit off.
127	Alarms buffer overflow.	Not all alarms stored.
200	Service input is on.	Alarm only.
201	Normally open (N.O.) input is on.	Unit off. Will retry every 5 minutes.
202	Normally closed (N.C.) input is off.	Unit off. Will retry every 5 minutes.
203	Blower overload (N.C. input) tripped.	Unit off. Will retry every 5 minutes.
204	Loss of phase. (N.C. input) tripped.	Unit off for 5 minutes or until loss of phase device is reset (N.C. input is on.)
205	Airflow switch tripped three times.	Unit is locked off until controller is reset.
206	Controller has lost communication from the master controller.	Controller switches to the backup setpoints and occupied mode until communication link is re-established.



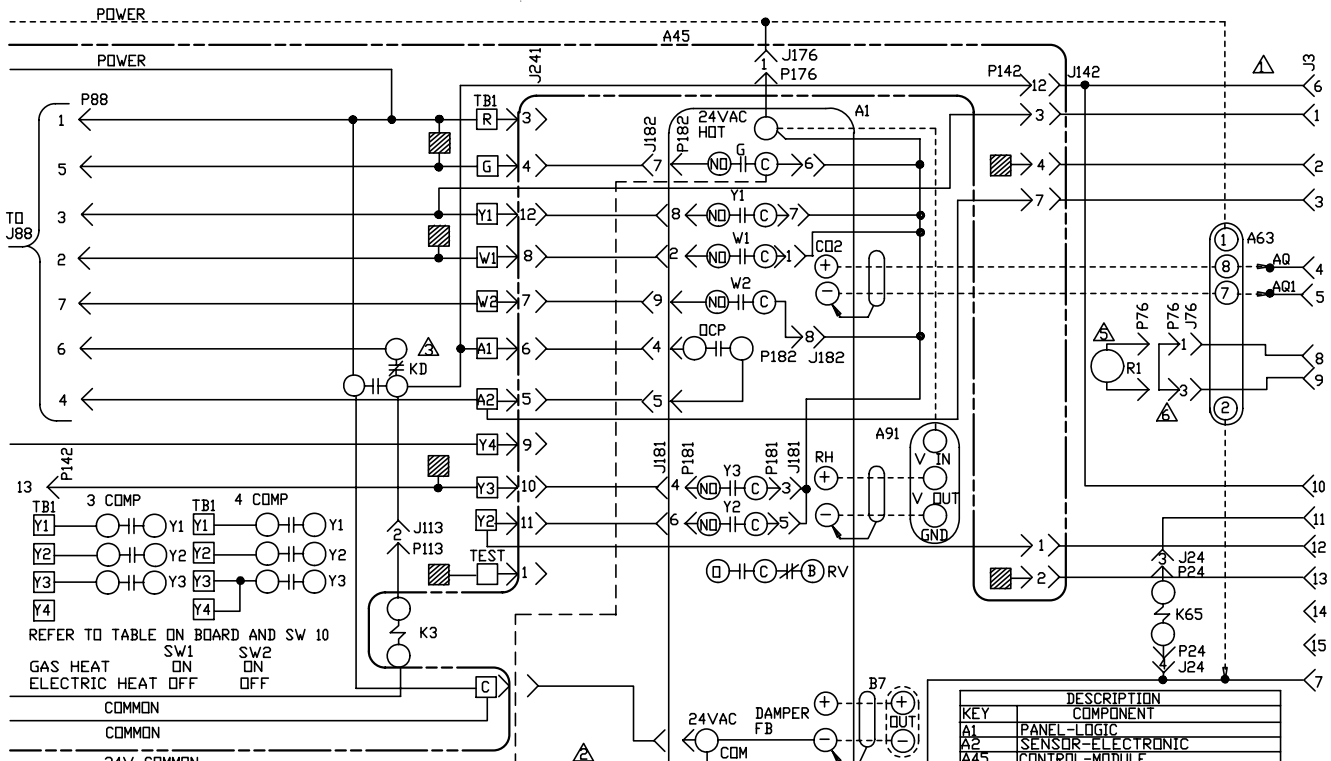
- ▲ J3 MAXIMUM LOAD 20VA 24VAC CLASS II
- ▲ INSTALL JUMPER IF CONTACTS ARE NOT USED
- ▲ KD IS ON A45 BOARD
- ▲ SEE BLOCK 3 IN INSTRUCTIONS FOR ALARM PARAMETERS
- ▲ R1 IS USED WITH MODULATING ECONOMIZER FIELD KIT
- ▲ REMOVE JUMPER WHEN R1 IS USED
- ▲ FOR T CLASS UNITS WITH SMOKE DETECTOR
- ▲ A74-SELECT ONE OF FOUR CONTROL VARIATIONS WITH OR WITHOUT DISPLAY
  1. TEMP ONLY
  2. TEMP AND RH
  3. TEMP AND CO2
  4. TEMP,RH AND CO2
- ▲ OPTIONAL AVERAGING SENSOR, ONE TO FOUR MAY BE USED (TWO ARE SHOWN)
- ▲ A105 IS OPTIONAL
- ▲ A2 OR A74 USED FOR SINGLE ZONE APPLICATIONS! A2 MAY BE USED WITH A74 AS BACKUP
- ▲ IF A148 IS NOT USED, CONNECT SYSBUS 1 AND 3 OF A105 TO 9 AND 8 OF A74
- ▲ A148 USED FOR ZONING APPLICATIONS. RT6 REQUIRED WHEN A148 IS USED

KEY	DESCRIPTION
A1	PANEL-LOGIC
A2	SENSOR-ELECTRONIC
A45	CONTROL-MODULE
A63	SENSOR-CO2
A74	SENSOR-ROOM
A91	SENSOR-HUMIDITY
A105	PANEL-CONTROL CONNECTION
A148	CONTROL-ZONE LINK
A158	CONTROL-OCCUPANCY
B7	MOTOR-DAMPER ECONOMIZER
J3	JACK-UNIT, ECONOMIZER
J24	JACK-EXHAUST FAN
J76	JACK-SENSOR ECONOMIZER
J113	JACK-BLOWER & COOL 1 CONTROL
J142	JACK-ECONOMIZER HARNESS
K3	RELAY-CONTRACTOR-BLOWER
K65	RELAY-EXHAUST FAN
P24	PLUG-EXHAUST FAN
P76	PLUG-SENSOR ECONOMIZER
P88	PLUG-HEAT CONTROL
P113	PLUG-BLOWER & COOL 1 CONTROL
P142	PLUG-ECONOMIZER HARNESS
R1	SENSOR-MIXED DR SUPPLY AIR
RT6	SENSOR-A55 DISCHARGE
RT16	SENSOR-RETURN AIR TEMP
RT17	SENSOR-OUTSIDE AIR TEMP
RT29	SENSOR-AVERAGING 11K OHM
S52	SWITCH-AIRFLOW
TB1	TERMINAL STRIP-24V CLASS II
TB68	TERMINAL STRIP-SYS BUS
TB69	TERMINAL STRIP-ZONE BUS
TB70	TERMINAL STRIP-POWER

DESIGNATES OPTIONAL WIRING  
CLASS II FIELD WIRING

WIRING DIAGRAM	9/06
ACCESSORIES	
NETWORK THERMOSTAT FOR TCA, TGA, THA UNITS	
B AND C BOX	
TEMPERATURE CONTROL SECTION	
Supersedes Form No.	New Form No. 535,512W

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DESIGNATES OPTIONAL WIRING CLASS II FIELD WIRING

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- ▲ INSTALL JUMPER IF CONTACTS ARE NOT USED
- ▲ KD IS ON A45 BOARD
- ▲ SEE BLOCK 3 IN INSTRUCTIONS FOR ALARM PARAMETERS
- ▲ R1 IS USED WITH MODULATING ECONOMIZER FIELD KIT
- ▲ REMOVE JUMPER WHEN R1 IS USED
- ▲ FOR T CLASS UNITS WITH SMOKE DETECTOR
- ▲ A74-SELECT ONE OF FOUR CONTROL VARIATIONS WITH OR WITHOUT DISPLAY
  1. TEMP ONLY
  2. TEMP AND RH
  3. TEMP AND CO2
  4. TEMP,RH AND CO2
- ▲ OPTIONAL AVERAGING SENSOR, ONE TO FOUR MAY BE USED (TWO ARE SHOWN)
- ▲ A105 IS OPTIONAL
- SHIELDED WIRE
- ▲ A2 OR A74 USED FOR SINGLE ZONE APPLICATIONS. A2 MAY BE USED WITH A74 AS BACKUP
- ▲ IF A148 IS NOT USED, CONNECT SYSBUS 1 AND 3 OF A105 TO 9 AND 8 OF A74
- ▲ A148 USED FOR ZONING APPLICATIONS. RT6 REQUIRED WHEN A148 IS USED

KEY	DESCRIPTION
A1	PANEL-LOGIC
A2	SENSOR-ELECTRONIC
A45	CONTROL-MODULE
A63	SENSOR-CO2
A74	SENSOR-ROOM
A91	SENSOR-HUMIDITY
A105	PANEL-CONTROL CONNECTION
A148	CONTROL-ZONE LINK
A158	CONTROL-OCCUPANCY
B7	MOTOR-DAMPER, ECONOMIZER
J3	JACK-UNIT, ECONOMIZER
J24	JACK-EXHAUST FAN
J76	JACK-SENSOR, ECONOMIZER
J113	JACK-BLOWER & COOL 1 CONTROL
J142	JACK-ECONOMIZER HARNESS
J176	JACK-NTC POWER IN
J181	JACK-NTC DIGITAL OUTPUT 1
J182	JACK-NTC DIGITAL OUTPUT 2
J241	JACK-TB1
K3	RELAY/CONTACTOR-BLOWER
K65	RELAY-EXHAUST FAN
P24	PLUG-EXHAUST FAN
P76	PLUG-SENSOR, ECONOMIZER
P88	PLUG-HEAT CONTROL
P113	PLUG-BLOWER & COOL 1 CONTROL
P142	PLUG-ECONOMIZER HARNESS
P176	PLUG-NTC POWER IN
P181	PLUG-DIGITAL OUTPUT 1
P182	PLUG-DIGITAL OUTPUT 2
R1	SENSOR-MIXED DR SUPPLY AIR
RT6	SENSOR-AS5 DISCHARGE
RT16	SENSOR-RETURN AIR TEMP
RT17	SENSOR-OUTSIDE AIR TEMP
RT29	SENSOR-AVERAGING 11K OHM
S52	SWITCH-AIR-FLOW
TB1	TERMINAL STRIP-24V CLASS II
TB68	TERMINAL STRIP-SYS BUS
TB69	TERMINAL STRIP-ZONE BUS
TB70	TERMINAL STRIP-POWER

WIRING DIAGRAM 9/06	
ACCESSORIES	
NETWORK THERMOSTAT FOR TCA,TGA,THA UNITS WITH WIRE HARNESS B AND C BOX	
TEMPERATURE CONTROL SECTION	
Supersedes Form No.	New Form No. 535,513W

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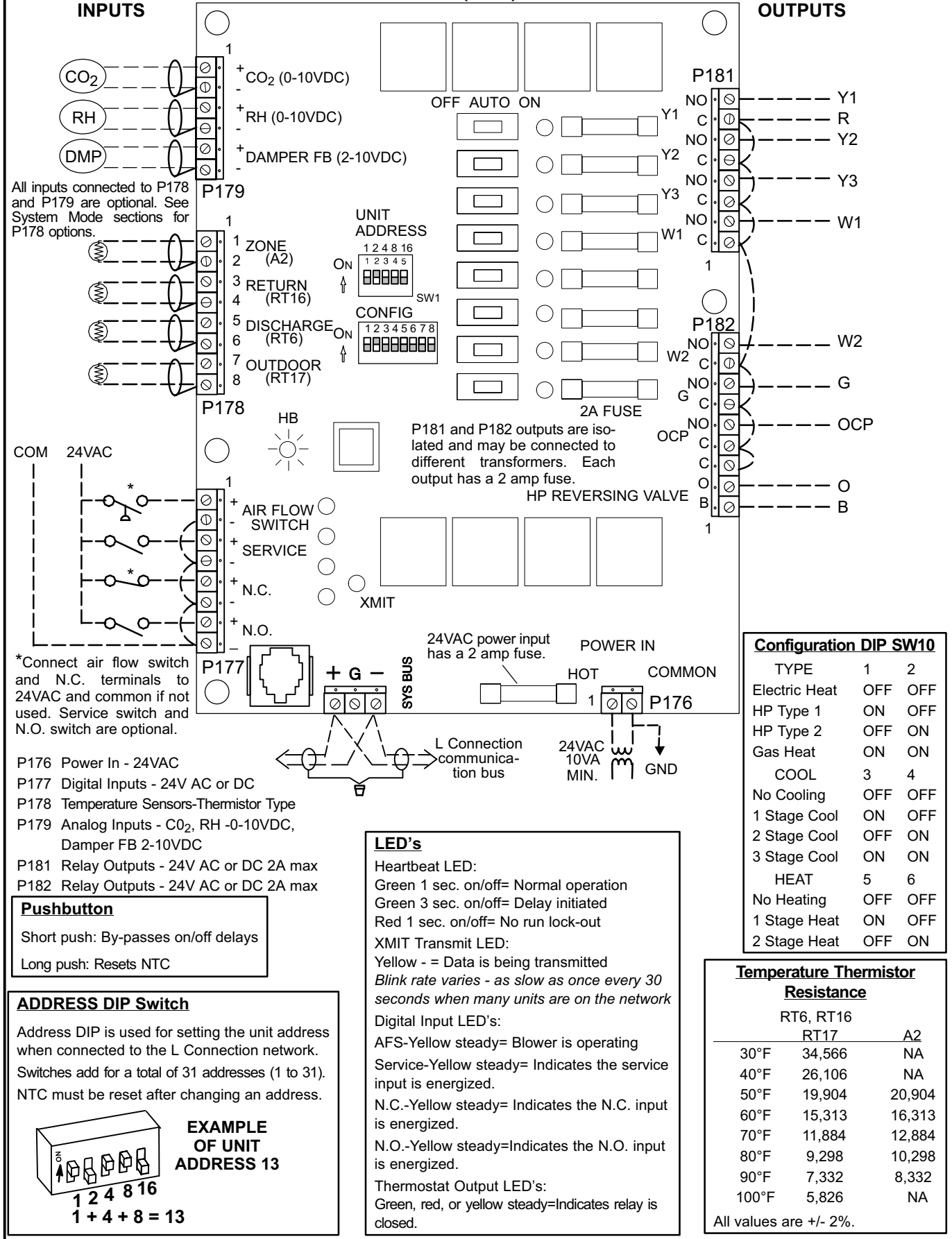








## TYPICAL NTC1-1 (A113) FIELD WIRING



All inputs connected to P178 and P179 are optional. See System Mode sections for P178 options.

\*Connect air flow switch and N.C. terminals to 24VAC and common if not used. Service switch and N.O. switch are optional.

- P176 Power In - 24VAC
- P177 Digital Inputs - 24V AC or DC
- P178 Temperature Sensors-Thermistor Type
- P179 Analog Inputs - CO<sub>2</sub>, RH -0-10VDC, Damper FB 2-10VDC
- P181 Relay Outputs - 24V AC or DC 2A max
- P182 Relay Outputs - 24V AC or DC 2A max

**Pushbutton**

Short push: By-passes on/off delays

Long push: Resets NTC

**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). NTC must be reset after changing an address.

**EXAMPLE OF UNIT ADDRESS 13**

1 2 4 8 16  
 1 + 4 + 8 = 13

**FIGURE 13**