



Revision: MAPSII-D11-D12-D12A (06-26) REV-A

Supersedes: CP-MAPS2-D11 (02-06) PN206137R1
CP-MAPS-D12 (09-07) PN209341R4,
CP-MAPS-D12woRH (06-05) PN209342R1
CP-MAPS-D12A (05-14) PN223464R4

CONTROL SYSTEM GUIDE FOR MODULAR AIR PROCESSING SYSTEM UNITS

**OPTIONS D11, D12, AND D12A
FOR MAPSII MODELS RCA, RDA, RDCA, RDDA, RECA, AND REDA**

OPTION D11 WITH FX05 CONTROLLER

OPTION D12 WITH FX05 CONTROLLER

OPTION D12 (WITHOUT REHEAT) WITH FX05 CONTROLLER

OPTION D12A WITH FX06 CONTROLLER

DO NOT DESTROY. PLEASE READ CAREFULLY. KEEP IN A SAFE PLACE FOR FUTURE REFERENCE.

Application and Instructions for Field Adjustment
of Model FX05 Controller in Option D11, Discharge Air Reset
Applies to Reznor MAPS®II Models RCA, RDCA, RECA
(includes worksheet to record adjustable parameters on pages 11 and 12)

WARNING: Risk of Electrical Shock - To avoid possible electrical shock or equipment damage, disconnect power supply before making electrical connections.

IMPORTANT: The Model FX05 control is designed for use only as an operating control. Where an operating control failure would result in personal injury or loss of property, it is the responsibility of the installer to add devices (safety and/or limit controls) or systems (alarm and/or supervisory systems) that provide protection from or warning of control failure.

Control Overview

The Model FX05 controller used in the Option D11 control system is custom programmed for the Reznor Modular Air Processing System (MAPS®II). Control features include:

- Custom 3-step control sequence of cooling (RCA, RDCA, RECA) and heating (RDCA, RECA)
- 6:1 Gas heating modulation control option (RDCA)
- Fully integrated outdoor ambient lockouts based on outdoor dry bulb and/or dewpoint (RCA, RDCA, RECA)
- Integrated timer functions for cooling (RCA, RDCA, RECA) and heating (RDCA, RECA)
- Alarm and equipment shutdown features (RCA, RDCA, RECA)

The display on the controller indicates the discharge air or space temperature, outdoor air temperature, dewpoint, which outputs are enabled, and the unit's mode of operation. It will also allow the user to change the:

- Discharge Air Heating/Cooling Setpoints
- Discharge Air Heating/Cooling Prop Bands
- Outdoor Air Heating/Cooling Setpoints
- Adjust the Time Clock
- Input Start-Stop Schedules for Occupied/Unoccupied Modes

FIGURE 1 - Model FX05 Programmable Controller, Reznor P/N 209828, located in the Control Compartment of the Unit

Function Key  - Depress and hold both the function key and enter key down for 5 seconds to change units (°F or °C) or adjust time clock, if equipped.

Enter Key  - To view settings and outputs, hold down the enter key for 5 seconds.

To check or change setpoints, depress and hold down the enter key for 10 seconds (See user settings table, pages 4-5, for adjustable parameters.)

Press the enter key to save new settings.



Up  & **Down**  **Buttons** - Toggle between settings or adjust values.

Display - With power applied the display will read "oFF" or "on". (If the display is flashing, see Alarm Section, page 5.) The auto/off switch must be closed for the display to read "on" (TB-48 and TB-49 terminals).

If the display indicates "on", pressing the down key will show the following: "dAt"; "oAt "; "Dp". To display the value being sensed, press the enter key:

dAt = Discharge Air Temperature

oAt = Outdoor Air Temperature

Dp = Dewpoint

After 10 seconds, the display will return to "on".

NOTE: Display also includes three LED lights indicating control status. See page 5 for explanation.

Operation/ Application

A Reznor Modular Air Processing System (MAPS) is a speciality unit typically applied for the treatment of outside air. Unlike a return air application, conditions entering the unit can vary widely (both sensible and latent) which necessitates a different approach to capacity control. The wide variation of outside air conditions can result in a low cooling or heating demand relative to the available equipment capacity.

Staging or sequencing cooling and heating capacity steps in conjunction with outdoor conditions can reduce unwanted compressor or heater operation. Controls include user defined outdoor setpoints to permit equipment capacity steps based on a combination of outdoor dry bulb and dewpoint. Heating permissive control is based on outdoor dry bulb temperature. Cooling permissive control can be based on both outdoor dewpoint and dry bulb temperatures.

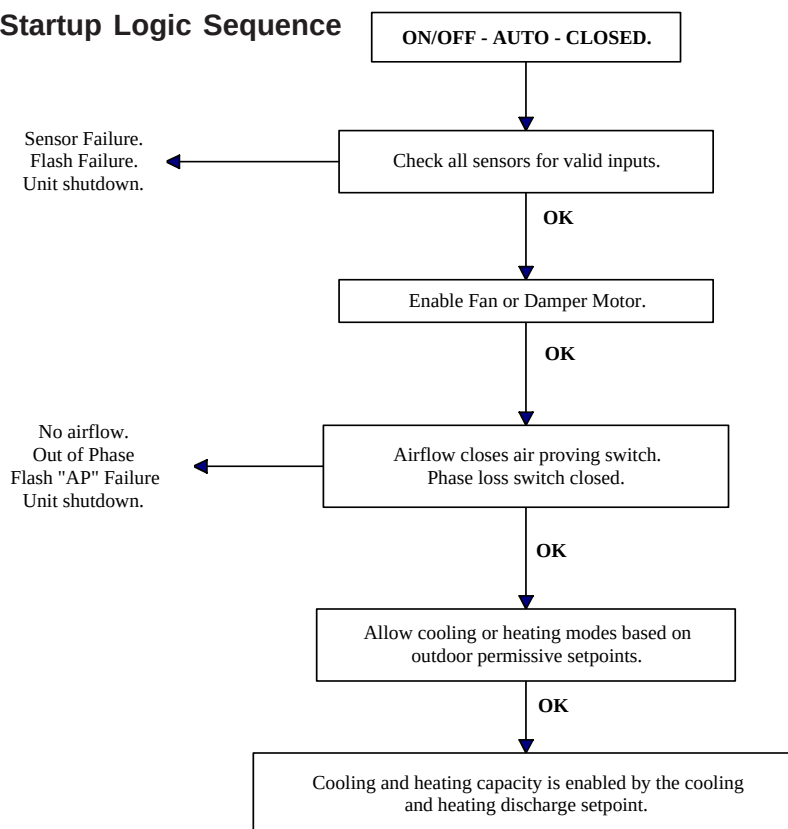
In addition to temperature control, equipment must be operated reliably without extreme short cycling. In the case of cooling, compressors must be allowed to run a minimum time for oil circulation and lubrication. Equipment timers override control inputs. External and internal safeties always override timers and control inputs. Because of equipment reliability, timers are not field adjustable but are listed here for information.

Non-adjustable Control Timer	Setting
Compressor Minimum Run Time	5 minutes
Compressor Off Time	5 minutes
Heating 1st and 2nd Inter-stage Time Delay	20 seconds
Heating 2nd to 1st inter-stage Time Delay	20 seconds
Heating 1st and 3rd Stage Minimum Run Time	200 seconds
Heating 2nd Stage Minimum Run Time	120 seconds
Heating Stage Off Time	Approximately 80 seconds
Low Limit Freeze Protection Delay	400 seconds
Air Proving/Phase Loss Lockout Fan Delay	120 seconds

General Startup Sequence (AUTO Mode)

“AUTO” Switch Activated - Unit controller will enable the outside air damper or blower motor (the blower motor is only energized with return air options). If the outside air damper motor is enabled, the damper motor end switch closes the blower circuit, enabling the blower motor. The air-proving switch is closed (upon proof of airflow) which enables the cooling or heating function. If the air-proving switch is not closed after 120 seconds (or the phase limit switch remains open), the unit will go into lockout mode. If the air-proving switch opens during a cooling or heating operation, heating and cooling will be locked out after a three second delay.

Startup Logic Sequence



Control System Parameters

Follow the instructions to **CHANGE** the "System" parameters listed in the table.

System Parameters		Selection	Default
Uni	Unit of Measure	°C or °F	°F
Hr	Time Clock - Hour	0-23 Hours (Military Time)	--
in	Time Clock - Minutes	0-59 Minutes	--
dAy	Time Clock - Day	0 - Sunday 1 - Monday 2 - Tuesday 3 - Wednesday 4 - Thursday 5 - Friday 6 - Saturday	--

Function Key



Instructions to Change the System Parameters:

- 1) Hold down **both** the "Enter" key and the "Function" key for five seconds.
- 2) The initial screen text will appear as "Uni". Scroll "up" or "down" to display parameters.
- 3) To view or change a parameter, scroll until it appears in the window. Depress the "enter" key once.
- 4) Using the "up" or "down" arrow, adjust the parameter to the desired variable. Press the "enter" key to accept the change.
- 5) Repeat these steps to adjust any other parameters.

If a button is not pressed for 10 seconds, display automatically returns to "OFF" or "ON".

Control Function Display (read only)

Follow the instructions to **VIEW (read only)** the status or setpoint of the control functions listed in the table.

Instructions to View Unit Status:

- 1) Hold down the "Enter" key for **five seconds**.
- 2) The initial screen text will appear as "HSP". Scroll "up" or "down" to select the function that you would like to display.
- 3) When that function is selected, depress the "enter" key again to see the setpoint or status.

To View Unit Status, Depress "ENTER" Key - Hold 5 Seconds

HSP	Discharge or Space Heating Setpoint	H1	1st Stage Heating Output Status • oFF – 1st Stage Heating Output "Off" • on – 1st Stage Heating Output "On"
St1	<u>Unit Status</u> • oFF – Unit "Off" or in the heating or cooling deadband • H1 – Unit in the 1st Heating Stage • H2 – Unit in the 2nd Heating Stage • H3 – Unit in the 3rd Heating Stage • C2 – Unit in the 1st Cooling Stage • C3 – Unit in the 2nd Cooling Stage • C4 – Unit in the 3rd Cooling Stage	H2	2nd Stage Heating Output Status • oFF – 2nd Stage Heating Output "Off" • on – 2nd Stage Heating Output "On"
		C2	1st Stage Cooling Output Status • oFF – 1st Stage Cooling Output "Off" • on – 1st Stage Cooling Output "On"
		C3	2nd Stage Cooling Output Status • oFF – 2nd Stage Cooling Output "Off" • on – 2nd Stage Cooling Output "On"
		GP	Modulating Gas Valve Output Status The value is displayed as a percentage and is only valid if the system is equipped with a Modulating Gas Valve (Option AG47).
St2	<u>Occupied/Unoccupied Status</u> • oCC – Unit in "Occupied" mode • onC – Unit in "Unoccupied" mode • ntC – No Time Clock Installed		
FAn	<u>Fan Output Status</u> • oFF – Fan Output "Off" • on – Fan Output "On"		

Option D11 is not available with reheat. Prior to Option D11, a system with this same type of control could have reheat. On a unit manufactured prior to 7/04 with this control and reheat, the view status is:

rH	<u>Reheat Output Status</u> • oFF – Reheat "Off" • on – Reheat "On"
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If a button is not pressed for 10 seconds, display automatically returns to "OFF" or "ON".

Control User Adjustable Parameters

Function Key



Enter
Key

Follow the instructions to **CHANGE** the parameters listed in the table.

Instructions to Change Parameters:

- 1) Hold down the "Enter" key for **ten seconds**.
- 2) The initial screen text will appear as "CSP". Scroll "up" or "down" to select the parameter that you would like to display.
- 3) To view or change a parameter, scroll until it appears in the window. Depress the "enter" key once.
- 4) Using the "up" or "down" arrow, adjust the parameter to the desired variable. Press the "enter" key to accept the change.
- 5) Repeat these steps to adjust any other parameters.

If a button is not pressed for 10 seconds, display automatically returns to "OFF" or "ON".

CAUTION: Refer to temperature control guidelines and worksheet (pages 11-12) prior to making adjustments. Improper settings can result in poor equipment performance.

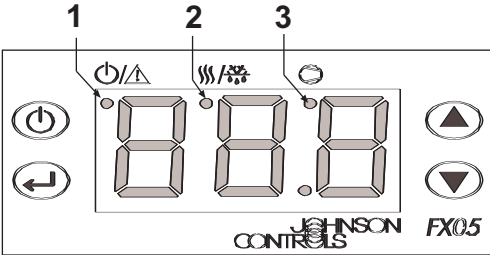
User Parameter Level (see Caution above)			Adjustable Range	DEFAULT Settings	
Display	Parameter	Explanation/Notes			
CSP	Cooling Setpoint	Desired temperature of discharge or optional space air.	49 to 100°F (9.45 to 37.78°C)	55°F	CSP
CPb	Cooling Prop Band	Defines the temperature range at which the cooling stage operates.	0 to 40°F (0 to 22.23°C)	10°F	CPb
*rSP	Reheat Permissive Setpoint	Not applicable; rSP is factory set to 0.		0	rSP
HSP	Heating Setpoint	Desired temperature of discharge or optional space air.	45 to 100°F (7.23 to 37.78°C)	75°F	HSP
HPb	Heating Prop Band	Defines the temperature range (+ or -) for minimum and maximum stage output.	0 to 40° (0 to 22.23°C)	10°F	HPb
iCt	Heating Integration Constant	Used with optional gas modulation only. Defines the integration time used during heating; recommended setting is 0.	0 to 999 seconds	0	iCt
LSP	Low Limit Freeze Protection Setpoint (disable LSP by setting to -40°F)	Low limit freeze will disable fan and outside air damper intake. The control will reset when supply air temperature increases by 30°F above the low limit setpoint.	-40 to 40°F (-40 to 4.45°C)	36°F	LSP
oC1	Heating/Cooling Changeover	Defines reference temperature setpoint for heating and cooling differential settings.	58 to 130°F (14.45 to 54.45°C)	70°F	oC1
oC2	Differential for 1st Stage Outdoor Air Cooling (Dry Bulb) Permissive Setpoint	Added to oC1 to define when 1st Stage Cooling is permitted.	0 to 70°F (0 to 38.89°C)	5°F	oC2
oC3	Differential for 2nd Stage Outdoor Air Cooling (Dry Bulb) Permissive Setpoint	Added to oC1, plus oC2 to define when 2nd Stage Cooling is permitted.	0 to 70°F (0 to 38.89°C)	10°F	oC3
oC4	Differential for 3rd Stage Outdoor Air Cooling (Dry Bulb) Permissive Setpoint	Added to oC1, plus oC2, plus oC3 to define when 3rd Stage Cooling is permitted.	0 to 70°F (0 to 38.89°C)	5°F	oC4
oH1	Differential for 1st Stage Outdoor Air Heating Permissive Setpoint	Subtracted from oC1 to define when 1st Stage Heating is permitted.	1 to 70°F (0.56 to 38.89°C)	10°F	oH1
oH2	Differential for 2nd Stage Outdoor Air Heating Permissive Setpoint	Subtracted from oC1, minus oH1 to define when 2nd Stage Heating is permitted.	0 to 70°F (0 to 38.89°C)	15°F	oH2
oH3	Differential for 3rd Stage Outdoor Air Heating Permissive Setpoint	Subtracted from oC1, minus oH1, minus oH2 to define when 3rd Stage Heating is permitted.	0 to 70°F (0 to 38.89°C)	15°F	oH3
Settings DP1, DP2, DP3, DP4 are applicable only with relative humidity transmitter, Option DT5.					
DP1	Dewpoint Permissive Setpoint Cooling	Defines reference temperature setpoint for dewpoint cooling differential settings	52 to 90°F (11.12 to 32.23°C)	60°F	DP1
DP2	Differential for 1st Stage Dewpoint Permissive Setpoint Cooling	Added to DP1 to define when 1st Stage Cooling is permitted.	0 to 20° (0 to 11.12°C)	2°F	DP2
DP3	Differential for 2nd Stage Dewpoint Permissive Setpoint Cooling	Added to DP1, plus DP2 to define when 2nd Stage Cooling is permitted.	0 to 20° (0 to 11.12°C)	8°F	DP3
DP4	Differential for 3rd Stage Dewpoint Permissive Setpoint Cooling	Added to DP1, plus DP2, plus DP3 to define when 3rd Stage Cooling is permitted.	0 to 20° (0 to 11.12°C)	5°F	DP4

*A system manufactured prior to 7/04 could have reheat. Default setting is 15°F.

Event Schedules below are only available if the unit has Option BHB1, Time Clock Card, installed.				
Display	Event / Explanation / Units			Display
H1	Event Schedule 1 - Hour	Defines the hour in which to start the occupied cycle from Monday through Friday.	0-23 Hours (Military Time)	H1
t1	Event Schedule 1 - Minutes	Defines the minute in which to start the occupied cycle from Monday through Friday.	0-59 Minutes	t1
H2	Event Schedule 2 - Hour	Defines the hour in which to stop the occupied cycle from Monday through Friday.	0-23 Hours (Military Time)	H2
t2	Event Schedule 2 - Minutes	Defines the minute in which to stop the occupied cycle from Monday through Friday.	0-59 Minutes	t2
H3	Event Schedule 3 - Hour	Defines the hour in which to start the occupied cycle on Saturday and Sunday.	0-23 Hours (Military Time)	H3
t3	Event Schedule 3 - Minutes	Defines the minute in which to start the occupied cycle on Saturday and Sunday.	0-59 Minutes	t3
H4	Event Schedule 4 - Hour	Defines the hour in which to stop the occupied cycle on Saturday and Sunday.	0-23 Hours (Military Time)	H4
t4	Event Schedule 4 - Minutes	Defines the minute in which to stop the occupied cycle on Saturday and Sunday.	0-59 Minutes	t4

LED Status Indicators on Control

LED Control Status Indicator Lights

			LED Light Lit (one only)	Status	Indicates System Mode
			1	ON	Fan Only "on"
				OFF	Fan Only "off"
			2	ON	Cooling Only "on"
				OFF	Cooling Only "off"
			3	ON	Heating Only "on"
				OFF	Heating Only "off"

Control Alarm Messages

When an alarm is triggered, one of the following alarm codes will flash on the display. Note: The Discharge Air Temperature will flash on the display with the alarm code.

- **AP** – Air Proving/Phase Loss Switch
- **FS** – Low Limit Freeze Protection Lockout (auto reset)
- **St** – Discharge Air Temperature Sensor Failure
- **ot** – Outdoor Air Temperature Sensor Failure
- **oH** – Outdoor Air Humidity Sensor Failure

Alarm Message Explanation

AP – If DO1 (call for blower) is closed for 120 seconds and AP remains open, then the unit goes into lockout mode (blower shutdown). If heating or cooling outputs are energized and AP opens, there is a 3-second delay before these functions are disabled. If the AP input continues to remain open for an additional 120 seconds, the blower is shutdown, and the unit is in lockout mode. System can be reset by cycling power (auto/off switch or push and hold the “up” and “down” arrow keys at the same time).

FS – If supply air temperature is less than the low limit freeze setpoint (LSP) for 180 seconds, the unit is shutdown (blower off). When supply air temperature increases to 30°F above LSP, the low limit freeze lockout is disabled allowing unit operation.

Sensor Failures (flashing oH, ot, or St) - Applies to humidity and outside and discharge air temperature sensors. A failed sensor will lockout unit operation.

If required for temporary operation a resistance value (1/4 watt rating, 1035 ohms at 77°F) or a potentiometer can be used until a replacement dry bulb sensor can be ordered. See the Johnson Controls Model A99 sensor resistance values versus temperature below.

Sensor Data for Johnson A99 Series Temperature Sensors

°F	-40	-31	-22	-13	-4	5	14	23	32	41	50	59	68	77	86	95	104	113	122	131	140	149	158	167	176	185	194	203	212	221	230	239	248
°C	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120
Ohms	613	640	668	697	727	758	789	822	855	889	924	960	997	1035	1074	1113	1153	1195	1237	1279	1323	1368	1413	1459	1506	1554	1602	1652	1702	1753	1804	1856	1908

Sensor Mounting and Wiring

Discharge Air Sensor – All systems have a discharge air sensor. The discharge air sensor is factory connected for startup only. The sensor must be field mounted in the supply air ductwork downstream of the unit outlet where full mixing of the air occurs. Using the holder in **FIGURE 2**, center the sensor in the bottom or top of the duct. Follow the instructions in the installation manual to mount the sensor.

Sensor Mounting and Wiring (cont'd)

Discharge Air Sensor and Holder for in Ductwork



Maximum Sensor Wire Length for less than 1°F Error

Wire Gauge	Maximum Sensor Wire Length	
	Feet	Meters
14	800	244
16	500	152
18	310	94
20	200	61
22	124	38

NOTE: Wire supplied with the sensor is 22 AWG.

Digital control inputs are low-current, resistance-based signals. The control manufacturer recommends for optimum temperature control performance that the analog and digital inputs (zone sensor, discharge air sensors, etc.) that are connected to the FX05 controller be routed to the unit in one of the following manners:

- In separate conduits, isolated from 24VAC controls and line voltage power to the unit.
- OR**
- If the FX05 wires are to be run in the same conduit as the 24VAC control wiring, the FX05 wiring must be completed using shielded cable and bundled separately from 24VAC control wiring. The shield must be drained at the unit and taped on the opposite end.

Comply with the maximum lengths in the table on the left to assure a sensed temperature with less than 1°F error.

Outside Air Dry Bulb and Dewpoint Permissive Control - If the application uses mixed air (return and outside air quantities), the outside air temperature sensor and humidity transmitter must be mounted together to sense outdoor air conditions. Verify that factory mounted positions provide acceptable performance. The humidity transmitter must be mounted in the upright position.

Sensor Accuracy and Outside Air Changeover Differential - Dry bulb sensor accuracy is within 1°F between 5° and 167°F. Outside air dewpoint is calculated based on a humidity transmitter input. Accuracy is rated as follows:

Humidity transmitter $\pm 3\%$ RH for 20 to 80% RH at 77°F and $\pm 5\%$ RH for 10 to 20% and 80 to 90% RH at 77°F. The dewpoint calculation is within 1% error at sea level. Hysteresis and the rate of moisture change also have an impact on sensor accuracy. Prolonged periods of high humidity (above 95% RH) can affect sensor accuracy (the bias is towards a higher RH reading than actual). The calculated outdoor dewpoint should be verified on an annual basis to ensure proper changeover operation.

All outside air changeover setpoints (heating, cooling, and dewpoint) include a minimum 1.8°F differential before staging is allowed. In cooling a rise of 1.8°F above the changeover setpoint is required prior to equipment staging. In heating mode, a fall of 1.8°F is required prior to equipment staging.

Controls

Optional Wall-Mount Discharge Air Control, Option CL54



Optional Outside Air Relative Humidity Transmitter, Option DT5



Standard AUTO/OFF Switch – All D11 control systems include an AUTO/OFF Switch either shipped attached to a 4x4 electrical box or, if ordered, mounted on a remote console. When the switch is closed (AUTO), the unit will operate in auto mode. The outside air changeover setpoints will determine if the unit is in heating or cooling mode.

Option CL54 is a wall-mount control that allows reset of the discharge air setpoint. The round dial can be used to adjust heating or cooling **discharge air setpoint** by $\pm 6^\circ\text{F}$ (total of 12°F).

Option DT5 - The sensor is factory-mounted in the outside air intake and sequences compressor operation based on outdoor dewpoint. It is recommended for humid and temperate climates.

Field Interface Wiring

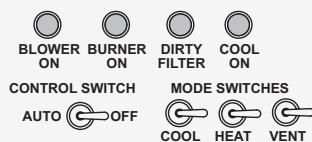
Control Input/Output Table

ANALOG INPUT		DIGITAL INPUT		ANALOG OUTPUT		DIGITAL OUTPUT	
AI1	Discharge Air Temperature Warm/Cool Adjustment (Optional)	DI1	Fan Only Switch	AO1	Modulating Gas Valve (Optional)	DO1	Fan
		DI2	Cooling Only Switch			DO2	1st Stage Heating
		DI3	Off/Auto Switch			DO3	2nd Stage Heating
AI2	Outdoor Air Humidity (Optional)	DI4	Heating Only Switch			DO5	1st Stage Cooling
AI3	Outdoor Air Temperature	DI5	Air Proving/Phase Loss Switch			DO6	2nd Stage Cooling
AI4	Discharge Air Temperature						

Mode Switch Connection Points

Remote Console Option RC33, RC34, RC35, or RC42

REZNOR



NOTES:

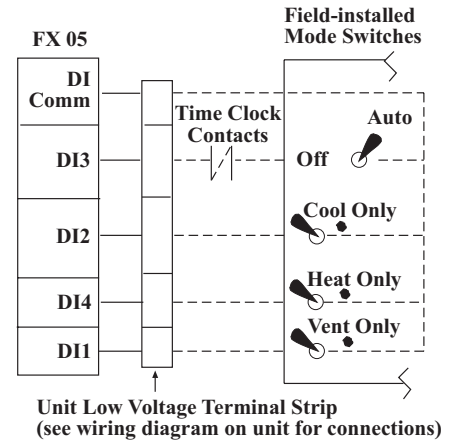
Switch must be in the "on" position for unit operation.

Customer provided time clock "dry contacts" should be wired to the Off/On Auto connection. Occupied = closed contacts.

Mode Switch Connection Points (cont'd)

Optional Mode Switches - A unit may be ordered with a remote console that includes three manual mode switches labeled “Cooling”, “Heating”, and “Vent”.

- **COOLING ONLY Switch** – When the COOLING switch is closed, the unit is allowed to operate only in the cooling mode (Note: Depending on cooling outside air changeover setpoints, active cooling may be locked out).
- **HEATING ONLY Switch** – When the HEATING switch is closed, the unit is allowed to operate only in the heating mode (Note: Depending on heating outside air changeover setpoints, active heating may be locked out). Additionally, closing the HEATING switch will provide an automatic heating setpoint change of 12°F.
- **VENT ONLY Switch** – When the VENT switch is closed, heating and cooling are locked out. The blower operates in continuous mode.



BAS Card Option

N2Open Card for FX05 Control, Option BHB2

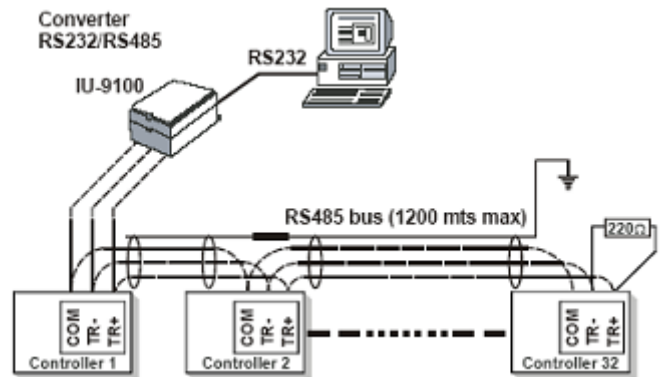


Pin	RS485
1	COM
2	RT-
3	RT+

RS485 line: maximum length without repeater: 3937 ft (1200 m), AWG26 twisted pair with shield;
RS232C line: maximum length: 33 ft (10 M);
Devices: maximum of 32 per 3937 ft (1200 M) bus segment

N2 Open Serial Card, Option BHB2

The N2Open serial card is a plug-in, optional card that allows the controllers of the FX05 line to be connected in a N2Open serial network through the RS485 standard. The connection to the network is made by means of the 3 pins on the plug-in connector shown in **FIGURE 7**. The network cable must be laid along a low voltage cable path. It must be placed at least at 12" (30 cm) from cables carrying high voltages or currents (>230V or >30A). If strong interference fields are expected, the cable must be located at the greatest distance possible from the source. The communication line must be laid out on the multi-drop line principle, i.e. from one controller to the next until the last controller has been connected. The line must be terminated at both ends with a 220 Ohm resistor between RT+ and RT-.



Points List

(MW014
FX0501-08)

NVO's		
ADF 18	nvoWHSP	adf-18 = WHSP
ADF 19	nvoWCSP	adf-19 = WCSP
ADF 32	nvoDewPoint	adf-32 = DP
ADF 41	nvoOATemperature	adf-41 = OAT
ADF 42	nvoDATemperature	adf-42 = DAT
NCI's		
ADF 1	nciSetpointT	adf-1 = HSP
ADF 2	nciSetpointT_1	adf-2 = CSP
ADF 3	nciOffsetT	adf-3 = RSP
ADF 4	nciSetpointT_4	adf-4 = OC1
ADF 5	nciDifferentialT	adf-5 = OC2
ADF 6	nciDifferentialT_6	adf-6 = OC3
ADF 7	nciDifferentialT_7	adf-7 = OC4
ADF 8	nciDifferentialT_8	adf-8 = OH2
ADF 9	nciDifferentialT_9	adf-9 = OH3
ADF 10	nciFloat	adf-10
ADF 11	nciFloat_11	adf-11
ADF 12	nciFloat_12	adf-12
ADF 13	nciFloat_13	adf-13
ADF 14	nciDifferentialT_14	adf-14 = HPB
ADF 15	nciTimeSec	adf-15 = ICT
ADF 16	nciDifferentialT_16	adf-16 = CPB
ADF 17	nciSetpointT_17	adf-17 = LSP

NCI's (cont'd)		
ADF 20	nciFloat_19	adf-20
ADF 21	nciFloat_20	adf-21
ADF 22	nciFloat_21	adf-22
ADF 23	nciFloat_22	adf-23
ADF 24	nciFloat_23	adf-24
ADF 25	nciFloat_24	adf-25
ADF 26	nciFloat_25	adf-26
ADF 27	nciFloat_26	adf-27
ADF 28	nciFloat_27	adf-28
ADF 29	nciOffsetT_28	adf-29 = OH1
ADF 30	nciFloat_29	adf-30
ADF 31	nciOffsetT_30	adf-31
ADF 33	nciSetpointT_31	adf-33 = DP1
ADF 34	nciDifferentialT_32	adf-34 = DP2
ADF 35	nciDifferentialT_33	adf-35 = DP3
ADF 36	nciDifferentialT_34	adf-36 = DP4
ADF 37	nciOffsetT_35	adf-37
ADF 38	nciOffsetT_36	adf-38
ADF 39	nciLevPercent	adf-39
ADF 40	nciLevPercent_38	adf-40
ADF 43	nviUnitEnable.Value	adf-43
ADF 44	nciTimeSec_39	adf-44
ADF 45	nciTimeSec_40	adf-45

NCI's (cont'd)		
BD 1	nci4eventSchedule.Hour	bd-1
BD 2	nci4eventSchedule.Minute	bd-2
BD 3	nci4eventSchedule.Status	bd-3
BD 4	nci4eventSchedule.Altern	bd-4
BD 5	nci4eventSchedule.Normal	bd-5
BD 6	nci4eventSchedule.Hour	bd-6
BD 7	nci4eventSchedule.Minute	bd-7
BD 8	nci4eventSchedule.Status	bd-8
BD 9	nci4eventSchedule.Altern	bd-9
BD 10	nci4eventSchedule.Normal	bd-10
BD 11	nci4eventSchedule.Hour	bd-11
BD 12	nci4eventSchedule.Minute	bd-12
BD 13	nci4eventSchedule.Status	bd-13
BD 14	nci4eventSchedule.Altern	bd-14
BD 15	nci4eventSchedule.Normal	bd-15
BD 16	nci4eventSchedule.Hour	bd-16
BD 17	nci4eventSchedule.Minute	bd-17
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Temperature Adjustment Guidelines

Selection of Cooling or Heating Setpoints and Outdoor Permissive Settings

Outdoor permissive setpoints permit or lock out equipment capacity based on outdoor conditions (dry bulb and dewpoint). Proper adjustment can prevent unwarranted equipment operation (saving energy), reduce equipment cycle rates (longer life), and provide a higher level of temperature control. Temperature control is accomplished based on the setup parameters (prop bands or throttling range) and heating or cooling setpoints.

Below are typical ranges of discharge air temperatures found in makeup or replacement air applications:

Heating 65 to 85°F

Cooling (humid climates) 53 to 60°F

Cooling (dry climates) 60 to 75°F

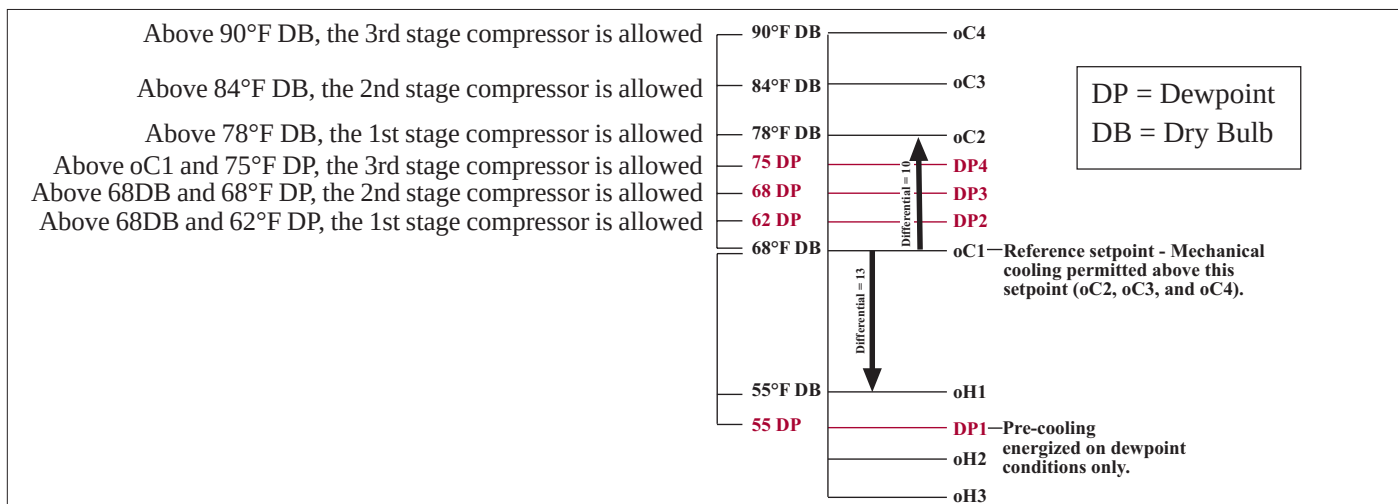
Understanding the system application will help guide you in selecting the appropriate setpoints. Below is a summary of the typical cooling application types:

- **Neutral Air Rooftop** – Treats only the outside air load and conditions it to space neutral conditions (typically 75°F).
- **Tempering Air Rooftop** - Treats only the outside air load and conditions it to a mild condition (typically in the low 60°'s). The supply air is delivered to the return duct system of two or three recirculating air rooftops where the outside air is distributed throughout the building.
- **Sole Source Rooftop** – Treats both outside air load and building loads. The application may include a quantity of outside air mixed with return air or a dedicated 100% outside air unit. These types of systems are usually found in kitchens, schools, and labs.

Dewpoint Permissive

Outdoor cooling permissive settings include dewpoint (if equipped with a humidity transmitter) and dry bulb. In the summer months, the outside air load is primarily latent (except in the dry southwest). Outside air is typically dehumidified when the ambient conditions are above 60°F dewpoint (at 75°F space temperature, a 60° degree dewpoint equates to 60% rh, the maximum recommended by ASHRAE). High moisture content in the summer occurs frequently when outdoor ambient conditions are between 68 and 85°F dry bulb. Active dehumidification will be required within these dry bulb temperatures. In Neutral Air applications, active dehumidification may be required as low as a 55°F ambient dry bulb.

In other seasons, the ambient dewpoint may be less than 55°F (low moisture content) while the dry bulb may be in the mid 70's to lower 80's (hot and dry). Because Tempering and Neutral Air systems are designed to reduce the outside air load (primarily latent), staging cooling equipment based on the outdoor dry bulb cooling permissive (oC2, oC3, oC4) is not recommended below 75°F outdoor dry bulb (typically the space temperature). *Below 75°F outdoor dry bulb, cooling compressors should be sequenced to satisfy dewpoint requirements.*



In sole source applications, space conditions could easily require active cooling below 75°F outdoor ambient. While rare, it may be necessary to disable the outdoor dry bulb lockout settings. This can be done by setting the oC2, oC3, and oC4 differentials to zero values. However, the heating and cooling changeover (oC1) must be selected to differentiate between heating and cooling operation. Read the section on Sole Source Applications for more information.

Estimating Outdoor Dewpoint Enable Settings

For estimating dewpoint enable setting, determine the following:

1. Design Dewpoint Temperature Drop per Stage = Design Dewpoint Temperature Drop ($T_{\text{outdoor design}} - T_{\text{supply}}$) $\div$ 3 Stages.
2. Outside Air Dewpoint where cooling is required.
3. Minimum Dewpoint Temperature allowed = typically between 50° and 55°F.
4. Maximum Dewpoint Temperature allowed = typically between 60° and 65°F.
5. Required Discharge Air Temperature Cooling Setpoint (CSP) = typically between 53° and 60°F

Dewpoint Example:

Design Dewpoint Temperature Drop = 23°F (i.e. typical 78° – 55°F)

Temperature Drop per Stage = $23 \div 3 = 7.5^\circ\text{F}$

Minimum Dewpoint Temperature allowed = 54°F (based on application requirements).

Maximum Dewpoint Temperature allowed = 62°F (based on application requirements).

Cooling Proportional Band (**CPB**) = $62 - 54 = 8^\circ\text{F}$

Discharge Air Temperature Setpoint (**CSP**) = 58°F ($\text{Prop band} \div 2 + 54^\circ\text{F}$)

Reference Heating/Cooling Changeover (**oC1**) = 68°F (based on application requirements).

Settings: 1st stage mechanical cooling allowed = $54 + 7.5^\circ\text{F} = 61.5^\circ\text{F}$; 2nd stage mechanical cooling allowed = $54 + 15^\circ\text{F} = 69^\circ\text{F}$; 3rd stage mechanical cooling allowed = $54 + 22.5^\circ\text{F} = 76.5^\circ\text{F}$.

Estimating Cooling Dry Bulb Permissive Setpoints

The cooling dry bulb permissive setpoints can be approximated in a similar fashion as shown above. Typically 1st stage cooling dry bulb permissive (oC2) is enabled between 75° and 80°F. A design dry bulb temperature drop is usually selected in the range of 20 to 30°F. This delta T is divided by 3 equal steps of capacity control to determine a temperature drop per cooling stage as shown in the example below.

Cooling Dry Bulb Example:

Design Dry Bulb Temperature Drop = $95 - 75 = 20^\circ\text{F}$ (space temperature is assumed to be in the 75° to 78° range)

Temperature Drop per Stage = $20 \div 3 = 6.6^\circ\text{F}$

Reference Heating – Cooling Setpoint (**oC1**) = 68°F (chosen to allow dehumidification based on dewpoint)

1st stage outdoor cooling dry bulb setting = 78°F.

oC2 = 10°F ($78 - 68^\circ$).

2nd stage outdoor cooling dry bulb setting = 84.6°F.

oC3 = 6.6°F ($84.6 - 78^\circ$).

3rd stage outdoor cooling dry bulb setting = 91.2°F.

oC4 = 6.6°F ($91.2 - 84.6^\circ$)

Dry Bulb Control (no dewpoint option)

In dry climate applications, only the outdoor cooling dry bulb settings will sequence compressor capacity. The procedure is essentially the same outlined in the section on dewpoint setup. Below is a procedure for determining outdoor air heating permissive setpoints for makeup or replacement air applications.

Estimating Outdoor Permissive Settings for Heating in Makeup Air Application

For estimating heating settings, determine the following:

1. Temperature Rise per Stage = Design Temperature Rise ($T_{\text{supply}} - T_{\text{outdoor design}}$) $\div$ 3 Stages.
2. Outside Air Dry Bulb where 1st Stage Heating is required = typically between 55 and 65°F.
3. Minimum Discharge Air Temperature allowed = typically between 60 and 70°F.
4. Maximum Discharge Air Temperature allowed = typically between 75 and 85°F.
5. Required Discharge Air Temperature Heating Setpoint (**HSP**) = typically between 65 & 80°F.

Temperature Adjustment Guidelines (cont'd)

Dry Bulb Control(no dewpoint option) (cont'd)

Example for Standard 3:1 Gas Capacity Control:

Design Temperature Rise = 75°F

Temperature Rise per Stage = $75 \div 3 = 25^\circ\text{F}$

Minimum Allowable Discharge Air Temperature = 65°F

Maximum Allowable Discharge Air Temperature = 80°F

Heating Proportional Band (**HPB**) = $80 - 65 = 15^\circ\text{F}$

Discharge Air Temperature Setpoint (**HSP**) = 72.5°F (Proportional band $\div 2 + 65^\circ$)

Reference Heating/Cooling Changeover (**oC1**) = 68°F

Outside Air Dry Bulb where 1st Stage Heating is required = 60°F

Settings: 1st stage allowed = **60° F** (typically based on the building heat gains between 60° and 65°F. Note, the unit will cycle “off “ heating capacity when discharge air temperature exceeds 80°F). **oH1** = 8° (68° – 60°).

2nd stage allowed = **40°F** (Subtract the temperature rise per stage from the minimum allowable discharge air temperature: $65 - 25 = 40^\circ\text{F}$). **oH2** = 20° (60° – 40°).

3rd stage allowed = **15°F** (Subtract the 2nd stage of temperature rise from the minimum allowable discharge air temperature: $65 - 50 = 15^\circ\text{F}$). **oH3** = 25° (40° – 15°).

Example for Modulating 6:1 Capacity Control Option AG47:

Design Temperature Rise = 75°F

Minimum Temperature rise = 12.5°F ($75 \div 6 = 12.5^\circ\text{F}$)

Discharge Air Temperature Setpoint (**HSP**) = 75°F

Proportional Band (**HPB**) = 8°F (8°F recommended for part load operation – the band provides an initial temperature range for the gas valve to stabilize under steady state conditions).

Reference Heating/Cooling Changeover (**oC1**) = 68°F.

Outside Air Dry Bulb where Heating is required = 60°F.

Settings: 1st stage heating = 60°F (Note the 1st stage call for heat is within the 12.5°F modulation range; the unit capacity can be modulated to hold the discharge air setpoint). **oH1** = 8° (68° – 60°).

2nd stage heating = 55°F (This setting should be between 60°F and 50°F. This will reduce the time required to position the gas valve during startup. 2nd stage should not be lower than 50°F). **oH2** = 5° (60° – 55°).

3rd stage heating = 45°F (This setting should be between 60°F and 25°F. This will reduce the time required to position the gas valve during startup. 3rd stage should not be lower than 25°F). **oH3** = 10° (55° – 45°).

Sole Source Guidelines

The term Sole Source is used to describe a packaged cooling and heating unit which conditions both outside and room air. It may introduce 100% outside air to the targeted space or mix return and outside air. In either case the controls will include optional space temperature reset. If the unit is installed in a cold climate, gas modulation should be specified to minimize space temperature fluctuations. In applications with greater than 12 air changes an hour, the standard three stage cooling capacity steps may be inadequate to meet space temperature requirements.

If a wall mount sensor is used, heating and cooling setpoints are typically in the 70 to 78°F range. When using this sensor with high quantities of outside air, the outdoor permissive settings become increasingly important to minimize temperature swings. Control bands should be reviewed as space temperature control bands are typically smaller than the discharge air control settings.

If the unit is being applied with both return and outside air quantities, the outside air sensor and relative humidity transmitter (if equipped) should be relocated and mounted near the filter rack to sense mixed air conditions. The best sensing location will vary by the percent and quantities of outside air. The outdoor dry bulb cooling permissive settings must continue to lock out primary compressors below 58°F ambient. A mixed air calculation will be required to determine this setting as shown below:

$$\text{Return Air} = 40\% \text{ of total airflow at } 72^\circ\text{F} = .4 \times 72 = 28.8$$

$$\text{Outside Air} = 60\% \text{ of total airflow at } 58^\circ\text{F} = .6 \times 58 = 34.8$$

$$\text{1st Stage Mechanical Cooling Lockout Setting} = 63.6^\circ\text{F}$$

In all applications heating/cooling changeover adjustment (**oC1**) will vary depending on the heat balance in the building. However, the selection of the heating “on” setpoint is more critical in applications with variable or high internal sensible loads. A dead band between heating and cooling is accomplished by adjusting **oH1** (allows 1st stage heat) and **oC2** (allows 1st stage cooling) differentials. Generally **oH1** should allow for heating in the 55 to 60°F ambient range. Variations in space conditions (such as a large kitchen) may arise where cooling may be required at lower ambient conditions (using 55°F supply air). This condition may require the use of an auxiliary relay (or thermostat) to enable the fan only mode (locks out heating). In special circumstances, supply air tempering (heating) may be required to maintain no less than 55°F in the free cooling mode.

It is important to note that the heating/cooling changeover setpoint (**oC1**) is always used to prevent simultaneous heating and cooling operation. Heating does not occur unless the temperature sensed by the outdoor dry bulb sensor is below the **oC1** setting (there is a 1 degree default dead band between **oC1** and heating). While rarely applied, zero value differentials effectively disable all outdoor permissive setpoints.

WORKSHEET for Changing Control Settings

(Page 1 of 2)

CAUTION: Prior to making adjustments, refer to instructions on page 4 and the temperature control guidelines. Improper settings can result in poor equipment performance.

Display	Function (Recommended Range)	Adjustable Range	DEFAULT Settings		Field Value
CSP	Cooling Setpoint (53 to 62°F, discharge air)	49 to 100°F (9.45 to 37.78°C)	55°F	CSP	
CPb	Cooling Prop Band (8 to 12, discharge air)	0 to 40°F (0 to 22.23°C)	10°F	CPb	
rSP	Reheat Setpoint (not applicable; always set at 0)	* (Not Applicable)	0	rSP	0
HSP	Heating Setpoint (65 to 85°F, discharge air)	45 to 100°F (7.23 to 37.78°C)	75°F	HSP	
HPb	Heating Prop Band (Optional Modulation = 8; 8 to 18°F)	0 to 40° (0 to 22.23°C)	10°F	HPb	
iCt	Heating Integration Constant (zero)	0 to 999 seconds	0	iCt	
LSP	Low Limit Freeze Protection Setpoint (32 to 40°F, disable LSP by setting to -40°F)	-40 to 40°F (-40 to 4.45°C)	36°F	LSP	
oC1	Heating/Cooling Changeover Reference Setpoint (65 to 75°F)	58 to 130°F (14.45 to 54.45°C)	70°F	oC1	
oC2	1st Stage Outdoor Air Cooling Permissive Setpoint	0 to 70°F (0 to 38.89°C)	5°F	oC2	
oC3	2nd Stage Outdoor Air Cooling Permissive Setpoint	0 to 70°F (0 to 38.89°C)	10°F	oC3	
oC4	3rd Stage Outdoor Air Cooling Permissive Setpoint	0 to 70°F (0 to 38.89°C)	5°F	oC4	
oH1	1st Stage Outdoor Air Heating Permissive Setpoint	1 to 70°F (0.56 to 38.89°C)	10°F	oH1	
oH2	2nd Stage Outdoor Air Heating Permissive Setpoint	0 to 70°F (0 to 38.89°C)	15°F	oH2	
oH3	3rd Stage Outdoor Air Heating Permissive Setpoint	0 to 70°F (0 to 38.89°C)	15°F	oH3	
DP1	Dewpoint Cooling Setpoint (DP settings are applicable only with a humidity transmitter, Option DT5)	52 to 90°F (11.12 to 32.23°C)	60°F	DP1	
DP2	1st Stage Dewpoint Cooling Permissive Setpoint	0 to 20°F (0 to 11.12°C)	2°F	DP2	
DP3	2nd Stage Dewpoint Cooling Permissive Setpoint	0 to 20°F (0 to 11.12°C)	8°F	DP3	
DP4	3rd Stage Dewpoint Cooling Permissive Setpoint	0 to 20°F (0 to 11.12°C)	5°F	DP4	

* A system manufactured prior to 7/04 could have reheat. Default setting is 15°F.

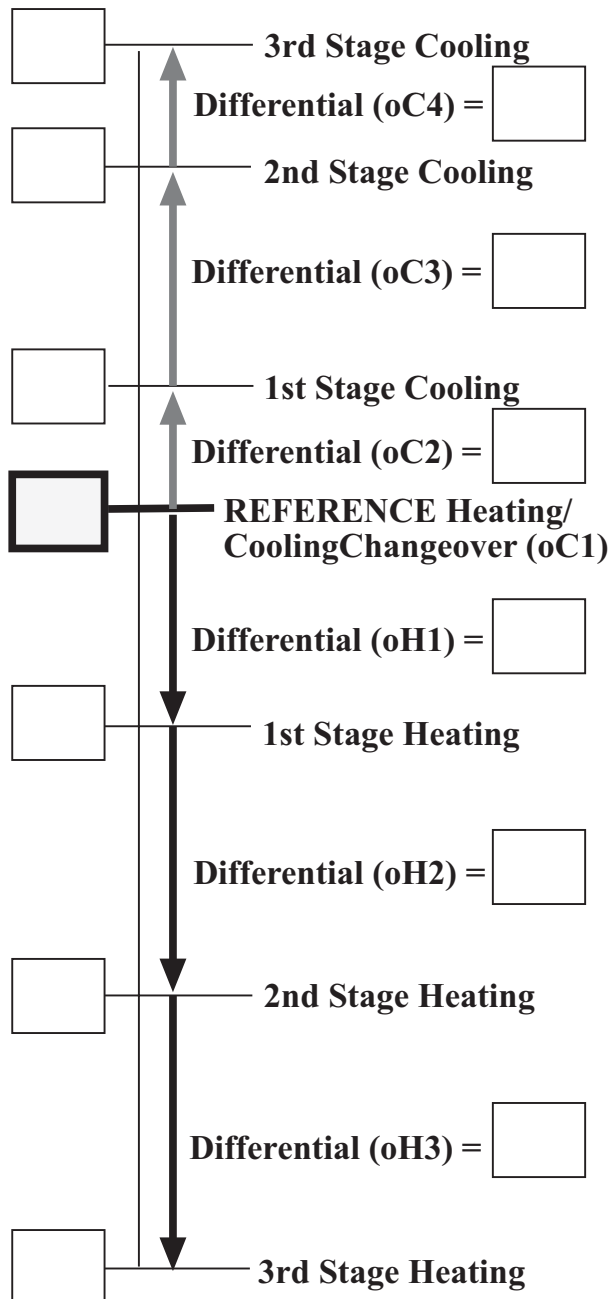
WORKSHEET for Changing Control Settings

(Page 2 of 2)

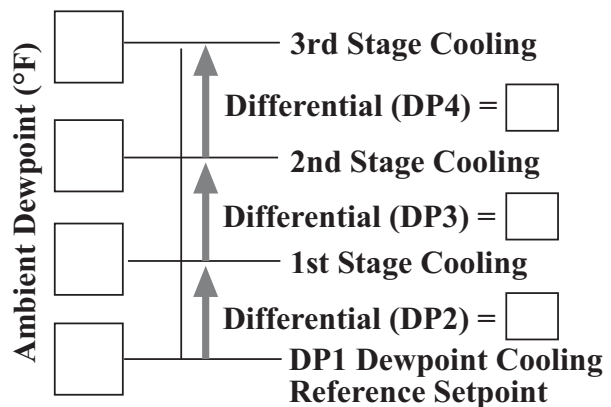
Typical °F Ranges for Tempering Air Applications:

Humid Climates (DB)	Southwest Climates (DB)	Humid Climate (DP)	Heating (75°F rise)
oC2 = 75 to 80°F	oC2 = 75 to 80°F	DP2 = 62 to 65°F	oH1 = 55 to 65°F
oC3 = 85 to 90°F	oC3 = 95 to 105°F	DP3 = 68 to 74°F	oH2 = 40 to 45°F
oC4 = 90 to 100°F	oC4 = 115 to 125°F	DP4 = 74 to 78°F	oH3 = 15 to 30°F

“Fill-in” outdoor dry bulb permissive temperature setpoints and calculate the differentials.



If equipped with a relative humidity transmitter, “Fill-in” outdoor dewpoint permissive temperature setpoint and calculate the differentials.



Application and Instructions for Field Adjustment of the Control (Model FX05) **in Digital Control Option D12, Space Control with Discharge Air Reset**

Applies to Reznor MAPS®II Models RCA, RDA, RDCA, RDDA, RECA and REDA

(Includes worksheet to record adjustable parameters on pages 26 - 27.)

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Introduction

The microprocessor unit (Model FX05) in control Option D12 is custom programmed for the Reznor Modular Air Processing System (MAPS®II). Control features include:

- Custom 3-step control sequence of cooling, dehumidification (reheat), and heating
- 6:1 Gas heating modulation control option
- Fully integrated outdoor ambient lockouts based on outdoor dry bulb/dewpoint or enthalpy
- Alarm and equipment shutdown features
- Service/Commissioning Test Mode
- Integrated timer functions for cooling and heating (optional)

There are four buttons that can be used for adjusting setpoints, viewing unit status; and enabling unit test or shut down modes. (See **FIGURE 2**, page 3.) The controller display will indicate unit status (on, off, or alarm), discharge air



FX05

Introduction (cont'd)

temperature, outdoor air temperature, dewpoint, and enthalpy. When equipped with a wall-mounted sensor, space temperature will be displayed.

General Sequence of Operation

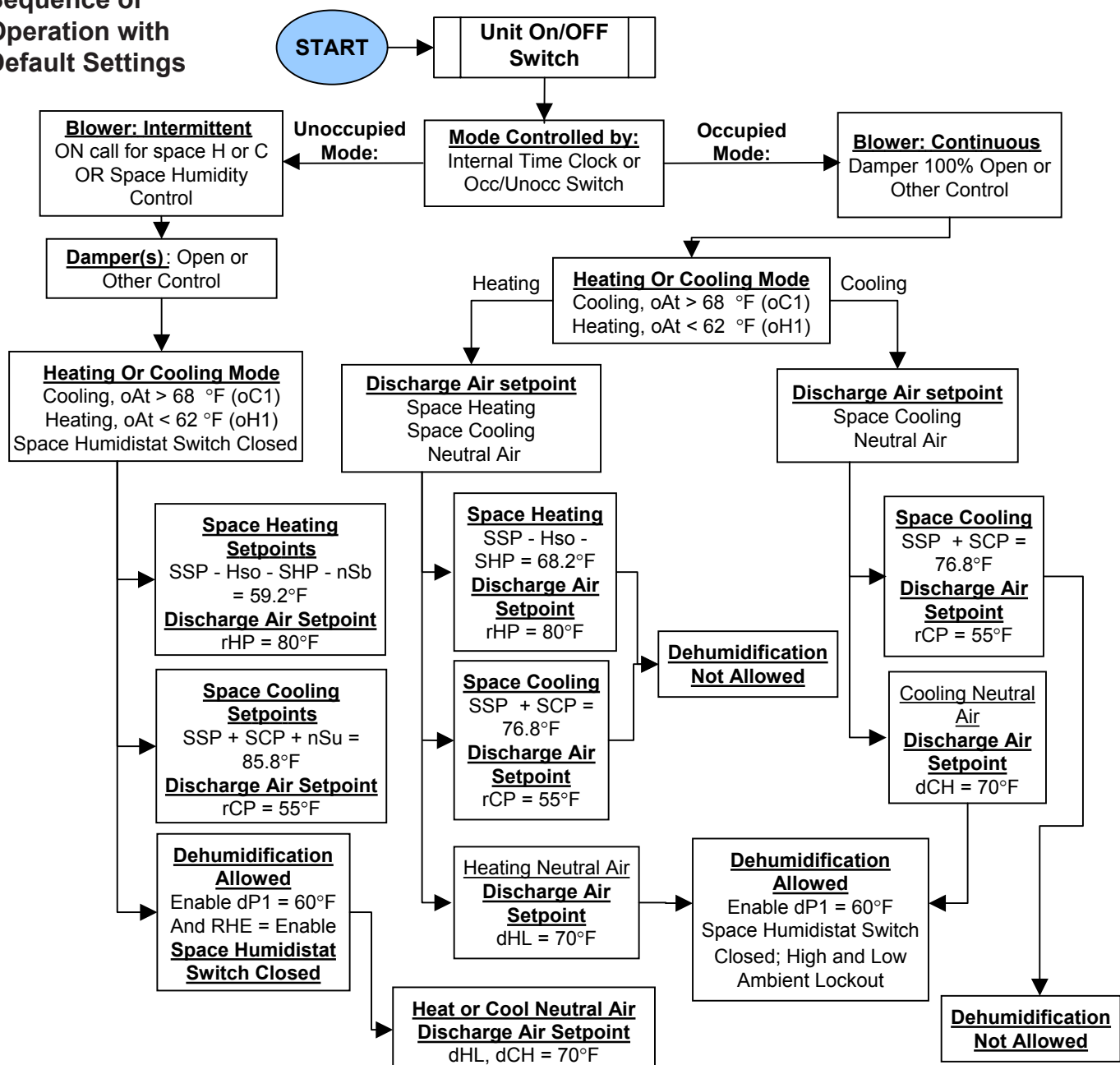
When the unit is called to operate, the main blower will run continuously in occupied mode and intermittently in unoccupied mode. The unit operates based on four **Discharge Air Temperature Setpoints** listed below.

1. Standard (Neutral) Heating Discharge Air Temperature Setpoint
2. Space Heating Discharge Air Temperature Setpoint
3. Standard (Neutral) Cooling Discharge Air Temperature Setpoint
4. Space Cooling Discharge Air Temperature Setpoint

The heating and cooling equipment will cycle to maintain the active discharge air temperature setpoint for occupied and unoccupied modes. Heating and cooling may be locked out of operation based upon outdoor air temperature and enthalpy conditions.

If equipped with reheat, the control will also activate the dehumidification circuit to maintain a neutral discharge air temperature setpoint and related dewpoint based upon outdoor air and space conditions.

**FIGURE 1 -
Sequence of
Operation with
Default Settings**



Display

For identification and troubleshooting of lockout “Alarm” Displays, see page 18.

The “welcome window” displays the active status of the unit (“oFF” or “on”). If the unit is in the “on” mode, press the “Down” arrow key for the following to be displayed:

- **SAT = Space Temperature** (If a space temperature sensor is not installed, the display shows a vertical dotted line.)
- **dAt = Discharge Air Temperature Sensor Value**
- **oAt = Outdoor Air Temperature Sensor Value**
- **En = Enthalpy (btu/lb)** (If a humidity transmitter is not installed, the display shows a dotted vertical line.)
- **Dp = Dewpoint Value** (If a humidity transmitter is not installed, the display shows a dotted vertical line.)

When any of the above are displayed, press the “Enter” key to display the active value or continue to the next sensor value.

After 10 seconds, the display will return to the active status of the unit (“oFF” or “on”).

FIGURE 2 - Model FX05 Programmable Controller located in the Electrical Compartment of the Unit

Function Key  - Press the function key to shut the unit down. Pushing it again for 5 seconds will re-enable the unit. Hold both “enter” and “function key” down for 5 seconds to change from °F to °C or adjust time clock (if equipped).

Up  and **Down**  **Buttons** - Toggle between settings or adjust values.



Enter Key  - Hold down 10 seconds: To change or check setpoints (see tables, pages 14-17, for adjustable parameters).

Hold down 5 seconds: To view unit status, outputs, and determine active controller mode.

Press the enter key to save new settings.

Display (Welcome Window) - With power applied, the display will read “oFF” or “on”. (If the display is flashing, see Alarm Section, page 17-18.) **Terminals TB-48 and TB-49 must be jumpered or field contacts closed for display to read “on”.**

If the display indicates “on”, pressing the down key will show sensor input. Pressing the enter key will show sensor values.

If no action is taken, the display will return to “on” after 10 seconds.

Unit Test Mode (See page 19.) - Hold “enter” key together with “down arrow” key for 5 seconds to enable auto test mode (display flashes “tst”). Unit will operate each output for one minute. Pushing the up arrow key for 5 seconds allows manual selection and testing of outputs. To exit test mode, push the down arrow key for 3 seconds.

Installation Warnings and Notes

WARNING: Risk of Electrical Shock - To avoid possible electrical shock or equipment damage, disconnect power supply before making electrical connections.

IMPORTANT: The Model FX05 controller is designed for use only as an operating control. Where an operating control failure would result in personal injury or loss of property, it is the responsibility of the installer to add devices (safety and/or limit controls) or systems (alarm and/or supervisory systems) that provide protection from or warning of control failure.

IMPORTANT INSTALLATION NOTES

1) All Installations - The FX05 control is DC voltage. DC voltage wires must not be run in the same conduit as the 24V or line voltage wiring. Use of shielded cable wire is recommended for DC voltage.

2) Units equipped with HEAT (Models RDCA, RDDA, RECA, and REDA) - The discharge air sensor is factory wired in the low voltage control box. The installer must relocate the discharge air sensor to the supply ductwork for proper heating discharge air control. Center the sensor and sensor holder on the bottom or top of the supply duct or plenum. (See instructions on pages 20-21.)

3) Installation with an optional communication or time clock card insert (Option BHB1, BHB2, or BHB3) - Always remove controller power when installing or removing a communication or time clock card insert.

Unit Power and Blower Operation

General Operation

The unit is supplied with a disconnect switch. The FX05 controller also has an ON/OFF button (function key). When the FX05 (on/off) input (Point BI-3) is closed, the unit will operate in either occupied or unoccupied mode. When the occupied / unoccupied switch (Point BI-4) is closed, the unit will run in occupied mode; otherwise the unit operates in unoccupied mode.

Time Clock (Option BHB1)

If an optional time clock card is installed in the FX05 controller, the unit will switch between occupied and unoccupied mode based upon a time of day schedule.

The unit will run in occupied mode when either BI-4 or the time clock calls for occupied mode. If both the internal time clock and external contacts are used, the physical input (point BI-4) will override the air handler to occupied mode if the physical point is closed. If the physical point is open, the internal time clock dictates the state.

The time clock allows for one time schedule for Monday through Friday and one time schedule for Saturday and Sunday. The start time (military) can be set from 0 hrs : 0 minutes thru 23 hrs : 59 minutes. See FX05 display setting for programming instructions.

Time Clock NOTE 1: Space sensor is required for unoccupied mode.

Time Clock NOTE 2: Make sure the BI-4 jumper is open when the internal time clock is used to avoid conflict of settings.

Heating and Cooling Control Modes

Occupied Mode

Blower operation is continuous in occupied mode. The FX05 contact BO-1 will close providing power for the outside air damper to open. The 2-position damper is electrically interlocked with the blower circuit. When the damper actuator opens to 80%, the blower is allowed to run. If power is lost, the mechanical spring will drive the damper closed.

If the unit is equipped with return air dampers, the blower control relay is not interlocked with the dampers.

Unoccupied Mode

The blower cycles ON/OFF with a call for either heating or cooling from the space sensor. Once the space heating or cooling unoccupied setpoints are satisfied, the blower will continue to run for 60 seconds then shut OFF.

During the Unoccupied Cycle the space setpoints will increase as follows:

$$\text{Space Cooling Setpoint (SSP)} = (\text{SSP} + \text{SCP} + n\text{Su}) = 75^{\circ}\text{F} + 1.8 + 9^{\circ}\text{F} = 85.8^{\circ}\text{F}$$

$$\text{Space Heating Setpoint} = (\text{SSP} - \text{HSo} - \text{SHP} - n\text{Sb}) = 75^{\circ}\text{F} - 5^{\circ}\text{F} - 1.8 - 9^{\circ}\text{F} = 59.2^{\circ}\text{F}$$

(nSu and nSb default value = 9°F, adjustable from 0-35°F)

Unoccupied Override Mode

If the space override button on the CL53 wall-mounted control (point BI-1) is pushed during an unoccupied period, the air handling unit will operate in occupied mode for a period of four hours. (UOT = 240 minutes adjustable 0-800 minutes) If the override button is pushed again in unoccupied mode, the unit goes into temporary boost mode which changes the space temperature setpoints.

The unit operates based upon four Discharge Air Temperature Setpoints.

1. Standard (Neutral) Heating Discharge Air Setpoint
2. Space Heating Discharge Air Setpoint
3. Standard (Neutral) Cooling Discharge Air Setpoint
4. Space Cooling Discharge Air Setpoint

With the space sensor installed, the unit will operate to maintain the space heating and cooling setpoints as required. When the space temperature sensor is satisfied (or not installed), the unit will operate to maintain the standard (neutral) discharge air setpoint. The space cooling setpoint (SSP) default value is 75°F. The space heating setpoint is a given differential (HSo) below the space cooling setpoint. The differential (Hso) can be adjusted from 1-30°F. The default value of 5°F makes the default heating setpoint 70°F.

Temporary Set Up Boost Mode with Wall-Mount Sensor, Option CL53 (Push button down for 1 second) - If the setpoint override button is pushed during an occupied period (or a unit without the time clock card option), unit will control to space setpoint as follows:

$$\text{Cooling Setpoint} = \text{SSP} - 3^{\circ}\text{F}$$

$$\text{Heating Setpoint} = \text{SSP} - \text{HSO} + 4^{\circ}\text{F}$$

The unit will default back to programmed setpoints after a minimum 10 minute interval and the setpoint is satisfied. The controller ignores additional pushes of the button until the space is satisfied and the unit is no longer in boost mode. The unit will remain in this mode until the space setpoint is satisfied.

Heating and Cooling Control Modes (cont'd)

When the space temperature sensor is satisfied (or not installed), the unit will discharge standard (neutral) air. The default cooling mode setpoint (dCH) value is 70°F. The default heating mode setpoint (dHL) is 70°F. These setpoints can automatically be adjusted by a user defined reset schedule.

The heating or cooling mode is determined by outside air conditions and mode lockout values. If the outside air temperature value (Point AI-3) is greater than the cooling mode lockout value (oC1, default 68°F), unit is in cooling mode. If the outside air temperature is lower than the heating mode lockout value (oH1, default 62°F), unit is in heating mode (gas or electric).

Unit is in Cooling Mode when outside air temperature **rises** above oC1

Unit is in Heating Mode when outside air temperature **falls** below oH1

FIGURE 3 - Reverse Lockout Values to switch between heating and cooling based on space temperature (instead of outside air temperature).

oH1 = 68°F, Outside Air Temperature <68°F HEATING

Unit in cooling mode - space temperature can change to heating mode.

Unit in heating mode - space temperature can change to cooling mode.

oC1 = 62°F, Outside Air Temperature >62°F COOLING

If the lockout values are reversed as shown in **FIGURE 3**, and a space sensor (CL53) is installed, the unit will switch between heating and cooling modes based upon space requirements. Example: If the outside air temperature rises from 50°F to 65°F, the unit will be in cooling mode. If the space sensor calls for heating when the outside air temperature is 65°F, the unit will switch to heating mode. Once the space is satisfied, the unit will operate in heating mode for neutral air control. The unit will not switch to cooling mode until the space sensor calls for cooling.

NOTE: If a space sensor is not installed, this function is not available.

Heating Mode

When the unit is in heating mode, the unit will discharge air based upon the neutral air discharge heating setpoint point (dHL) or the room discharge air heating setpoint (rHP). If the space sensor is not installed, the unit will operate to provide neutral air only.

If a local space sensor is installed, the unit will change the neutral air discharge setpoint to the room discharge air heating setpoint (rHP) whenever the space requires heating. Whenever the space temperature is below the setpoint by a value greater than the space heating proportional band (SHP), then space heating is required. The SHP default value is 1.8°F, adjustable from 1 to 8°F.

Example:

Space heating setpoint = (SSP - Hso) = 75°F - 5°F = 70°F

Space heating proportional band (SHP) = 1.8°F (Range 1 to 8°F)

Space heating active [(SSP - Hso) - SHP]: 70°F - 1.8°F = 68.2°F

Room discharge air temperature heating setpoint (rHP) = 80°F

During the Unoccupied Cycle the space setpoints will increase as follows:

Space Heating Setpoint = (SSP - Hso - SHP - nSb) = 75°F - 5°F - 1.8 - 9°F = 59.2°F

(nSb default value = 9°F; adjustable from 0 to 35°F)

When the space temperature is more than SHP above the setpoint (71.8°F), the unit will switch to neutral air control and space heating requirements will be OFF. The neutral discharge air control setpoint value will be the dHL value.

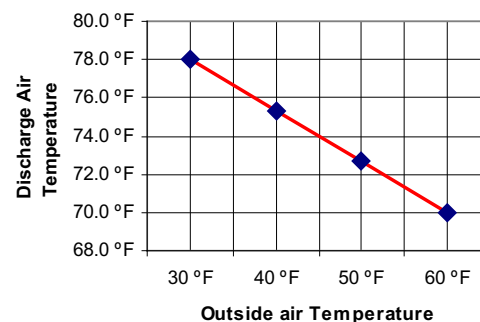
It may be useful to change the neutral air setpoint if the indoor ambient comfort conditions significantly change based upon outdoor air conditions. The discharge air setpoint can be set to automatically adjust between the dHL and the dHH values depending upon the outside air conditions. Example: Elder care centers tend to require higher space temperatures during the winter season

(example 78°F). Therefore, when the outside air is 60°F, the unit can deliver 70°F neutral air. And, when the outside air temperature drops to 30°F, the unit can provide 78°F neutral air. The higher neutral air setpoint provides neutral air matching the space temperature, thus better comfort control.

FIGURE 4 - Outside Air Reset (dHH) allows automatic changing of discharge air temperature based on outside air temperature.

Discharge Air Setpoint	Outside Air Temperature
dHL = 70°F	oH2 = 60°F
dHH = 78°F	oH3 = 30°F

Automatic Changing of the Discharge Air Setpoint Based Upon Outside Air Temperature



Variable Name	Description	Default Value (Range)
dHL	Standard Discharge Air Setpoint (Primary Setpoint) dHL is the value of the discharge air heating setpoint when the outside air temperature is at its warmest value to allow minimum heating. The discharge air temperature will not change to a lower value than dHL regardless of the outside air temperature. If the reset option is disabled, the dHL becomes the primary neutral air heat discharge air setpoint.	70°F (50 - 115°F)
dHH	Outdoor Air Reset Option dHH is the value of the discharge air heating setpoint when the outside air temperature is at its coldest value to allow maximum heating. The discharge air temperature will not change to a higher value than dHH regardless of the outside air temperature. The default value disables the option.	78°F (45 - 120°F)
oH2	Outdoor Reset Dry Bulb Heating – High Setting The value of the outside air temperature corresponding to the dHL low heating setpoint value.	60°F (20 - 70°F)
oH3	Outdoor Reset Dry Bulb Heating – Low Setting The value of the outside air temperature corresponding to the dHH high heating setpoint value.	30°F (-40 - 65°F)
Disable	Making the dHH value lower than the dHL value disables this functionality.	Disabled

Heat Staging

Upon a call for heat, to maintain the active discharge air setpoint, the unit will enable a stage when the discharge air temperature is more than ½ of the heating proportional band (HPP) below the setpoint. Default HPP value is 10°F.

Example: Active setpoint = 70°F. A stage is enabled when the discharge air temperature (dAt) is less than 65°F. Likewise, if the discharge air temperature is above 75°F, an active stage of heating is turned OFF.

If the discharge air temperature rises above ½ HPP value above the setpoint (70°F + 5°F = 75°F) after initially starting, the 1st stage will remain ON for 180 seconds then turn OFF.

Heating and Cooling Control Modes (cont'd)

Heating Mode (cont'd)

Heat Staging (cont'd)

After the first 180 seconds from the 1st stage activating, if the discharge air temperature does not increase above $\frac{1}{2}$ of the band (HPP), the controller will turn on the 2nd stage. The 2nd stage closes (DO-3), and the 1st stage (DO-2) remains ON for 20 seconds. The system uses the 1st stage to ignite the 2nd stage and vice versa. After twenty seconds, stage 1 will turn OFF.

The 2nd stage has a minimum run time of 100 seconds. If the discharge air temperature is still less than $\frac{1}{2}$ of HPP after 100 seconds, then the system will activate the 3rd stage. Stage 3 heating is stage 1 and 2 combined (DO-2 and DO-3 closed), providing 100% heating.

If the discharge air temperature increases above 75°F, then the stages start turning OFF in the reverse sequence. If the dAt remains between the proportional band (HPP = 10, 65°F to 75°F), the unit will not add or subtract a stage of heating. Stage 3 does not have a minimum run time.

For optional modulating gas heat units, the same sequence applies with the following addition. When the unit is in any stage of heating other than OFF, the gas modulating value will vary from 100% open to 50% open based upon the heating discharge air proportional band (HPP).

Example: If the discharge air temperature (dAt) is 4.9°F above the setpoint, AO-1 output will provide 50% gas. If the dAt is 4.9°F below the setpoint, the gas value will modulate to provide 100% gas. When heating is not required, the analog output will be 10V, 50% open. (The gas valve converts the control signal voltage: 10V - 0V = signal at the valve = 3 VDC = 100% open, 7 VDC = 50% open).

Heating Mode Lockout

If the Discharge Air Temperature (Point AI-4), does not rise above LSP (36°F) in 600 seconds after blower enables, the unit will shut down. Upon a rise in discharge air temperature (LSP + 30°F = 66°F), the unit is enabled. Three consecutive lockouts within one hour will result in a continuous lockout state (24 VAC power must be cycled to reset the controller). If the Outdoor Air Temperature sensor fails, the blower will operate without cooling, reheat, or heating equipment active. If the Outdoor Air Temperature rises above the oH1 heating lockout (62°F), the heating equipment will be turned OFF after the minimum run times.

Cooling Mode

When the unit is in cooling mode, the unit will discharge air based upon the neutral air cooling setpoint point (dCH) and the room discharge air cooling setpoint (rCP). If the space sensor is not installed, the unit will operate to provide neutral air only.

If a space sensor is installed, the unit will change from the neutral discharge air temperature setpoint to the room discharge air heating setpoint (rCP) value whenever the space requires cooling. Whenever the space temperature is above the setpoint by a value greater than the space cooling proportional band (SCP), the space will call for space cooling to be ON. The SCP default value is 1.8°F.

Example:

Space cooling setpoint SSP = 75°F (Default)

Space cooling proportional band (SCP) = 1.8°F (adjustable 1 to 8°F)

Space cooling active above: (SSP + SCP) = 75°F + 1.8°F = 76.8°F

Space cooling discharge air setpoint (rCP) = 55°F

During the Unoccupied Cycle the space setpoints will increase as follows:

$$\text{Space Cooling Setpoint} = (\text{SSP} + \text{SCP} + \text{nSu}) = 75^{\circ}\text{F} + 1.8^{\circ}\text{F} + 9^{\circ}\text{F} = 85.8^{\circ}\text{F}$$

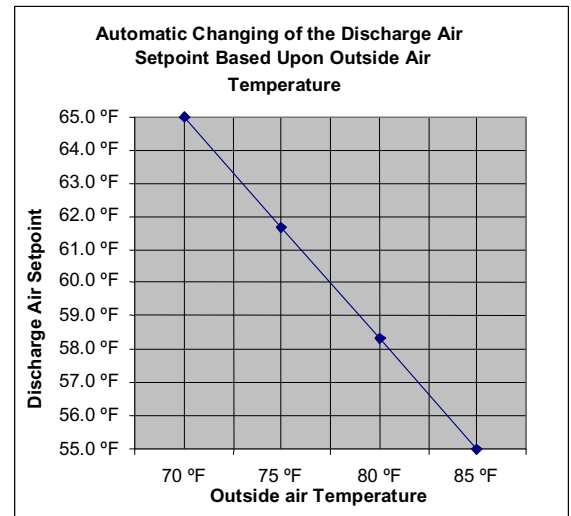
(nSu default value = 9°F, adjustable from 0-35°F)

When the space temperature is more than SCP below the setpoint (73.2°F), the unit will switch to neutral air control. The control setpoint value will be the dCH value.

The neutral air setpoint can be automatically adjusted based on outside air values. The discharge air setpoint will float between the dCL value and the dCH value depending upon the outside air conditions. In low humidity applications where the unit may serve other mechanical equipment directly, it may be beneficial to automatically adjust the setpoint to minimize the use of mechanical equipment. **NOTE: This function is not recommended for humidity sensitive applications.**

FIGURE 5 - Outside Air Reset (dCL) allows automatic changing of discharge air temperature based on outside air temperature.

Discharge Air Setpoint	Outside Air Temperature
dCL = 55°F	oC2 = 85°F
dCH = 65°F	oC3 = 70°F



Variable Name	Description	Default Value (Range)
dCH	Standard Discharge Air Setpoint (Primary Setpoint) dCH is the value of the discharge air cooling setpoint when the outside air temperature is at its coldest value to allow minimum cooling. The discharge air temperature will not change to a higher value than dCH regardless of the outside air temperature. If the reset option is disabled, the dCH becomes the primary neutral air cooling discharge air setpoint.	65°F (50 - 115°F)
dCL	Outdoor Air Reset Option dCL is the value of the discharge air cooling setpoint when the outside air temperature is at its warmest value to allow maximum cooling. The discharge air temperature will not change to a lower value than dCL regardless of the outside air temperature. The default value disables the option.	55°F (49 - 115°F)
oC2	Outdoor Reset Dry Bulb Cooling – High Setting The value of the outside air temperature corresponding to the dCL coldest cooling setpoint value.	85°F (20 - 70°F)
oC3	Outdoor Reset Dry Bulb Cooling – Low Setting The value of the outside air temperature corresponding to the dCH warmest cooling setpoint value.	70°F (-40 - 65°F)
Disable	Making the dCL value higher than the dCH value disables this functionality.	Disabled

Heating and Cooling Control Modes (cont'd)

Cooling Mode (cont'd)

Cooling Staging

Upon a call for mechanical cooling to maintain the active discharge air setpoint, the unit will enable a stage when the discharge air temperature is more than $\frac{1}{2}$ of the cooling proportional band (CPP) above the setpoint. (Default CPP value is 10°F.)

Example: Active setpoint = 70°F. The 1st stage enables when the discharge air temperature is greater than 75°F. Likewise if the discharge air temperature is below 65°F, an active stage of cooling is turned OFF.

The system has intra-stage time delays of 4.5 minutes. Thus, compressors have a minimum ON and OFF time of 4.5 minutes. After the first stage has been turned ON and the discharge air temperature is still 5°F greater than the setpoint ($\frac{1}{2}$ CPP) and 4.5 minutes has passed, the unit will turn on stage 2 cooling. Because the unit has 33%, 66%, and 100% staging, compressor 1 will turn OFF and compressor 2 will turn ON.

If after 4.5 minutes the same condition exists, stage 3 will be active and both compressors 1 and 2 will be ON. If the discharge air temperature value is between the cooling proportional band (CPP is 65°F - 75°F), the active stage will remain ON. If the dAt falls 5°F below the setpoint, the staging control will act in reverse, turning OFF stages.

Cooling Mode Lockout

The unit is equipped with a manual reset high pressure switch and an auto-reset low pressure switch for each compressor circuit. If any pressure switch trips, that particular mechanical cooling circuit is disabled. Each circuit on the evaporator coil has an auto-reset froststat which will disable the cooling circuit if the temperature drops below 36°F.

To reduce compressor cycling, the compressors are enabled to run based upon outdoor dry bulb temperature and enthalpy settings. No mechanical cooling is allowed to operate if the outside air temperature is below the cooling mode lockout (oC1). Default oC1 setting is 68°F; adjustable range is 58 to 130°F. If the compressors are enabled and the temperature falls below the oC1 setting, the minimum run time will keep the compressors ON. **ALL** compressors will immediately turn OFF after the current minimum run time expires; the unit does not stage down.

If the unit is equipped with an outdoor air humidity sensor (Point AI-2), the compressors are locked out until the outside air enthalpy value rises above the lockout settings

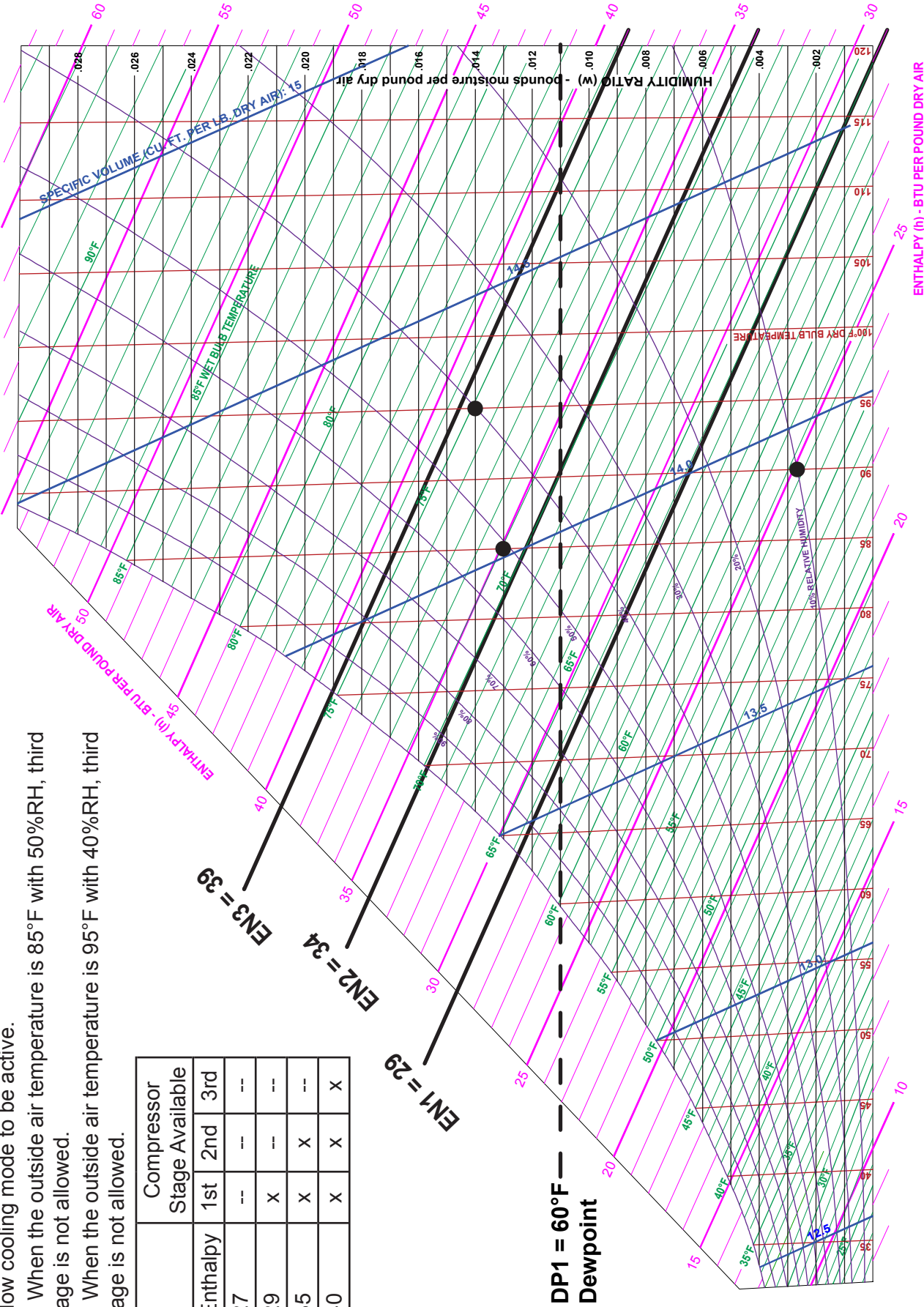
- ❖ Stage 1 compressor is locked out when the outdoor air enthalpy is below EN1 settings.
- ❖ Stage 2 compressor is locked out when the outdoor air enthalpy is below EN2 setting.
- ❖ Stage 3 compressors are locked out when the outdoor air enthalpy is below EN3 settings.

FIGURE 6 - Optional humidity transmitter measures outdoor air humidity and controls compressor operation based on enthalpy settings EN1, EN2, EN3

Example:

- 1) When the outside air temperature is 90°F with 10%RH, the enthalpy is ~27. The standard enthalpy setting EN1 (29) will not allow cooling mode to be active.
- 2) When the outside air temperature is 85°F with 50%RH, third stage is not allowed.
- 3) When the outside air temperature is 95°F with 40%RH, third stage is not allowed.

Enthalpy	Compressor Stage Available		
	1st	2nd	3rd
27	--	--	--
29	X	--	--
35	X	X	--
40	X	X	X



Dehumidification (Reheat)

Reheat control is enabled based on the outdoor dewpoint temperature setpoint (dP1). If the outside air dewpoint is above the setpoint (dP1 = 60°F), BO-4 will be ON activating the reheat system. The reheat circuit adds 7 to 17°F to the discharge air temperature after it leaves the main cooling section of the unit. The reheat control output will be OFF based upon any of the following conditions:

1. The space temperature sensor calls for the unit to provide space cooling. In this mode the reheat is OFF. Once space cooling (SSP) is satisfied, reheat can restart.
2. The unit is equipped with a space humidistat with setpoint control. If the humidistat is not calling for dehumidification, thus the switch is open to BI-2, the reheat circuit is OFF.
3. If the outdoor air temperature is below the low ambient lockout (roL), the reheat circuit will be OFF. The roL default value is 65°F.
4. If the outdoor air temperature is above the high ambient lockout (roH), the reheat circuit will be OFF. The roH default value is 120°F.
5. If the unit is in unoccupied mode and the (rHE) reheat value is NO, reheat is not allowed in the unoccupied mode. If the rHE default value is YES, reheat is allowed in the unoccupied mode based upon space humidistat. If a space humidistat is not installed, the contact is wired closed thus allowing reheat in the unoccupied mode.
6. If the outdoor air temperature sensor fails, cooling, reheat, and heating equipment are not allowed to operate.

Control Adjustment Guidelines for a Reheat System

The discharge air temperature can be adjusted when the reheat point is ON. When reheat is ON, the discharge air temperature can be reset as follows.

$$dCH = dCH + rSP$$

NOTE: Does not apply to Option AU25 reheat.

NOTE: If outdoor reset is used, dCL must replace dCH)

NOTE: It is important that rSP be used when the dCH value is lower than 65°F. Because the reheat system adds 7 to 17°F to reheat, a dCH setpoint of 55°F must discharge 40°F from the main coil to maintain a 55°F setpoint value. This low discharge temperature may damage the unit.

There are many ways to combine settings based on each application. The type of reheat application will determine the setting for **dCH** and **rSP**. The typical application requires rSP to be 0°F when dCH is 70°F. The unit will discharge a dewpoint of 52 to 55°F at 70°F discharge air temperature.

EXAMPLE 1) Neutral Air Application (corridor or kitchen makeup air)

Since the unit reheat override is based primarily on space temperature, the reheat override parameter roH will be adjusted outside of operating range. Below are the proposed settings:

dP1 = 58; reheat enabled above 58°F dewpoint

roL = 58; reheat compressor locked out below 58°F dry bulb

oC1 = 65; cooling compressors locked out below 65°F (Assumes reheat pump alone is adequate.)

En1 = 29; 1st stage cooling compressor enabled above 29 btu/lb

oH1 = 70; Heating locked out above 70°F ambient

dCH = 70; cooling duct discharge air setpoint with rSP = 0 (use dCL with outdoor reset)

rSP = 0; Regardless of ambient dewpoint, the duct discharge air temperature setting is 70°F.

roH = 115; High ambient reheat override is set where reheat is not disabled.

rCP = 55; if the space temperature exceeds the cooling setpoint, reheat is disabled and discharge air is supplied at 55°F.

EXAMPLE 2) Neutral Air Application (Space Temperature Override – RH input Jumpered and Reheat Override)

If space sensible loads increase with outdoor ambient dry bulb, it may be preferred to override reheat mode by using the **roH** reheat override in conjunction with space temperature override. Below are the proposed settings:

dP1 = 58; reheat enabled above 58°F dewpoint

roL = 58; reheat compressor locked out below 58°F dry bulb

oC1 = 68; cooling compressors locked out below 68°F (Assumes reheat pump alone is adequate.)

En1 = 29; 1st stage cooling compressor enabled above 29 btu/lb

oH1 = 72; Heating locked out above 72°F ambient

dCH = 62; cooling duct discharge air with reheat overrides (use dCL with outdoor reset)

rSP = 8; The duct discharge air temperature setting with reheat is 70°F (62 + 8).

roH = 92; Reheat mode is disabled over 92°F ambient dry bulb with a supply air temperature of 62°F.

rCP = 55; if the space temperature exceeds the cooling setpoint, reheat is disabled and discharge air is supplied at 55°F.

In this mode, if the dewpoint is below 58°F, the unit will discharge 62°F air to the space in neutral air mode. If the dewpoint rises above 58°F, the unit will discharge 70°F air to the space in neutral air mode. If the space requires cooling, the unit will discharge 55°F air to the space until the space setpoint is satisfied.

NOTE: If AU25 option is installed, reheat is only available when the first stage compressor is running. Option AU25 cannot enable a compressor.

Unit Status Level

> Press FX05 “Enter Key” for 5 seconds

The Unit Status Mode is helpful in determining the actual control state.

To enable this menu, hold the “Enter” key for 5 seconds. The initial screen text will appear as “HSP” (working heating setpoint). Scroll through the parameters (listed below) using the “Up” or “Down” arrow keys. If you would like to view a parameter setpoint, select the desired parameter and push the “Enter” key once.

HSP	Active Heating Discharge Air Setpoint (Press Enter to view setpoint.)	
	This is a monitor only parameter used to view the current Working Heating Setpoint. This could be the boost setup or occupied/unoccupied setpoint and reset based on outdoor dry bulb.	
CSP	Active Reheat or Cooling Discharge Air Setpoint (Press Enter to view setpoint.)	
	This is a monitor only parameter used to view the current Working Reheat or Cooling Setpoint. This could be the boost setup or occupied/unoccupied setpoint and discharge air reset based on outdoor dry bulb.	
HC1	Unit Cooling/Heating Status (Press Enter to view status.)	
	OFF – No active thermal outputs except blower or Reheat Pump	H3 – Unit in the 3rd Heating Stage
	PH1 – Pre-purge heating stage 1	C1 – Unit in the 1st Cooling Stage
	H1 – Unit in the 1st Heating Stage	C2 – Unit in the 2nd Cooling Stage
	H2 – Unit in the 2nd Heating Stage	C3 – Unit in the 3rd Cooling Stage
oC1	Occupied/Unoccupied Status (Press Enter to view status)	
	oCC = Occupied ; oFF = Unoccupied; PuP = PreMorning Pull Up; nSu = Night Set Up; nSb = Night Set Back	
RS1	Discharge Air Control Mode (Press Enter to view Discharge Air Control Mode.)	
	SAC – Space Air Control – Call for Cooling from space	
	SAH – Space Air Control – Call for Heating from space	
	DAC – Duct Air Control – No Call for Cooling from space	
	DAH – Duct Air Control – No Call for Heating from space	
RHS	Active Room Heating Setpoint (Press Enter to view setpoint)	
RCS	Active Room Cooling Setpoint (Press Enter to view setpoint)	

FX05 Commissioning Parameters Level

Press and hold the Enter Key for 10 Seconds. These values are “changeable” which means that they are pieces of information that can be viewed and changed. The values will affect the way the sequence operates.

Press the Up or Down arrow keys to scroll through the names. Press the Enter Key to view a value; then use the Up or Down arrows to increase or decrease that value. Finally, press the Enter Key to save the change. If the Enter Key is not pressed, the change will not be saved.

NOTES: *Parameter is valid with a reheat system (Model RDA, RDDA, REDA or a Model RCA, RDCA, or RECA with optional subcooling reheat Option AU25).

Display Name	Control Variable Description	Default Value	Range
SSP	<u>SSP - Space Cooling Temperature Setpoint</u> This is the setpoint above which the unit will begin to initiate space cooling. As the space temperature increases above this value, the space cooling discharge air setpoint will become active (rCP).	75°F	68° - 130°F
HSo	<u>HSo - Space Heating Setpoint Offset</u> This value is subtracted from the SSP value to calculate the space heating setpoint. (Example: $SSP - HSo = 75^\circ - 5^\circ = 70^\circ$.) As the space temperature drops below 70°F, the space heating discharge air setpoint will become active (rHP).	5°F	1° - 30°F
SCP	<u>SCP - Space Cooling Proportional Band</u> This value determines when the unit switches between space cooling and neutral air control. When the space temperature rises or falls greater than this amount, the unit switches states. (Examples: $SSP + SCP = 75^\circ + 1.8^\circ = 76.8^\circ$, space cooling mode. $SSP - SCP = 75^\circ - 1.8^\circ = 73.2^\circ$, neutral air cooling mode.) NOTE: The greater the number of air changeovers in the space per hour, the greater the prop band setting. Typically, setting is no larger than two with less than six changeovers per hour.	1.8°F	1° - 8°F
SHP	<u>SHP - Space Heating Proportional Band</u> This value determines when the unit switches between space heating and neutral air control. When the space temperature rises or falls greater than this amount, the unit switches states. (Examples: $SSP - HSO + SHP = 70^\circ + 1.8^\circ = 71.8^\circ$, neutral air heating mode. $SSP - HSO - SHP = 70^\circ - 1.8^\circ = 68.2^\circ$, space heating mode.) NOTE: The greater the number of air changeovers in the space per hour, the greater the proportional band setting. Typically, setting is no larger than two with less than six changeovers per hour.	1.8°F	1° - 8°F
dCL	<u>dCL - Outdoor Reset Option – Duct Discharge Air Temperature Setpoint</u> When used in conjunction with dCH, OC2, and OC3, the neutral discharge air cooling setpoint will be linearly adjusted based on the outdoor air temperature. If dCL is less than dCH (duct discharge cooling setpoint), the controller will reset the discharge air temperature setpoint from the low value of dCL to the high value of dCH as the outdoor air goes from the high value of OC2 to the low value of OC3. The default value disables this feature.	80°F disabled	49° - 115°F
rCP	<u>rCP - Room (space) Discharge Air Cooling Temperature Setpoint</u> When a space temperature sensor is installed and the temperature in the space increases above the space cooling setpoint (SSP) through the space cooling prop band (SCP), the rCP value will become the active discharge air setpoint. The value of rCP will not be used by the unit if a space temperature sensor is not used.	55°F	49° - 115°F
CPP	<u>CPP - Cooling Discharge Air Prop Band</u> The value of CPP is divided in half around the value of dCH (duct discharge cooling setpoint). When the discharge air temperature goes above $dCH + \frac{1}{2} CPP$, a stage of cooling is activated. When the discharge air temperature goes below $dCH - \frac{1}{2} CPP$ value, a stage of cooling is deactivated.	10°F	2° - 40°F
rSP	<u>rSP - Reheat Setpoint Offset</u> If the unit is equipped with reheat and conditions are such that reheat is being called for, the neutral air cooling setpoint value will increase by rSP amount. This value should not be used unless the neutral air discharge air temperature setpoint (dCH) is lower than 65°F.	0°F	0° - 30°F

Display Name (cont'd)	Control Variable Description (cont'd)	Default Value	Range
	<u>rHP - Room Discharge Air Temperature Heating Setpoint</u> When the temperature in the space decreases below the space heating setpoint (SSP-HSo) through the space heating prop band (SHP), the rHP value will become the active discharge air setpoint. The value of rHP will not be used by the unit if a space temperature sensor is not used.	80°F	45° to 120°F
	<u>dHH - Outdoor Reset Option – Duct Discharge Air Temperature Heating Setpoint</u> When used in conjunction with dHL, OH2 and OH3, the neutral discharge air heating setpoint will be adjusted based on the outdoor air temperature. If dHH is higher than dHL, the controller will reset the discharge air temperature setpoint from the low value of dHL to the high value of dHH as the outdoor air goes from the high valve of OH2 to the low value of OH3. The default value disables this feature.	55°F	45° to 120°F
	<u>HPP - Heating Discharge Air Proportional Band</u> The value of HPP is divided in half around the value of dHL (duct discharge heating setpoint). When the discharge air temperature goes below dHL + ½ HPP, a stage of heating is activated. When the discharge air temperature goes below dHL – ½ HPP value, a stage of heating is deactivated.	10°F	4° to 30°F
	<u>Hdb - Space Heating Dead Band</u> The space heating dead band is a value around the heating setpoint at which nothing will occur – hence “dead band.” For instance, if the space heating setpoint is 70°F and the Space Heating Dead Band has a value of 2°F, then the temperature in the space drops below 70° (SSP - HSO - ½ HdB) to 67.2° before the unit will switch to space heating control. Likewise a value of 72.8 will switch back to neutral air heating control. This parameter should only carry a value for difficult tuning applications.	0°F	0° to 2°F
	<u>LSP - Low Limit Freeze Protection Setpoint</u> If the discharge air temperature sensor senses discharge air temperature below the value of LSP for 600 seconds, the blower will be disabled and the outside air damper will close. The control will reset when the discharge air sensor senses discharge air 30° above the value of LSP. If this sequence occurs three times within one hour, the control will go to continuous lockout.	36°F	-40° to 40°F
	<u>oC1 - Cooling Mode Lockout – Ambient Dry Bulb</u> If the outdoor air temperature is less than the value of oC1, cooling mode will be disabled. When the outside air temperature rises above oC1, the unit will be in cooling mode.	68°F	58° to 130°F
	<u>oH1 - Heating Mode Lockout – Ambient Dry Bulb</u> If the outdoor air temperature is greater than the value of oH1, mechanical heating will be disabled. When the outside air temperature falls below oH1, the unit will be in heating mode.	62°F	20° to 105°F
	<u>dP1 - Reheat Enabled Setpoint – Ambient Dewpoint</u> At dewpoints below this value, reheat will not be enabled	60°F	52° to 80°F
	<u>dCb - Discharge Air Cooling Deadband</u>	9°F	4° to 20°F
	<u>roH - High Ambient Heat Override – Dry Bulb</u> If the outdoor air temperature is above this setpoint, the reheat will not be enabled.	120°F	60° – 120°F
	<u>roL - Low Ambient Reheat Override – Dry Bulb</u> If the outdoor air temperature is below this setpoint, the reheat will not be enabled.	65°F	54° – 75°F
	<u>En1 - 1st Stage Enthalpy Cooling Reference Lockout</u> If the outdoor enthalpy is below this value, no cooling mode is allowed. Above this value, 1st, 2nd, or 3rd stage may be active.	29°	15 - 40
	<u>En2 - 2nd Stage Enthalpy Cooling Lockout</u> Provides an enthalpy differential to the En1 setting (add this differential to the En1 value). If outdoor enthalpy is below this value, the 2nd or 3rd stage cooling control is not allowed.	5°	0 - 20

(continued)

FX05 Commissioning Parameters Level (cont'd)

Display Name (cont'd)	Control Variable Description (cont'd)	Default Value	Range
En3	<u>En3 - 3rd Stage Enthalpy Cooling Lockout</u> En3 provides an enthalpy differential to the En2 setting (add this differential to the En2 value). If outdoor enthalpy is below this value, the 3rd stage of cooling is not allowed.	5°	0 - 20
nSU	<u>nSU - Night Setup - Cooling</u> This value is added to the space cooling setpoint (SSP) for unoccupied periods. If the cooling setpoint (SSP) is 75° during the occupied mode, and Nsu is 9, then during unoccupied modes, the cooling setpoint will be 84°F (75 + 9).	9°F	0 - 35
nSb	<u>nSb - Night Set Back – Heating</u> This value is the amount subtracted from the space heating setpoint in the unoccupied mode. SSP - Hso - nSb ~ 75 - 5 - 9 = 61°F space heating setpoint in the unoccupied mode.	9°F	0 - 35
iCt	<u>iCt - Heating Integration Constant</u> (requires room sensor) This adjustable parameter defines the integration time used during heating. iCt has a default value of zero and is rarely adjusted.	0	0 - 999 seconds
dAo	<u>dAo - Space Sensor Calibration</u> (requires room sensor) Allows a small sensor offset when space wires add significant resistance.	-1	Used to offset wire resistance.
rHE	<u>rHE - Reheat Enabled or Disabled during Unoccupied Mode</u> Yes or No input. Default to “No”, unless room is equipped with an RH input or controller. “Yes” will allow only the reheat pump to be enabled upon a rise in space RH.	Yes	Yes or No
PUt	<u>PUt - Pull Up Time - Heating</u> (requires room sensor) Time frame allows for fast heating of space when transitioning from unoccupied to occupied modes. The unit will switch to occupied mode the selected number of minutes before the scheduled time.	15	0 to 15 minutes
dCH	<u>dCH - Standard Discharge Air Temperature Setpoint</u> (Primary Setpoint) . If the reset option is disabled, the dCH becomes the primary neutral air cooling discharge air temperature setpoint. If the reset option is active, this is the maximum cooling value based on outdoor air conditions. The discharge air temperature will not change to a higher value than dCH regardless of the outside air temperature. .	70°F	50 - 115°F
dCL	<u>dCL - Outside Air Reset Option</u> The value of the neutral discharge air cooling setpoint when the outside air temperature is at its warmest value to allow maximum cooling. The discharge air temperature will not change to a lower value than dCL regardless of the outside air temperature. The default value disables reset functionality.	80°F	49 - 115°F
oC2	<u>oC2 - Outdoor Reset Dry Bulb Cooling – High Setting</u> The value of the outside air temperature corresponding to the dCL coldest cooling setpoint.	60°F	20 - 70°F
oC3	<u>oC3 - Outdoor Reset Dry Bulb Cooling – Low Setting</u> The value of the outside air temperature corresponding to the dCH warmest cooling setpoint.	20°F	-40 - 65°F
dHL	<u>dHL - Standard Discharge Air Setpoint (Primary Setpoint)</u> If the reset option is disabled, the dHL becomes the primary neutral air heat discharge air setpoint. dHL is the value of the discharge air heating setpoint when the outside air temperature is at its warmest value to allow minimum heating. The discharge air temperature will not change to a lower value than dHL regardless of the outside air temperature.	70°F	45 - 120°F
dHH	<u>dHH - Outdoor Air Reset Option</u> dHH is the value of the discharge air heating setpoint when the outside air temperature is at its coldest value to allow maximum heating. The discharge air temperature will not change to a higher value than dHH regardless of the outside air temperature.	70°F	50 - 115°F
oH2	<u>oH2 - Outdoor Reset Dry Bulb Heating – High Setting</u> The value of the outside air temperature corresponding to the dHL low heating setpoint value.	60°F	20 - 70°F

Display Name (cont'd)	Control Variable Description (cont'd)	Default Value	Range
883	oH3 - Outdoor Reset Dry Bulb Heating – Low Setting The value of the outside air temperature corresponding to the dHH high heating setpoint value.	20°F	-45 - 65°F

Time Clock

(Option BHB1 required.)

Current Status

To view the current time clock status on the FX05, hold the “Enter” and “Function” key for 5 seconds. The initial display text will appear as “Uni” or Units of measure. The time clock variables are only valid if a time clock card (Option BHB1) is installed in the controller.

Display	Description	Value
Uni	Unit of Measure	°C or °F
TS	Time Clock Status - Press Enter to view	OFF= not active, ON = Active, URL = card not installed.
Add	Lon or N2 Network Address (Option BHB2 or BHB3 required)	
Hr	Current Time Clock - Hour	0-23 Hours (Military Time)
in	Current Time Clock - Minutes	0-59 Minutes
dAy	Current Time Clock - Day	Sunday thru Saturday -- = 0 thru 7 value

Time Clock Variables

To access the time clock variables, hold the “Enter” key for the 10 seconds. (The initial screen text will appear as “SSP”.) Use the “Up” or “Down” arrow key to scroll through the parameters. If you would like to view a parameter setpoint, select the desired parameter and push the “Enter” key once. Use the “Up” or “Down” arrow key to change the parameter. To exit, press “enter” (to accept the value displayed) and “enter” again to exit. A description for each of the field adjustable time clock parameters is shown below.

Variable Displayed	Description	Default Value	Range
H1	Defines the hour in which to start the occupied cycle from Monday to Friday	6	0 - 23
t1	Defines the minute in which to start the occupied cycle from Monday to Friday	0	0 - 59
H2	Defines the hour in which to stop the occupied cycle from Monday to Friday	18	0 - 23
t2	Defines the minute in which to stop the occupied cycle from Monday to Friday	0	0 - 59
H3	Defines the hour in which to start the occupied cycle on Weekends	6	0 - 23
t3	Defines the minute in which to start the occupied cycle on Weekends	0	0 - 59
H4	Defines the hour in which to stop the occupied cycle on Weekends	18	0 - 23
t4	Defines the minute in which to stop the occupied cycle on Weekends	0	0 - 59

Alarm Displays

When an alarm is triggered, one of the following codes will flash on the FX05 display window.

888	AP - Air Proving
888	FS - Low Limit Freeze Protection Lockout
888	St - Discharge Air Temperature Sensor Failure
888	ot - Outdoor Air Temperature Sensor Failure
888	EE - FX05 Controller Low Voltage Lockout
Phase Loss Switch (optional) - Nothing Displayed (Lockout)	

Alarm Displays (cont'd)

AP – Air Proving - When the blower is called to be ON (point BO-1), the blower starts, and the blower status switch must close proving blower operation. If the blower status does not show blower operation within 180 seconds, the unit shuts down. The unit must be restarted by cycling power to the FX05 controller or opening/closing the “Unit ON/OFF” switch (point BI-3).

During normal operation after initial blower startup, if the blower status input shows open for more than three seconds, the unit will shut down cooling and heating equipment. If the AP input continues to remain open for an additional 180 seconds, the blower is shutdown, and the FX05 controller will be in lockout mode. The controller can be reset by cycling power to the FX05 controller or toggling the BI-3 system on/off switch. If the blower status switch is made before the unit reaches lockout mode, cooling and heating operation will restart.

Troubleshooting - A flashing AP is caused due to an open circuit on Terminals 48 and 46. Check the air proving switch to ensure it is operational (be sure the blower cabinet door is closed). If equipped with an Option BF15 phase loss monitor (in the high voltage box), check the indicator light. The green light indicates the unit is in phase. Red light indicates out of phase. Recycle power to the unit to clear out the alarm.

FS – Low Limit Freeze Protection Lockout - When the blower is called to be ON and the discharge air temperature is below the low limit freeze setpoint (LSP = 36°F) for 600 seconds, the unit is shutdown (blower OFF). The display will flash “FS”. When the discharge air rises above the low limit freeze setpoint plus 30°F, the low limit freeze lockout is disabled, allowing the unit to operate. Three (3) consecutive lockouts within one hour will result in a continuous lockout state. The FX05 power must be cycled before operation can continue. Toggling the BI-3 input will **not** reset the unit.

Troubleshooting - A flashing FS indicates the unit has encountered a low discharge air temperature (below 36°F) for over 7 minutes. Investigate the heating system and recycle the power to clear out the alarm. Verify that the gas valve is open and the heating board is operational.

Sensor Failures (flashing “ot” or “St”) - If a temperature sensor value reads (999) or open circuit, the sensor is in a failed condition. If the discharge air dry bulb sensor fails, the controller will lock out the unit. No mechanical equipment will be allowed to run. The display will flash “St”. Installing or replacing the sensor will allow immediate restarting of the equipment. A failed outdoor air sensor (flashing “ot”) will lock out mechanical cooling and heating operation. However, the blower will continue to operate.

Troubleshooting - A flashing St means the discharge air sensor may not be connected (check for two white wires on terminals 54 and 57). To check the sensor for failure, remove the two wires and check resistance against temperature (See chart on page 21). Make sure that the sensor is properly located in the ductwork.

A flashing “ot” means the outdoor air sensor may not be connected or has failed. Check terminals 54 and 56 and sensor operation.

“EE” – Controller Low Voltage Lockout - If the FX05 controller power drops below the minimum level, the display will read EE and all controller functions will be OFF. The controller will restart when power level returns to normal.

Phase Loss Switch - No Display (Lockout) - (Option BF14 or BF15 is required.) If the phase monitor detects a poor power condition, the phase loss switch will cut power to the control circuit. The phase loss switch will automatically reset when the poor power condition is no longer detected.

Auto Test Mode

Press both the enter and down arrow key for three seconds (press the enter key an instant prior to pressing the down arrow key). Controller flashes “tst” and the blower is enabled. No other action needs to be taken. The unit will cycle all outputs and automatically skip to the next mode in one-minute intervals. The outputs are sequenced as follows:

1. Fan/Blower (always enabled)
2. 1st stage heat (H1)
3. 2nd stage heat (H2)
4. Reheat output (rH) (*Reheat output applies to Models RDA, RDDA, REDA with standard reheat and Models RCA, RDCA, or RECA with Option AU25 Supplemental Reheat Coil*)
5. 1st stage cooling (C1)
6. 2nd stage cooling (C2)

Upon completion, unit will exit test mode and return to the auto mode state. If preferred, the user can override the auto test mode by pressing the up arrow key for approximately three seconds (hold the up arrow key down until the unit shifts to the next mode) to jump from mode to mode. (NOTE: While holding the key down button, the display will temporarily show sensor values.)

In this test sequence, the output is energized for 15 minutes or until the up arrow key is pressed. If desired, pressing the up arrow key for approximately one second will extend the current test mode by 15 minutes (total of 30 minutes). The user may exit test mode at any time by pressing the down arrow key for 3 seconds.

Sensor Data and Application

Optional Space (Wall-Mounted) Sensors

Space Temperature Sensor - The wall mounted sensor should be located on an interior wall (avoid direct placement in the sun), the wall opening should be insulated to prevent cold drafts and the sensor located for sampling representative space air.

Option CL53 is a wall-mount space sensor control that provides:



- Space temperature sensing
- Occupied (boost) and unoccupied override button
- LED fan alarm status (except on heat systems with gas modulation).
- NOTE: Setpoint dial on CL53 control is inactive with Option D12

FIGURE 7 - Optional Wall-Mount Space Air Sensor, Option CL53, P/N 207239

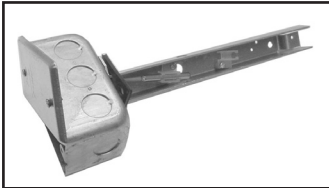
FIGURE 8 - Wall-Mounted Dehumidistat, Option CL47, P/N 177231



Room RH Input with Reheat Mode - Since reheat is already enabled based on outdoor dewpoint, a room RH control is typically not required for rooftops that condition 100% outside air. A wall mounted RH control (**FIGURE 8**) is typically specified when internal latent loads vary considerably, the rooftop is applied with return air, or an unoccupied space RH control is desired. When applied with an RH input, reheat is enabled if space RH is above setpoint and the space cooling load is satisfied. During unoccupied mode, a rise in room RH will enable the dehumidification and reheat circuit. If there is no call for space cooling, only the reheat pump is enabled (cooling compressors are locked out).

Sensor Data and Application (cont'd)

FIGURE 9A - Discharge Air Sensor, P/N 206112, and Holder, P/N 115850, for Ductwork Installation



Discharge/Duct Sensor

All systems have a discharge air sensor. The discharge sensor element on cooling only or cooling with reheat systems (Models RCA/RDA) is attached to the discharge opening of the system. On systems with a heat section (Models RDCA/RDDA/RECA/REDA) or Models RCA and RDA with Option DU1, the sensor is temporarily installed for heater startup but must be relocated to the ductwork .

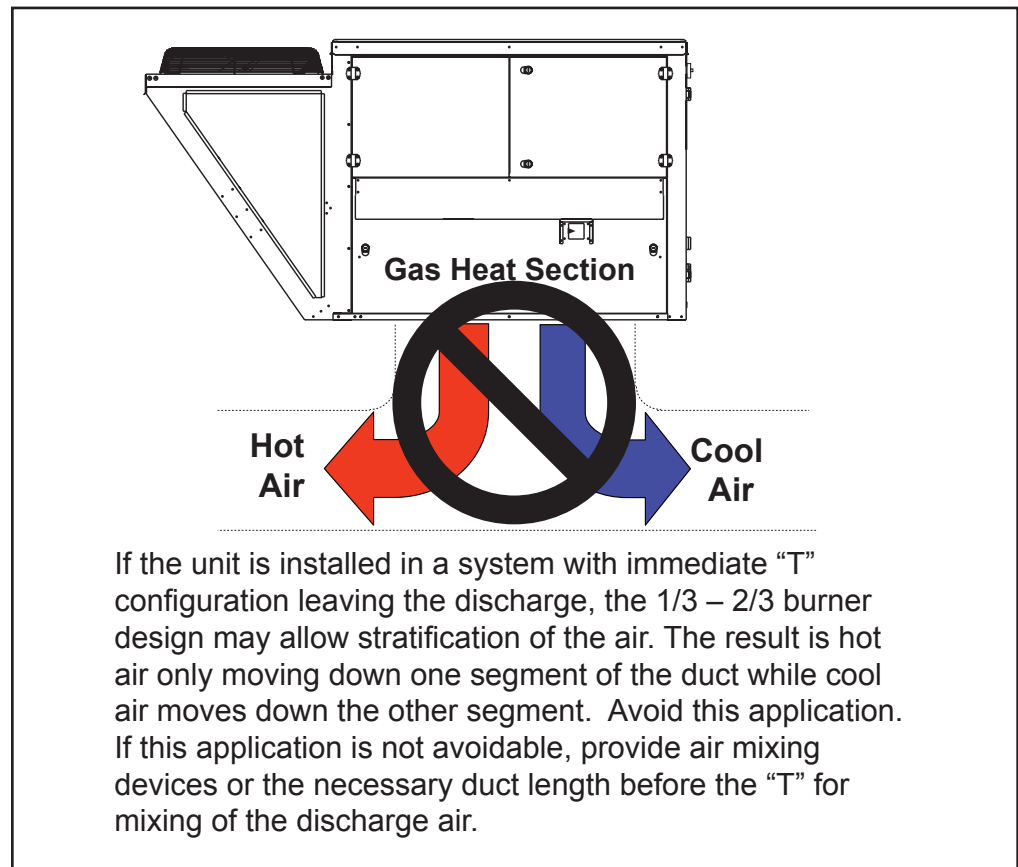
When installed in the ductwork the sensor must be housed in a mixing tube which is attached to a 2x4 electrical box. The assembled parts (See **FIGURE 9A**) are shipped in the control compartment. Read the instructions below and follow carefully to relocate the discharge air temperature sensor.

Discharge Air Temperature Sensor Location - Apply to all Models RDCA/RDDA/RECA/REDA and Models RCA/RDA with Option DU1

Placement of the discharge air sensor in the ductwork is critical to the correct operation of a MAPS system in both the cooling and heating modes.

Due to the split burner and dual heat exchanger features of the MAPS gas heat section, duct configuration and sensor location is extremely important in the heating mode when equipped with a gas heat section. The gas heat section of the MAPS unit is designed to conserve fuel by only firing a portion of the burner or one of the dual heat exchangers as required to supply the demand for heat. Improperly locating the sensor can result in poor control of discharge temperature.

FIGURE 9B - On units with a gas heat section, avoid an immediate "T" in the discharge duct



Sensor Data for Johnson A99 Series Temperature Sensors - Resistance vs Temperature (applies to both discharge and outside air sensor)

°F	°C	Ohms
-40	-40	613
-31	-35	640
-22	-30	668
-13	-25	697
-4	-20	727
5	-15	758
14	-10	789
23	-5	822
32	-0	855
41	5	889
50	10	924
59	15	960
68	20	997
77	25	1035
86	30	1074
95	35	1113
104	40	1153
113	45	1195
122	50	1237
131	55	1279
140	60	1323
149	65	1368
158	70	1413
167	75	1459
176	80	1506
185	85	1554
194	90	1602
203	95	1652
212	100	1702
221	105	1753
230	110	1804
239	115	1856
248	120	1908

Maximum Sensor Wire Length for less than 1°F Error

Wire Gauge	Maximum Sensor Wire Length	
	Feet	Meters
14	800	244
16	500	152
18	310	94
20	200	61
22	124	38

NOTE: Wire supplied with the sensor is 22 AWG.

Instructions for Installing Sensor in Discharge Duct

- Determine the appropriate distance from the unit.** Be sure there is sufficient distance from the outlet to have a good mixture of discharge air temperature. According to the latest edition of AMCA Standard 201, in straight ducts, the air is typically well mixed a minimum of five equivalent duct diameters from the discharge of the unit with equivalent duct diameter defined as equal to the square root of $4AB/3.14$. "A" and "B" are the duct cross-sectional dimensions.

Example: Supply ductwork cross-sectional dimension is 24" x 12" (610mm x 305mm).

$$5 \times \sqrt{\frac{4 \times 12 \times 24}{3.14}} = 96"$$

$$5 \times \sqrt{\frac{4 \times 305 \times 610}{3.14}} = 2435\text{mm}$$

Locate the sensor a minimum of 96" (2435mm) from the outlet of the unit.

Important NOTES: If the length of the discharge duct is less than 12 ft (3.7M), a mixing vane is recommended for mixing the discharge air.

Do not mount the sensor in the ductwork after a split in the supply as that will cause loss of control in the duct that does not house the sensor.

- Determine the location and orientation of the sensor holder assembly.**

The position of the sensor holder in the duct is also important. In horizontal ductwork, locate the sensor assembly in the top, middle of the duct with the sensor holder extending vertically down into the center of the airstream. In vertical ductwork, locate the sensor assembly in the middle of the side of the duct that corresponds with the top middle of the discharge outlet. The sensor holder will extend horizontally into the center of the airstream.

Push the sensing element into the clip attached to the inside of the sensor holder. Turn the metal holder so that the element will be shielded from direct airflow and will sense the temperature in the airstream as it flows through the holes in the sensor holder.

At the location selected, mark the diamond-shaped hole required for the sensor holder. Cut the hole no larger than required for the holder, approximately 1" x 1" (25mm x 25mm).

In the electrical box portion of the sensor holder, determine where the sensor wire should come through the box and remove the knockout at that location.

- Attach the sensor holder assembly.** Slide the sensor holder into the opening in the ductwork. Using four field-provided No. 6 sheetmetal screws, attach the box to the ductwork. Attach a field-supplied cable connector to the box, run the sensor wire out, and attach the cover to the box.
- Run the sensor wire to the unit.** Digital control inputs are low-current, resistance-based signals. The manufacturer recommends for optimum temperature control performance that the analog and digital inputs (zone sensors, discharge air sensors, etc.) that are connected to the FX05 controller be routed to the unit in one of the following manners:
 - In separate field-supplied conduits, isolated from 24VAC controls and line voltage power to the unit,

OR

 - If the FX05 wires are to be run in the same field-supplied conduit as the 24 VAC control wiring, the FX05 wiring must be completed using shielded cable and bundled separately from 24 VAC control wiring. The shield must be drained at the unit and taped on the opposite end.

Sensor Data and Application (cont'd)

Outside Air Sensors

FIGURE 10A - Outside Air Dry Bulb Sensor, P/N 206112



FIGURE 10B - Outside Air Relative Humidity Transmitter, Option DT5, P/N 206081



Wall-Mounted Sensor and Communication Wire Installation

Control Wiring

Outside Air Dry Bulb Sensor and Dewpoint or Enthalpy Permissive Control

The outside air sensor (P/N 206112) for the FX05 is the same as the discharge sensor. The Johnson A99 Series Temperature Sensor Chart on page 21 applies to both the discharge and outside air sensors.

If the application uses mixed air (return and outside air), the outside air temperature sensor and optional humidity transmitter (**FIGURE 10B**) must be mounted together to sense outdoor air conditions. Verify that factory mounted positions provide acceptable performance.

Sensor Accuracy and Outside Air Changeover Differential

Dry bulb sensor accuracy is within 1°F between 5° and 167°F. Outside air dewpoint is calculated based on a humidity transmitter (**FIGURE 10B**) input. Accuracy is rated as follows:

Humidity transmitter $\pm 3\%$ RH for 20 to 80% RH at 77°F and $\pm 5\%$ RH for 10 to 20% and 80 to 90% RH at 77°F. The dewpoint calculation is within 1% error at sea level. Hysteresis and the rate of moisture change also have an impact on sensor accuracy. Prolonged periods of high humidity (above 95% RH) can affect sensor accuracy (the bias is towards a higher RH reading than actual). *The calculated outdoor dewpoint should be verified on an annual basis to ensure proper changeover operation.*

Before connecting or disconnecting any wires, ensure that all power supplies have been switched off and all wires are potential-free to prevent equipment damage and avoid electric shock.

IMPORTANT: The FX05 control wiring control inputs are low-current, resistance-based signals. The control manufacturer recommends for optimum temperature control performance that the analog and digital inputs (space sensor, discharge air sensors, etc.) that are connected to the FX05 controller be routed to the unit in one of the following manners:

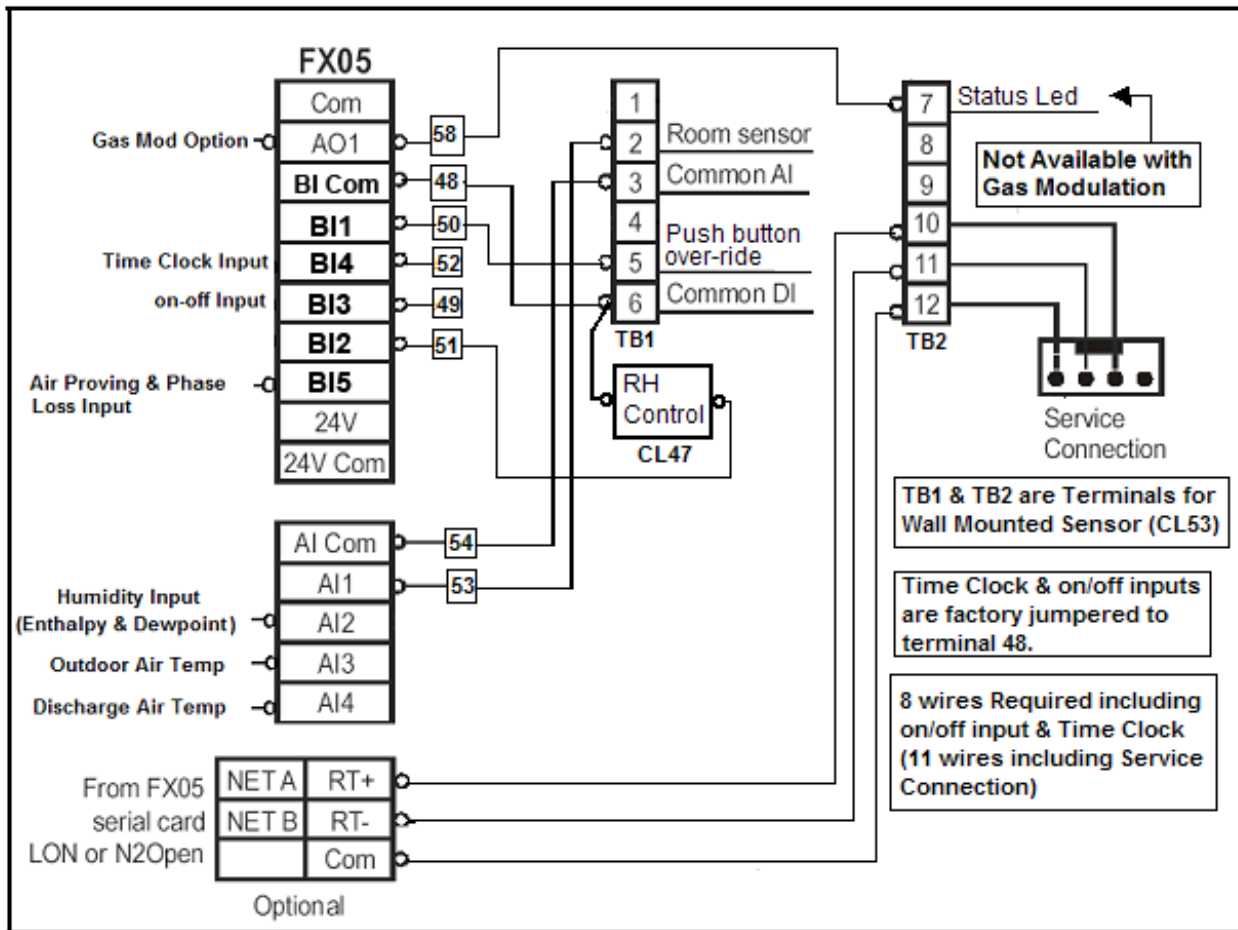
- In separate conduits, isolated from 24VAC controls and line voltage power to the unit.

OR

- If the FX05 wires are to be run in the same conduit as the 24VAC control wiring, the FX05 wiring must be completed using shielded cable and bundled separately from 24VAC control wiring. The shield must be drained at the unit and taped on the opposite end.

Wiring terminations in space sensor, Option CL53 (**FIGURE 7**, page 19), are made at the terminal blocks in the base of the module. Those terminal blocks will accept up to 1.5 mm² (AWG 16) wires. To access the terminals, remove the cover from the base of the module by inserting a pointed tool into the small hole at the center top of the cover. While pressing down gently, pry the cover away from the base. As the two parts separate, remove the tool and continue to pull the cover away from the base until the cover is free.

All wiring to the module is at extra low (safe) voltage and must be separated from line voltage wiring. Do not run wiring close to transformers or high frequency generating equipment such as a lighting ballast. Complete and verify all wiring connections before applying power to the controller connected to the module. Under the lateral cover on the space sensor, service connector pins provide for serial connection if the optional serial card (N2Open or LON) is inserted in the FX05 controller and properly connected to the room command module pins 10, 11, and 12.



Physical Point List

When the FX05 controller is “on” and operational, the FX05 controller will operate the Reznor MAPS air handling equipment based upon the following physical points list and D12 control sequence.

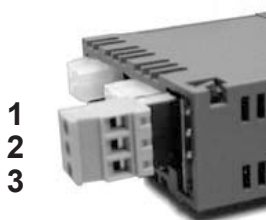
Controller Physical Points List						
Point Description	AI	AO	BI	BO	Elec Component	Comment
Occupied Override Switch (BI-1)			√		CL53 Push button	The wall-mounted temperature sensor with override push button.
Relative Humidity Switch (BI-2)			√		CL 47 Humidistat	
On/Off Switch (BI-3)			√		External dry contact	Factory jumper wire installed
Occupied Switch (BI-4)			√		External dry contact	
Air Proving (BI-5)			√		Differential Pressure Switch	
Space Temperature (AI-1)	√				A99 Thermistor	Resistance = -40 to 100°C
Outdoor Air Humidity (AI-2)	√				Humidity Sensor	0-5V = 0-100% RH
Outdoor Air Temperature (AI-3)	√				A99 Thermistor	Resistance = -40 to 100°C
Discharge Air Temperature (AI-4)	√				A99 Thermistor	
Modulating Gas Valve (AO-1)		√			Gas Valve	0-10V = 100-0% open converted at valve to 3V- 7V ~ 100%-50% open
Fan Start/Stop (Damper) (BO-1)				√	Relay	Triac outputs to mech relays
1st Stage Heating (On/Off) (BO-2)				√	Relay	
2nd Stage Heating (On/Off) (BO-3)				√	Relay	
Reheat (BO-4)				√	Relay	
1st Stage Cooling (BO-5)				√	Relay	
2nd Stage Cooling (BO-6)				√	Relay	

NOTE: AI = Analog Input, AO = Analog Output, BI = Binary Input, BO = Binary Output.

BAS Card Options

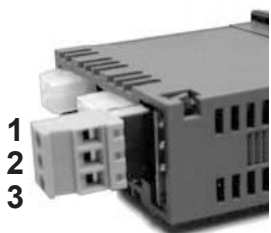
FIGURE 11 - LON Card for FX05 Control, Option BHB3

P/N for Option BHB3 with software for Gas Control Option AG55 is 220747; P/N for Option BHB3 with software for Gas Control Option AG57 is 209877



Pin	Twisted pair
1	NET A
2	NET B
3	COM

FIGURE 12 - N2Open Card for FX05 Control, Option BHB2, P/N 206077



Pin	RS485
1	COM
2	RT-
3	RT+

Lon Card, Option BHB3

The LON Serial Card is a plug-in card that allows the FX05 control to be connected to a LON network. The connection to the network is made by means of the 3 pins on the plug-in connector. The meaning of each pin is shown in **FIGURE 11**.

The network cable must be laid along a low voltage cable path. It must be placed at least 12" (30 cm) from cables carrying high voltages or currents (>230V or >30A). If strong interference fields are expected, the cable must be located at the greatest distance possible from the source. The TP/FT-10 network is designed to support free topology wiring, and will accommodate bus, star, loop or any combination of these topologies. FTT-10A transceivers can be located at any point along the network wiring.

LON network: Doubly-Terminated Bus Topology; Free topology (single terminator required).

Nodes: 64 (if repeaters are not used), FTT-10 nodes only.

Cable Type	Length with FTT-10 devices	
	Bus topology	Free topology
Belden 85102	8858 ft (2700m)	1640 ft (500m)
Belden 8471	8858 ft (2700m)	1640 ft (500m)
Level IV 22 AWG	4593 ft (1400m)	1312 ft (400m)

Power link topology supported.

N2 Open Card, Option BHB2

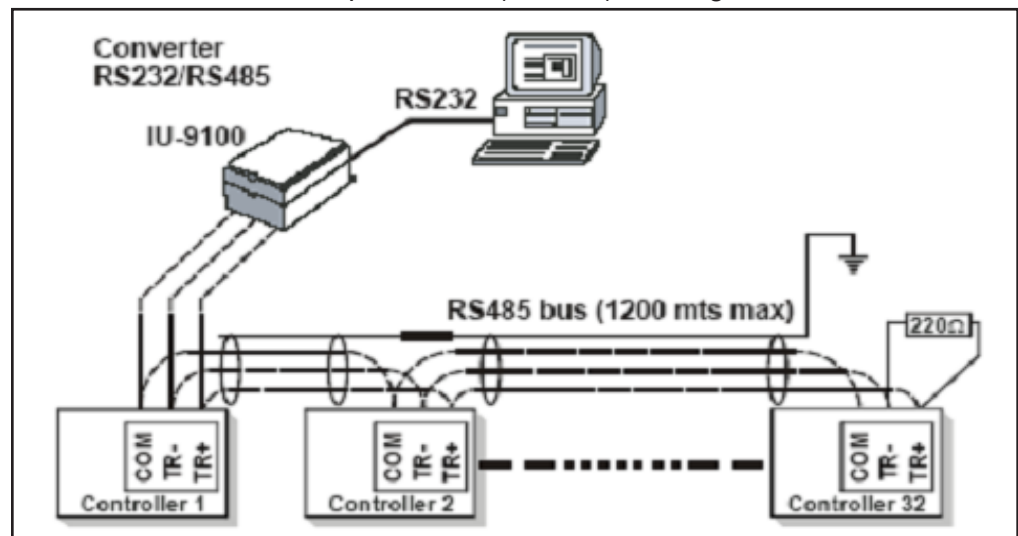
The N2Open serial card is a plug-in, optional card that allows the controllers of the FX05 line to be connected in a N2Open serial network through the RS485 standard. The connection to the network is made by means of the 3 pins on the plug-in connector shown in **FIGURE 12**.

The network cable must be laid along a low voltage cable path. It must be placed at least at 12" (30 cm) from cables carrying high voltages or currents (>230V or >30A). If strong interference fields are expected, the cable must be located at the greatest distance possible from the source. The communication line must be laid out on the multi-drop line principle, i.e. from one controller to the next until the last controller has been connected. The line must be terminated at both ends with a 220 Ohm resistor between RT+ and RT-.

RS485 line: maximum length without repeater: 3937 ft (1200 M), AWG26 twisted pair with shield.

RS232C line: maximum length: 33 ft (10 m)

Devices: maximum of 32 per 3937 ft (1200 m) bus segment



Network Points List

MW025-FX0511-00A-MOD

NVO's	Description	Point
NvoRoomstate		*bd-26
	1 Discharge HTG	
	2 Room Heating	
	3 Disch. Cooling	
	4 Room Cooling	
nvoOccupied		*bd-24
	0 Off	
	1 Occupied	
	2 Warmup	
	3 Night Htg Cycle	
nvoState		*bd-25
	0 Htg/Clg Deadband	
	1 Clg1, y1	
	2 Clg2, y2	
	3 Clg3, y1 + y2	
	6 Htg 1	
	9 Htg2	
	12 Htg3	
nvoOAtemperature	Ambient Dry Bulb	adf-19
nvoDATemperature	Discharge Air Temp	adf-20
nvoWHSP	Working Heat Setpoint	adf-28
nvoWCSP	Working Cooling Setpoint	adf-29
nvodewpoint	Outdoor Dewpoint	adf-30
nvoSpaceTemp	Space Temperature	adf-31
nvoHumidity	Outdoor Humidity %	adf-32
nvoRM_Htg_sp	Room Heating Setpoint	adf-34
nvoRM_Clg_SP	Room Cooling Setpoint	adf-35
nvoEnthalpy	Outdoor Enthalpy	adf-52
nvoRH_Status	Reheat Pump Output	bd-37

NCI 's		Point
nciSetpointT	Duct DA Heating - High (dHH)	adf-1
nciTimeMin	Heating Pull Up Time (PUT)	adi-1
nciSetpointT_1	Duct Discharge Air Cooling - Low (dcl)	adf-2
nciOffsetT	Reheat Offset (RSP)	adf-3
nciSetpointT_19	Reheat DP Lockout (DP1)	adf-14
nciOffsetT_20	Space Heating Offset (HSo)	adf-15
nciKeyTask_35	Unocc Reheat Enabled (rHE)	bd-23
nciCoolSetpt	Space Cooling Setpoint (SSP)	adf-24
nciSetpointT_27	Room Discharge Air Heating Setpoint (rHP)	adf-25
nciSetpointT_28	Room Discharge Air Cooling Setpoint (rCP)	adf-26
nciSetpointT_32	OA Heating Lockout (oH1)	adf-33
nciSetpointT_33	Duct Discharge Air Cooling - High (dCH)	adf-36
nciSetpointT_34	Duct Discharge Air Htg - Low (dHL)	adf-37
nciSetpointT_35	OA Htg Low (oH3)	adf-38
nciSetpointT_36	OA Htg High (oH2)	adf-39
nciSetpointT_37	OA Clg Low (oC3)	adf-40
nciSetpointT_38	OA Clg High (oC2)	adf-41
nciSetpointT_39	Setup Cooling (nSu)	adf-42
nciSetpointT_40	Setback Heating (nSb)	adf-43
nciDifferentialT_6	Space Cooling PropBand (SCP)	adf-45
nciDifferentialT_7	Space Heating Prop Band (SHP)	adf-46
ncisetpointT_43	rOH - Reheat Override - High Dry Bulb	adf-48
nciFloat_49	Enthalpy Setpoint (EN1) - Reference	adf-53
nciFloat_50	Enthalpy Setpoint (EN2) - differential	adf-54
nciFloat_51	Enthalpy Setpoint (EN3) - differential	adf-55
NVI's	Description	Point
nviunitenable.state	On/Off Control	bd-22
nviunitenable.value	Value	adf-21
nviunitsshutdown		bd-35
nviUnitOccupied.value	Occupied state	adf-56
nviUnitOccupied.state	Occupied state	bd-38

Points List Notes:

*When applied with N2open systems, the BD points are multistage and mapped as an Msi point.

Room Discharge air heating setpoint = Supply air temperature to offset heating losses in the space

Room Discharge Air Cooling Setpoint = Supply air temperature to offset heat gains in the space

Duct Discharge Air Cooling Setpoint = Supply air value when there is no call for cooling from the space (typically equals the space temperature)

Duct Discharge Air Heating Setpoint = Supply air value when there is no call for heat from the space (typically equals the space temperature)

Note: Option CL47 (**FIGURE 8**, page 19) room dehumidistat is a mechanical control. Room Rh is not available as a BAS point. For return air applications (with return air dampers), there is no BAS output to override motorized damper operation during unoccupied mode.

WORKSHEET for Adjustable Parameters

(See pages 14-17 for explanations.)

Display	Parameter (BOLD FACE = Typical Adjustments; <u>UNDERLINED</u> = Most Typical)	Adjustable Range	DEFAULT Setting	Field Value
SSP	SSP - <u>SPACE COOLING SETPOINT</u>	68 to 130°F	75°F	
HSo	HSo - <u>SPACE HEATING SETPOINT OFFSET</u>	1 to 30°F (subtract from SSP)	5°F	
SCP	SCP - Space Cooling Prop Band	1 to 8°F (typically no greater than 2 with ACH<6)	1.8°F	
SHP	SHP - Space Heating Prop Band	1 to 8°F (typically no greater than 2 with ACH<6)	1.8°F	
dCL	dCL - Outdoor Reset Option - Duct Discharge Air Cooling Setpoint	49 to 115°F (used with outdoor reset only)	80°F	
rCP	rCP - <u>ROOM DISCHARGE AIR COOLING SETPOINT</u>	49 to 115°F (design discharge air setpoint for space)	55°F	
CPP	CPP - Cooling Discharge Air Prop Band	2 to 40°F	10°F	
rSP	rSP - <u>REHEAT SETPOINT OFFSET</u>	0 to 30°F	0°F	
rHP	rHP - <u>ROOM DISCHARGE AIR HEATING SETPOINT</u>	45 to 120°F (design discharge air setpoint for space)	80°F	
dHH	dHH - Outdoor Reset Option - Duct Discharge Air Heating Setpoint	45 to 120°F (used with outdoor reset only)	55°F	
HPP	HPP - Heating Discharge Air Prop Band	4 to 30°F	10°F	
HdB	HdB - Space Heating Dead Band	0 to 2°F (rarely applied)	0°F	
LSP	LSP - <u>LOW LIMIT FREEZE PROTECTION SETPOINT</u>	-40 to 40°F (to disable, set at -40°F)	36°F	
oC1	oC1 - <u>COOLING MODE LOCKOUT - AMBIENT DRY BULB</u>	58 to 130°F	68°F	
oH1	oH1 - <u>HEATING MODE LOCKOUT - AMBIENT DRY BULB</u>	20 to 105°F (disables heat above this OA dry bulb)	62°F	
dP1	dP1 - <u>1ST STAGE REHEAT ENABLED SETPOINT - AMBIENT DEWPOINT</u>	52 to 80°F	60°F	
dCd	dCd - Discharge Air Heating Deadband	4 to 20°F	9°F	
roH	roH - <u>HIGH AMBIENT REHEAT OVERRIDE - DRY BULB</u>	60 to 120°F (disables reheat above this outside air dry bulb temperature).	120°F	
roL	roL - <u>LOW AMBIENT REHEAT OVERRIDE - DRY BULB</u>	54 to 75°F	65°F	
En1	En1 - <u>1ST STAGE ENTHALPY COOLING REFERENCE LOCKOUT</u>	15 Btu/lb to 40 Btu/lb	29	
En2	En2 - <u>2ND STAGE ENTHALPY COOLING LOCKOUT</u>	0 to 20 Btu/lb (differential add to EN1)	5	
En3	En3 - <u>3RD STAGE ENTHALPY COOLING LOCKOUT</u>	0 to 20 Btu/lb (differential add to EN2)	5	
nSu	nSu - Night Set Up – Cooling	0 to 35°F	9°F	
nSb	nSb - Night Set Back – Heating	0 to 35°F	9°F	
iCt	iCt - Heating Integration Constant	0 to 999 seconds	0	
dAO	dAO - Space Sensor Calibration	Used to offset sensor wire resistance	-1	
rHE	rHE - <u>REHEAT ENABLED OR DISABLED DURING UNOCCUPIED MODE</u>	Yes or No (allows reheat based on RH input)	Yes	
PuT	PuT - <u>PULL UP TIME - HEATING</u>	0 to 15 minutes	15	
dCH	dCH - <u>STD DISCHARGE COOLING SETPOINT</u>	50 to 115°F (discharge duct control without wall sensor or reheat, adjust setting to 55°F))	70°F	
dHL	dHL - <u>STD DISCHARGE HEATING SETPOINT</u>	40 to 120°F	70°F	

(continued)

WORKSHEET (cont'd) for Adjustable Parameters (See pages 14-17 for explanations.)

Display	Parameter (BOLD FACE = Typical Adjustments; <u>UNDERLINED</u> = Most Typical)	Adjustable Range	DEFAULT Setting	Field Value
882	oH2 - Outdoor Reset Dry Bulb Heating - High Setting	20 to 70°F (corresponds to dHL, part load heating)	60°F	
883	oH3 - Outdoor Reset Dry Bulb Heating - Low Setting	-40 to 65°F (corresponds to dHL, design load heat)	20°F	
882	oC2 - Outdoor Reset Dry Bulb Cooling - High Setting	70 to 130°F (corresponds to dCL, design load cool)	75°F	
883	oC3 - Outdoor Reset Dry Bulb Cooling - Low Setting	58 to 85°F (corresponds to dCH, part load cool)	60°F	
888	H1 - Event Schedule 1 - Hour	0 to 23 hours	6	
888	t1 - Event Schedule 1 - Minutes	0 to 59 minutes	0	
888	H2 - Event Schedule 2 - Hour	0 to 23 hours	18	
888	t2 - Event Schedule 2 - Minutes	0 to 59 minutes	0	
888	H3 - Event Schedule 3 - Hour	0 to 23 hours	6	
888	t3 - Event Schedule 3 - Minutes	0 to 59 minutes	0	
888	H4 - Event Schedule 4 - Hour	0 to 23 hours	18	
888	t4 - Event Schedule 4 - Minutes	0 to 59 minutes	0	
888	UOt - Unoccupied Override Mode	0 to 800 minutes	240	

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WORKSHEET 26

Application and Instructions for Field Adjustment of Model FX05 in Option D12, Discharge Air Control

Applies only to Reznor MAPS®II Models RCA, RDCA, RECA

(includes two worksheets to record adjustable parameters - page 10, unit/duct discharge air control only
OR pages 11-12, unit/duct discharge air control with optional space-mounted sensor)

WARNING: Risk of Electrical Shock - To avoid possible electrical shock or equipment damage, disconnect power supply before making electrical connections.

IMPORTANT: The Model FX05 control is designed for use only as an operating control. Where an operating control failure would result in personal injury or loss of property, it is the responsibility of the installer to add devices (safety and/or limit controls) or systems (alarm and/or supervisory systems) that provide protection from or warning of control failure.

Introduction

The Model FX05 controller is custom programmed for the Reznor Modular Air Processing System (MAPS®II). Control features include:

- Custom 3-step control sequence of heating, cooling, and dehumidification (reheat). (NOTE: This instruction sheet does not apply to a reheat installation.)
- 6:1 Gas heating modulation control option or wall mount LED fan status/alarm option
- Fully integrated outdoor ambient lockouts based on outdoor dry bulb/dewpoint or enthalpy
- Integrated timer functions for cooling and heating
- Alarm and equipment shutdown features
- Service/Commissioning Test Mode

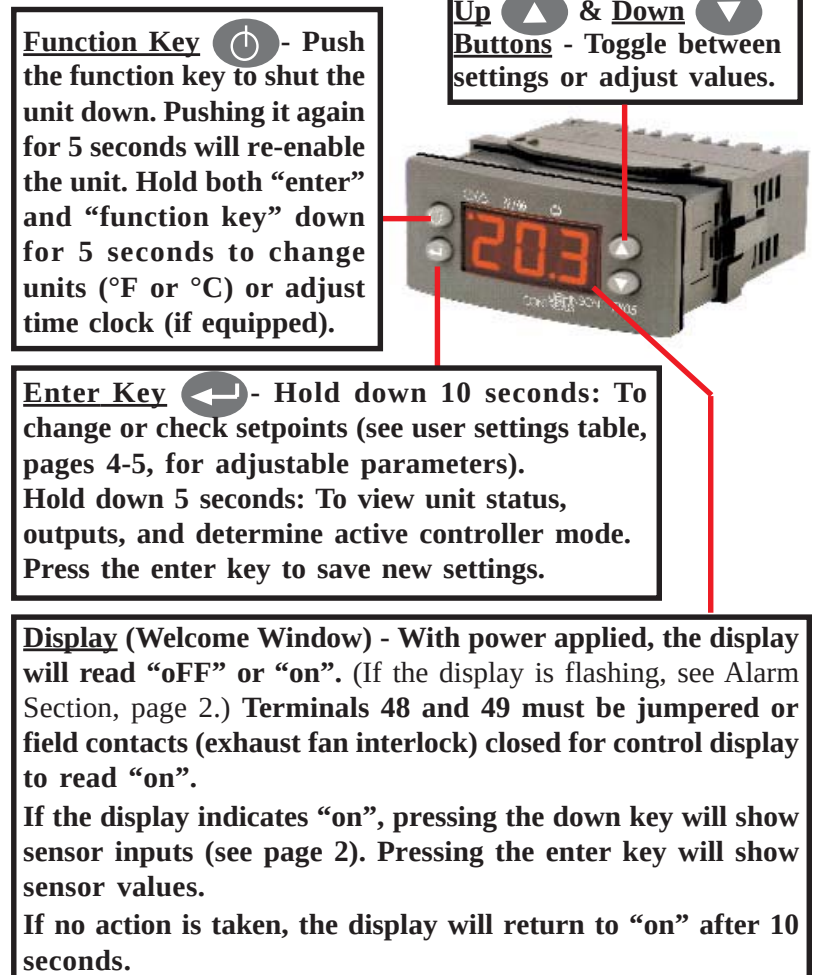
The user interface panel provides 4 buttons used for adjusting setpoints, viewing unit status, and enabling unit test or shut down modes.

The controller display will indicate unit status (on, off, or alarm), discharge air temperature, outdoor air temperature, dewpoint, and enthalpy. If equipped with an optional wall-mounted sensor, zone temperature will be displayed. Non-adjustable Parameters are shown below:

- Compressor minimum run time = 4.5 minutes
- Compressor off time = 4.5 minutes
- Heating 1st Stage Minimum run time = 180 seconds (1st stage - 80 seconds Pre-Purge).
- Heating 2nd stage Minimum run time = 100 seconds (Full capacity at 4 minutes 30 seconds).
- Low Limit Cooling Discharge Air Temperature is 49°F (controller cycles last stage when discharge air temperature is less than 49°F after a 5-minute time delay)

Special NOTE: Stages of Cooling and Heating Can Be Locked Out Due to Ambient Conditions During Operating Mode (Dry Bulb or Enthalpy). Verify Programmed Lockout Setpoints.

FIGURE 1 - Model FX05 Programmable Controller, Reznor P/N 209000, located in the Control Compartment of the Unit



Unit Test Mode (See page 3.) - Hold “enter” key together with “down arrow” key for 5 seconds to enable auto test mode (display flashes “tst”). Unit will operate each output for one minute. Pushing the up arrow key for 5 seconds allows manual selection and testing of outputs. To exit test mode, push the down arrow key for 3 seconds.

IMPORTANT INSTALLATION NOTES

1) All Installations - The FX05 control is DC voltage. DC voltage wires must not be run in the same conduit as the 24V or line voltage wiring.

Use of shielded cable wire is recommended for DC voltage.

2) Units equipped with HEAT (Models RDCA and RECA) - The discharge air sensor is factory wired in the low voltage control box. The installer must relocate the discharge air sensor to the supply ductwork for proper heating discharge air control. Center the sensor and sensor holder on the bottom or top of the supply duct or plenum. (See instructions in the system installation manual, Form I-MAPS II.)

3) NOTE – ALWAYS CHECK ENTHALPY OR DEWPOINT VALUES. ENSURE THE DISPLAYED VALUE IS REPRESENTATIVE OF THE OUTSIDE AIR CONDITIONS.

Display

The “welcome window” displays the active status of the unit (“oFF” or “on”). If the unit is in the “on” mode, press the “Down” arrow key for the following information to be displayed:

- **SAT = Space Temperature** (shows vertical dotted line, if not installed)
- **dAT = Discharge Air Temperature Sensor Value**
- **oAt = Outdoor Air Temperature Sensor Value**
- **En = Enthalpy (btu/lb)** (shows vertical dotted line if humidity transmitter is not installed).
- **Dp = Dewpoint Value** (shows vertical dotted line if humidity transmitter is not installed)

When any of the above text strings are displayed, you can press the “Enter” key to display the active value or continue to the next sensor value (press the “enter” key again). After 10 seconds, the display will return to the active status of the unit (“oFF” or “on”) .

Control Alarm Messages

When an alarm is triggered, one of the following alarm codes will flash on the display. Note: The Discharge Air Temperature will flash on the display with the alarm code.

- **AP – Air Proving/Phase Loss Switch**
- **FS – Low Limit Freeze Protection Lockout (auto reset)**
- **St – Discharge Air Temperature Sensor Failure (blower shuts down)**
- **ot – Outdoor Air Temperature Sensor Failure (blower runs without cooling or heating)**

Alarm Message Explanation

AP – Air proving and phase limit switch -- If Do1 (call for blower) is closed for 180 seconds and AP remains open, then the unit goes into lockout mode (blower shutdown). User interface (USI) flashes “AP”. If heating, cooling or reheat outputs are energized and AP opens, there is a 3-second delay before these functions are disabled. If the AP input continues to remain open for an additional 180 seconds, the blower is shutdown, and the unit is in lockout mode. System can be reset by cycling power or cycling the on/off input.

FS – Low limit freeze lock out (auto-reset) -- If supply air temperature is less than the low limit freeze setpoint (LSP) for 420 seconds, the unit is shutdown (blower off). USI has flashing “FS”. If supply air temperature is > low limit freeze setpoint + 30, then the low limit freeze lock out is disabled, allowing unit operation.

Sensor Failures (flashing ot or St) - Applies to the outside air dry bulb sensor, and discharge air dry bulb sensor. A failed discharge air sensor alarm (flashing St) will lock out unit operation. A failed outdoor air sensor (flashing ot) will allow blower operation only. If required for temporary operation, a resistance value (1/4 watt rating, 1035 ohms at 77°F) or a potentiometer can be used until a replacement (dry bulb sensors are Johnson A99 series temperature sensors) can be ordered. A99 resistance values versus temperature are shown on page 7.

Troubleshooting Alarms

Flashing AP - A flashing AP is caused due to an open circuit on Terminals 48 and 46. Check phase monitor in the high voltage box. The green light indicates the unit is in phase. Red light indicates out of phase.

Check the air proving switch to ensure it is closed (be sure the blower door is closed).

Recycle power to the unit to clear out the alarm.

Troubleshooting
Alarms (cont'd)

Flashing St - A flashing St means the discharge air sensor may not be connected (check for two white wires on terminals 54 and 57). To check the sensor for failure, remove the two wires and check resistance against temperature (see the section on sensor data and application).

Flashing ot - A flashing “ot” means the outdoor air sensor may not be connected (check the terminals 54 and 56 and ensure the wires are routed to the fresh air intake) or it has failed (check the sensor as already described for the discharge air sensor).

Flashing FS - A flashing FS indicates the unit has encountered a low discharge air temperature (below 36 F) for over 7 minutes. Investigate the heating system and recycle the power to clear out the alarm. Ensure the gas valve is opened.

Keypad
Instructions

Test Mode

> Press both
“Enter” and the
Down Arrow Key
(3 seconds)

Initiate Auto Test Mode: Press both the enter and down arrow key for 3 seconds (press the enter key an instant prior to pressing the down arrow key). Controller Flash’s “tst” and the blower is enabled. No other action needs to be taken. The unit will cycle all outputs and automatically skip to the next mode in 1 minute intervals. The outputs are sequenced as follows:

1. Fan/Blower (always enabled)
2. 1st stage heat (**H1**)
3. 2nd stage heat (**H2**)
4. Reheat output (**rH**) (*Not applicable without reheat.*)
5. 1st stage cooling (**C1**)
6. 2nd stage cooling (**C2**)

Upon completion, unit will exit test mode and return to the auto mode state. If preferred, the user can override the auto test mode, by pressing the up arrow key for approximately 3 seconds (hold the up arrow key down until the unit shifts to the next mode) to jump from mode to mode (note, while holding the key down the display will temporarily show sensor values). In this test sequence, the output is energized for 15 minutes or until the up arrow key is pressed. If desired, pressing the up arrow key for approximately 1 second will extend the current test mode by 15 minutes (total of 30 minutes). The user may exit test mode at any time by pressing the down arrow key for 3 seconds.

On/Off
Command

> Press “Function
Key” 1 second for
OFF mode;
3 seconds for
ON mode



Unit Status
Level

> Press “Enter Key”
for 5 seconds

To enable this menu, hold the “Enter” key for 5 seconds. The initial screen text will appear as “HSP” (working heating setpoint). Scroll through the parameters (listed below) using the “Up” or “Down” arrow keys. If you would like to view a parameter setpoint, select the desired parameter and push the “Enter” key once. **The Unit Status Mode is helpful in determining the actual control state.**

HSP	Active Heating Discharge Air Setpoint (Press Enter to view setpoint)	
	This is a monitor only parameter used to view the current Working Heating Setpoint. This could be the boost setup or occupied/unoccupied setpoint and reset based on outdoor dry bulb.	
CSP	Active Cooling Discharge Air Setpoint (Press Enter to view setpoint)	
	This is a monitor only parameter used to view the current Working Cooling Setpoint. This could be the boost setup or occupied/ unoccupied setpoint and discharge air reset based on outdoor dry bulb.	
HC1	Unit Cooling/Heating Status (Press Enter to view status)	
	OFF – No active thermal outputs except blower	H3 – Unit in the 3rd Heating Stage
	PH1 – Pre-purge Heating stage 1	C1 – Unit in the 1st Cooling Stage
	H1 – Unit in the 1st Heating Stage	C2 – Unit in the 2nd Cooling Stage
	H2 – Unit in the 2nd Heating Stage	C3 – Unit in the 3rd Cooling Stage

Keypad Instructions (cont'd)

Unit Status Level (cont'd)

> Press "Enter Key" for 5 seconds

OC1	Occupied/Unoccupied Status (Press Enter to view status) OCC = Occupied ; oFF = Unoccupied; PuP = PreMorning Pull Up; NSU = Night Set Up; NSB = Night Set Back
RS1	Discharge Air Control Mode (Press Enter to view Discharge Air Control Mode) SAC – Space Air Control – Call for Cooling from space SAH – Space Air Control – Call for Heating from space DAC – Duct Air Control – No Call for Cooling from space DAH – Duct Air Control – No Call for Heating from space
RHS	Active Room Heating Setpoint (Press Enter to view setpoint)
RCS	Active Room Cooling Setpoint (Press Enter to view setpoint)

Control System Parameters

> Press "Enter Key" and "Function Key" for 5 seconds

To enable this menu, hold the "Enter" and "Function" key for 5 seconds. The initial screen text will appear as "Uni" or Units of measure. The time clock variables are only valid if a time clock card insert is installed in the controller.

System Parameters		Selection	Default
Uni	Unit of Measure	°C or °F	°F
Hr	Time Clock - Hour	0-23 Hours (Military Time)	--
in	Time Clock - Minutes	0-59 Minutes	--
dAy	Time Clock - Day	0 - Sunday	--
		3 - Wednesday	
		6 - Saturday	
		1 - Monday	
		4 - Thursday	
		2 - Tuesday	
		5 - Friday	
TS	Time Clock Status - Press Enter to view OFF/ON/URL URL = No time Clock Card		

Commissioning Parameters

> Press "Enter Key" for 10 seconds

To enable this menu, hold the "Enter" key for the 10 seconds. The initial screen text will appear as "SSP" or space cooling setpoint. Use the "Up" or "Down" arrow key to scroll through the available parameters. If you would like to view a parameter, select the desired parameter and push the "Enter" key once. Use the "Up" or "Down" arrow key to change the parameter. To exit, press "enter" (to accept the value displayed) and "enter" again to exit. Below are descriptions for each of the field adjusted parameters (Applies to Models RCA, RDCA, RECA with unit discharge air control and no reheat. Non applicable codes are listed because they will appear in the display window.):

NOTES: * Parameter is valid with a wall-mounted sensor (Option CL53).
 ** Parameter is valid with a reheat system only. (This instruction sheet does not include reheat systems.
 For complete control instructions including reheat systems, refer to Form RZ-NA-MAPS-D12.)

Display	PARAMETER - Hold "Enter" key down for 10 seconds. (Highlighted BOLD FACE UNDERLINED = Typical Adjustments)	ADJUSTABLE RANGE	DEFAULT SETTING
SSP	* Space Cooling Setpoint (Default setting is not valid without space sensor.) This defines the space cooling setpoint.	68 to 130°F	75°F
HSO	* Space Heating Setpoint Offset (Default setting is not valid without space sensor.) The space heating setpoint is a differential offset from the cooling setpoint. The space heating setpoint must be less than the cooling setpoint.	1 to 30°F (subtract from SSP)	5°F
SCP	* Space Cooling Prop Band (Default setting is not valid without space sensor.) This adjustable parameter defines the space temperature upper and lower limits for cooling. Typically, space control with high outside air requires at least 2° (plus or minus 1° F) minimum. The greater the number of outside air changeovers in the space per hour (typically less than 8 ACH), the greater the prop band setting.	1 to 8°F (typically no greater than 2 with ACH<6)	1.8°F
SHP	* Space Heating Prop Band (Default setting is not valid without space sensor.) This adjustable parameter defines the space temperature upper and lower limits for heating. Typically, space control with high outside air requires at least 2° (plus or minus 1° F) minimum. The greater the number of outside air changeovers in the space per hour (typically less than 8 ACH), the greater the prop band setting.	1 to 8°F (typically no greater than 2 with ACH<6)	1.8°F

**Commissioning (Adjustable)
Parameters (cont'd)**

> Press "Enter Key" for 10 seconds

Display	PARAMETER - Hold "Enter" key down for 10 seconds. (Highlighted BOLD FACE UNDERLINED = Typical Adjustments)	ADJUSTABLE RANGE	DEFAULT SETTING
dCL	Outdoor Reset Option - Duct Discharge Air Cooling Setpoint Optional Discharge Air Reset based on outdoor ambient reset. Used in conjunction with dCH. See Control Notes for further information.	49 to 115°F (used with outdoor reset only)	80°F
rCP	* Room Discharge Air Cooling Setpoint (Default setting is not valid without space sensor.) Room discharge air cooling is active when there is a call from the space for cooling (duct discharge is deactivated). This setpoint is used to satisfy space cooling requirements.	49 to 115°F (design discharge air setpoint for space)	55°F
CPP	Cooling Discharge Air Prop Band This adjustable parameter defines the discharge temperature band at which the control cycles cooling stages. Typically set for 10°F.	2 to 40°F	10°F
rSP	** Reheat Setpoint Offset	(Not applicable)	
rHP	* Room Discharge Air Heating Setpoint (Default setting is not valid without space sensor.)	45 to 120°F (design discharge air setpoint for space)	80°F
dHH	Outdoor Reset Option - Duct Discharge Air Heating Setpoint Optional Discharge Air Reset based on outdoor ambient reset. Used in conjunction with dHL. See Control Notes for further information.	45 to 120°F (used with outdoor reset only)	55°F
HPP	Heating Discharge Air Prop Band This adjustable parameter defines the temperature band at which the control cycles heating stages.	4 to 30°F	10°F
HdB	* Space Heating Dead Band (Default setting is not valid without space sensor.)	0 to 2°F (rarely)	0°F
LSP	Low Limit Freeze Protection Setpoint (Note: Disable LSP by setting to -40°F). Low limit Freeze will disable blower and outside air damper intake if discharge air temperature remains below the setting for 7 minutes. The control will reset when supply air temperature increases by 30°F above the low limit setpoint).	-40 to 40°F (to disable, set at -40°F)	36°F
oC1	COOLING MODE LOCKOUT - AMBIENT DRY BULB Locks out useful cooling below this value. For discharge air only applications, oC1 must be greater than oH1.	58 to 130°F	68°F
oH1	HEATING MODE LOCKOUT - AMBIENT DRY BULB Locks out heating above this value. For discharge air only applications, oH1 must be less than oC1.	20 to 105°F (disables heat above this OA dry bulb)	62°F
dP1	**1st Stage Reheat Enabled Setpoint - Ambient Dewpoint	(Not applicable)	
dCb	*Discharge Air Heating Deadband (Default setting is not valid without space sensor.)	4 to 20°F	9°F
roH	**High Ambient Reheat Override – Dry Bulb (disables reheat above OA dry bulb)	(Not applicable)	
roL	**Low Ambient Reheat Override – Dry Bulb	(Not applicable)	
En1	1ST STAGE ENTHALPY COOLING REFERENCE LOCKOUT If outdoor enthalpy is below this value, no useful mechanical cooling is allowed.	15 Btu/lb to 40 Btu/lb	27
En2	2ND STAGE ENTHALPY COOLING LOCKOUT En2 provides an enthalpy differential to the En1 setting (add this differential to the En1 value). If outdoor enthalpy is below this value no 2nd stage useful mechanical cooling is allowed.	0 to 20 Btu/lb (differential add to EN1)	5
En3	3RD STAGE ENTHALPY COOLING LOCKOUT En3 provides an enthalpy differential to the En2 setting (add this differential to the En2 value). If outdoor enthalpy is below this value no 3rd stage useful mechanical cooling is allowed.	0 to 20 Btu/lb (differential add to EN2)	5
nSu	* Night Set Up – Cooling (Default setting is not valid without space sensor.)	0 to 35°F	9°F
nSb	* Night Set Back – Heating (Default setting is not valid without space sensor.)	0 to 35°F	9°F
iCt	* Heating Integration Constant Used with gas modulation only. Recommended value is zero. (Default setting is not valid without space sensor.)	0 to 999 seconds	0
dAo	* Sensor Calibration (Default setting is not valid without space sensor.)	Used to offset sensor wire resistance	-1
rHe	** Reheat Enabled or Disabled during unoccupied mode	(Not applicable)	
PUT	* Pull Up Time – Heating (Default setting is not valid without space sensor.)	0 to 15 minutes	15
dCH	<u>STD DISCHARGE COOLING SETPOINT</u>	50 to 115°F	55°F
dHL	<u>STD DISCHARGE HEATING SETPOINT</u>	40 to 120°F	70°F

(continued)

Keypad Instructions (cont'd')

Commissioning (Adjustable) Parameters (cont'd)

> Press "Enter Key" for 10 seconds

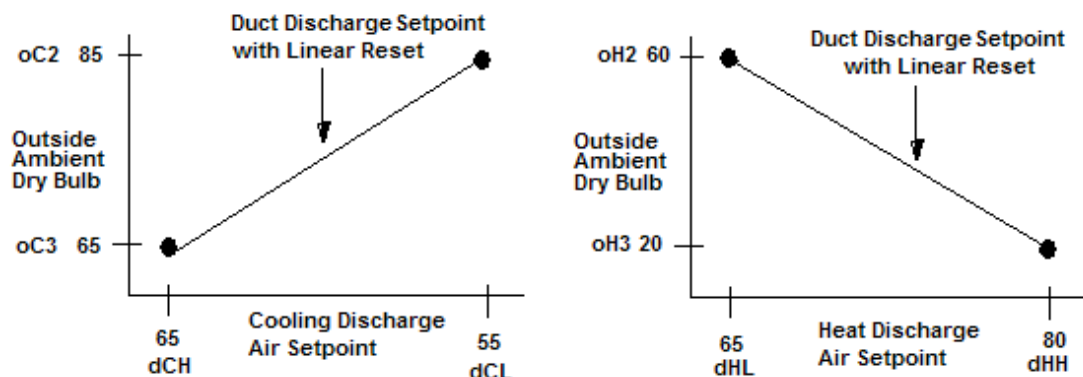
Display	PARAMETER - Hold "Enter" key down for 10 seconds. (Highlighted BOLD FACE UNDERLINED = Typical Adjustments)	ADJUSTABLE RANGE	DEFAULT SETTING
OH2	Outdoor Reset Dry Bulb Heating - High Setting The duct discharge air setpoint will match the part load setting (dHL).	20 to 70°F (corresponds to dHL, part load heating)	60°F
OH3	Outdoor Reset Dry Bulb Heating - Low Setting The heating duct discharge air setpoint will match the design value at this outdoor temperature.	-40 to 65°F (corresponds to dHL, design load heat)	20°F
OC2	Outdoor Reset Dry Bulb Cooling - High Setting The duct discharge air setpoint will match the design value at this outdoor temperature.	70 to 130°F (corresponds to dCL, design load cool)	75°F
OC3	Outdoor Reset Dry Bulb Cooling - Low Setting The cooling duct discharge air setpoint will match the dCH part load setting.	58 to 85°F (corresponds to dCH, part load cool)	60°F
ADJUST TIME CLOCK VARIABLES ONLY WITH TIME CLOCK INSERT, OPTION BHB1 (Requires time clock and insert.)			
H1	Event Schedule 1 - Hour (Default setting is not valid without space sensor.)	0 to 23 hours	6 hrs
t1	Event Schedule 1 - Minutes (Default setting is not valid without space sensor.)	0 to 59 minutes	0 min
H2	Event Schedule 2 - Hour (Default setting is not valid without space sensor.)	0 to 23 hours	18 hrs
t2	Event Schedule 2 - Minutes (Default setting is not valid without space sensor.)	0 to 59 minutes	0 min
H3	Event Schedule 3 - Hour (Default setting is not valid without space sensor.)	0 to 23 hours	6 hrs
t3	Event Schedule 3 - Minutes (Default setting is not valid without space sensor.)	0 to 59 minutes	0 min
H4	Event Schedule 4 - Hour (Default setting is not valid without space sensor.)	0 to 23 hours	18 hrs
t4	Event Schedule 4 - Minutes (Default setting is not valid without space sensor.)	0 to 59 minutes	0 min
UOT	Unoccupied Override Mode	0 to 800 minutes	240 min

Control Notes

The unit controller can be applied as a pure discharge air controller or a combination space control with discharge air temperature reset. If a wall mount sensor (Option CL53, **FIGURE 4**) is not used, default operation is discharge air control.

When used with the wall mount sensor, the unit controller uses two distinct discharge air setpoints. If a call for space control is initiated, the discharge air setting is adjusted to a supply air temperature that satisfies design cooling and heating requirements. Once space heating or cooling setpoints are satisfied (with the discharge air temperature), the controller is reset to control duct discharge air temperatures. The duct discharge air settings are typically adjusted to temper the outside air.

Optional Discharge Air Reset Based On Outdoor Ambient Reset - The duct discharge air cooling and heating setpoints may be reset based on outdoor ambient dry bulb temperature. This allows the duct discharge setpoint to vary linearly with outdoor dry bulb ambient. Room discharge air cooling and heating setpoints are not adjustable. The methodology for set up is shown below:



The standard factory settings disable the ambient reset feature by raising dCL greater than dCH (for cooling mode) and lowering dHH below dHL (in heating mode). The heating linear reset feature is recommended for applications with variable appliance loads.

Sensor Data and Application

Discharge/Duct Sensor

FIGURE 2 - Discharge Air Sensor and Holder for in Ductwork



Maximum Sensor Wire Length for less than 1°F Error

NOTE: Wire supplied with the sensor is 22 AWG.

Discharge Air Sensor – All systems have a discharge air sensor.

If there is a heat section (Model RCDA or RECA) or if a cooling only system (Model RCA) was ordered with Option DU1, the discharge air sensor must be field mounted in the supply air ductwork downstream of the unit outlet where full mixing of the air occurs. Using the holder in **FIGURE 2**, center the sensor in the bottom or top of the duct.

Control sensor wiring is DC voltage. Run the wire in its own conduit, independent of both line and 24V wiring. Avoid routing the DC cable over lighting ballasts. If additional length is required, use shielded cable wire. If the sensor wire is lengthened, additional resistance may affect the sensor reading. Comply with the maximum lengths in the table below to assure a sensed temperature with less than 1°F error.

Wire Gauge	Maximum Sensor Wire Length	
	Feet	Meters
14	800	244
16	500	152
18	310	94
20	200	61
22	124	38

Sensor Data for Johnson A99 Series Temperature Sensors

°F	°C	Ohms
-40	-40	613
-31	-35	640
-22	-30	668
-13	-25	697
-4	-20	727
5	-15	758
14	-10	789
23	-5	822
32	0	855
41	5	889
50	10	924
59	15	960
68	20	997
77	25	1035
86	30	1074
95	35	1113
104	40	1153
113	45	1195
122	50	1237
131	55	1279
140	60	1323
149	65	1368
158	70	1413
167	75	1459
176	80	1506
185	85	1554
194	90	1602
203	95	1652
212	100	1702
221	105	1753
230	110	1804
239	115	1856
248	120	1908

Outside Air Sensor

FIGURE 3 - Humidity Transmitter, Option DT5



Outside Air Dry Bulb and Dewpoint or Enthalpy Permissive Control - If the application uses mixed air (return and outside air quantities), the outside air temperature sensor and optional humidity transmitter (**FIGURE 3**) must be mounted together to sense outdoor air conditions. Verify that factory mounted positions provide acceptable performance.

Sensor Accuracy and Outside Air Changeover Differential - Dry bulb sensor accuracy is within 1°F between 5° and 167°F. Outside air dewpoint is calculated based on a humidity transmitter (**FIGURE 3**) input. Accuracy is rated as follows: Humidity transmitter $\pm 3\%$ RH for 20 to 80% RH at 77°F and $\pm 5\%$ RH for 10 to 20% and 80 to 90% RH at 77°F. The dewpoint calculation is within 1% error at sea level. Hysteresis and the rate of moisture change also have an impact on sensor accuracy. Prolonged periods of high humidity (above 95% RH) can affect sensor accuracy (the bias is towards a higher RH reading than actual). The calculated outdoor dewpoint should be verified on an annual basis to ensure proper changeover operation.

Sensor Data and Application (cont'd)

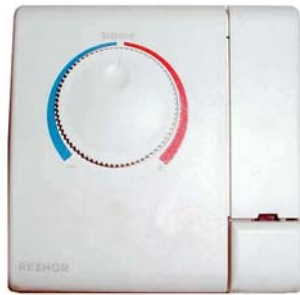
Outside Air Sensor (cont'd)

All outside air changeover setpoints (heating, cooling, and dewpoint) include a minimum 1.8°F differential before staging is allowed. In cooling a rise of 1.8°F above the changeover setpoint is required prior to equipment staging. In heating mode, a fall of 1.8°F is required prior to equipment staging.

Control from Optional Space (Wall-Mounted) Sensor

FIGURE 4 - Optional Wall-Mount Space Air Control, Option CL53

OPTIONAL WALL-MOUNTED SPACE SENSOR



Option CL53 is a wall-mount control that provides:

- Zone temperature sensing
- Occupied (boost) and unoccupied override button
- LED fan alarm status (except on heat systems with gas modulation).
- NOTE: Setpoint dial on CL53 control is inactive with Option D12 Control System

Control Modes

Occupied Mode - The fan operation is constant in occupied mode. The unit is controlled by duct discharge air setpoints.

Temporary Set Up Boost Mode with Wall Sensor, Option CL53, FIGURE 4 (Push button down for 1 second) - If the setpoint override button is pushed during an occupied period (or a unit without the time clock card option), unit will control to zone setpoint as follows:

Cooling setpoint = Programmed Cooling Setpoint – 3

Heating Setpoint = Programmed Heating Setpoint + 4

Once the boost setpoint is satisfied, unit will default back to programmed setpoints after a minimum 10 minute interval. The unit controller ignores additional inputs (user pushes button before the boost setpoint is satisfied).

Unoccupied Mode - The unit blower cycles with a call for either heating or cooling from the space sensor. Once heating or cooling unoccupied setpoints are satisfied the blower will continue to run for 60 seconds. The unit is controlled by only the room discharge air setpoints in unoccupied mode. If equipped, heating modulation is disabled during unoccupied mode with two stages of heating capacity.

Unoccupied Override Mode - If the setpoint override button is pushed during an unoccupied period (or a unit without the time clock card option), unit will control to programmed occupied setpoints for a period of four hours. If the override button is pushed again in unoccupied mode, the unit goes into temporary boost mode.

Unoccupied Mode with Return Air Dampers - Note the user must apply a customer supplied time clock (or dry contacts from a BAS system) if the outside air dampers must remain shut during unoccupied mode (Reznor Option BNC1 – Damper Changeover). *Units ordered with an FX05 time clock card (Option BHB1) will not hold the outside air damper closed during unoccupied mode.*

Wiring

Sensor and Communication Wire Installation

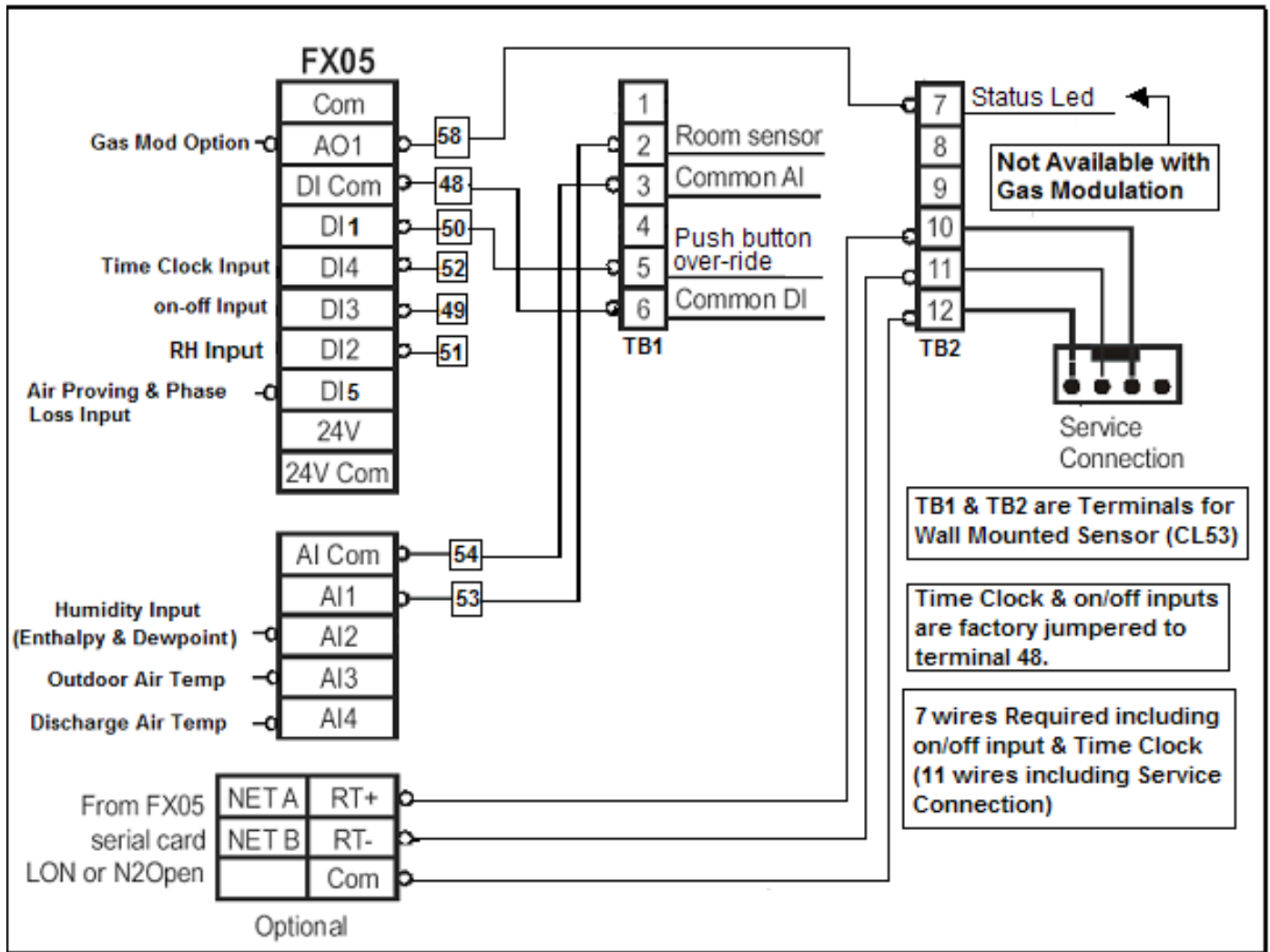
Wall-Mounted Space Sensor Wiring

Before connecting or disconnecting any wires, ensure that all power supplies have been switched off and all wires are potential-free to prevent equipment damage and avoid electric shock.

The FX05 control wiring is DC voltage. ***This wiring should be installed in its own conduit and routed independently of both line and 24 VAC control voltage.*** Avoid routing of DC cable over lighting ballasts.

In the space-mounted sensor Option CL53 (FIGURE 4), terminations are made at the terminal blocks in the base of the module. Those terminal blocks will accept up to 1.5 mm² (AWG 16) wires. To access the terminals, remove the cover from the base of the module by inserting a pointed tool into the small hole at the center top of the cover. While pressing down gently, pry the cover away from the base. As the two parts separate, remove the tool and continue to pull the cover away from the base until the cover is free.

All wiring to the module is at extra low (safe) voltage and must be separated from line voltage wiring. Do not run wiring close to transformers or high frequency generating equipment such as a lighting ballast. Complete and verify all wiring connections before applying power to the controller connected to the module.



WORKSHEET for Adjustable Parameters Using Unit/Duct Discharge Sensor only
(no space sensor installed) (See pages 4-6 for explanations.)

(If installation includes optional wall-mounted space sensor, use Worksheet on pages 11-12.)

Display	PARAMETER - Hold "Enter" key down for 10 seconds. (CAPS & UNDERLINED = Typical Adjustments)	ADJUSTABLE RANGE	DEFAULT Setting	FIELD VALUE
SSP	Space Cooling Setpoint	Not Applicable		
HSO	Space Heating Setpoint Offset	Not Applicable		
SCP	Space Cooling Prop Band	Not Applicable		
SHP	Space Heating Prop Band	Not Applicable		
dCL	Outdoor Reset Option - Duct Discharge Air Cooling Setpoint	49 to 115°F (used with outdoor reset only)	80°F	
rCP	Room Discharge Air Cooling Setpoint	Not Applicable		
cPP	Cooling Discharge Air Prop Band	2 to 40°F	10°F	
rSP	Reheat Setpoint Offset	Not Applicable		
rHP	Room Discharge Air Heating Setpoint	Not Applicable		
dHH	Outdoor Reset Option - Duct Discharge Air Heating Setpoint	45 to 120°F (used with outdoor reset only)	55°F	
HPP	Heating Discharge Air Prop Band	4 to 30°F	10°F	
HdB	Space Heating Dead Band	Not Applicable		
LSP	Low Limit Freeze Protection Setpoint	-40 to 40°F (to disable, set at to 40°F)	36°F	
oC1	COOLING MODE LOCKOUT - AMBIENT DRY BULB	58 to 130°F	68°F	
oH1	HEATING MODE LOCKOUT - AMBIENT DRY BULB	20 to 105°F (disables heat above this OA dry bulb)	62°F	
dP1	1st Stage Reheat Enabled Setpoint - Ambient Dewpoint	Not Applicable		
dCb	Discharge Air Heating Deadband	Not Applicable		
roH	High Ambient Reheat Override – Dry Bulb	Not Applicable		
roL	Low Ambient Reheat Override – Dry Bulb	Not Applicable		
En1	1ST STAGE ENTHALPY COOLING REFERENCE LOCKOUT	15 Btu/lb to 40 Btu/lb	27	
En2	2ND STAGE ENTHALPY COOLING LOCKOUT	0 to 20 Btu/lb (differential add to EN1)	5	
En3	3RD STAGE ENTHALPY COOLING LOCKOUT	0 to 20 Btu/lb (differential add to EN2)	5	
nSu	Night Set Up – Cooling	Not Applicable		
nSb	Night Set Back – Heating	Not Applicable		
iCt	Heating Integration Constant (Used with gas modulation only. Recommended value is zero)	Not Applicable		
dAo	Sensor Calibration	Not Applicable		
rHe	Reheat Enabled or Disabled during unoccupied mode	Not Applicable		
PUT	Pull Up Time – Heating	Not Applicable		
dCH	STD DISCHARGE COOLING SETPOINT	50 to 115°F	55°F	
dHL	STD DISCHARGE HEATING SETPOINT	40 to 120°F	70°F	
OH2	Outdoor Reset Dry Bulb Heating - High Setting	20 to 70°F (corresponds to dHL, part load heating)	60°F	
OH3	Outdoor Reset Dry Bulb Heating - Low Setting	-40 to 65°F (corresponds to dHL, design load heat)	20°F	
OC2	Outdoor Reset Dry Bulb Cooling - High Setting	70 to 130°F (corresponds to dCL, design load cool)	75°F	
OC3	Outdoor Reset Dry Bulb Cooling - Low Setting	58 to 85°F (corresponds to dCH, part load cool)	60°F	
H1	Event Schedule 1 - Hour	Not Applicable		
t1	Event Schedule 1 - Minutes	Not Applicable		
H2	Event Schedule 2 - Hour	Not Applicable		
t2	Event Schedule 2 - Minutes	Not Applicable		
H3	Event Schedule 3 - Hour	Not Applicable		
t3	Event Schedule 3 - Minutes	Not Applicable		
H4	Event Schedule 4 - Hour	Not Applicable		
t4	Event Schedule 4 - Minutes	Not Applicable		
UOT	Unoccupied Override Mode	0 to 800 minutes	240	

WORKSHEET for Adjustable Parameters Using a Wall-Mounted Space Sensor (Option CL53)

(See pages 4-6 for explanations.)

(If installation does not include an optional wall-mounted space sensor, use Worksheet on page 10.)

Display	Parameter (BOLD FACE = Typical Adjustments; <u>UNDERLINED</u> = Most Typical)	Adjustable Range	DEFAULT Setting	Field Value
SSP	<u>SPACE COOLING SETPOINT</u>	68 to 130°F	75°F	
HS _o	<u>SPACE HEATING SETPOINT OFFSET</u>	1 to 30°F (subtract from SSP)	5°F	
SCP	Space Cooling Prop Band	1 to 8°F (typically no greater than 2 with ACH<6)	1.8°F	
SHP	Space Heating Prop Band	1 to 8°F (typically no greater than 2 with ACH<6)	1.8°F	
dCL	Outdoor Reset Option - Duct Discharge Air Cooling Setpoint	49 to 115°F (used with outdoor reset only)	80°F	
rCP	<u>ROOM DISCHARGE AIR COOLING SETPOINT</u>	49 to 115°F (design discharge air setpoint for space)	55°F	
CPP	Cooling Discharge Air Prop Band	2 to 40°F	10°F	
rSP	Reheat Setpoint Offset	0 to 30°F	Not Applicable	
rHP	<u>ROOM DISCHARGE AIR HEATING SETPOINT</u>	45 to 120°F (design discharge air setpoint for space)	80°F	
dHH	Outdoor Reset Option - Duct Discharge Air Heating Setpoint	45 to 120°F (used with outdoor reset only)	55°F	
HPP	Heating Discharge Air Prop Band	4 to 30°F	10°F	
HdB	Space Heating Dead Band	0 to 2°F (rarely applied)	0°F	
LSP	<u>LOW LIMIT FREEZE PROTECTION SETPOINT</u>	-40 to 40°F (to disable, set at -40°F)	36°F	
oC1	<u>COOLING MODE LOCKOUT - AMBIENT DRY BULB</u>	58 to 130°F	68°F	
oH1	<u>HEATING MODE LOCKOUT - AMBIENT DRY BULB</u>	20 to 105°F (disables heat above this OA dry bulb)	62°F	
dP1	Reheat Enabled - Ambient Dewpoint	52 to 80°F	Not Applicable	
dCb	Discharge Air Heating Deadband	4 to 20°F	9°F	
roH	High Ambient Dry Bulb - Reheat Override	60 to 120°F	Not Applicable	
roL	Low Ambient Dry Bulb - Reheat Override	54 to 75°F	Not Applicable	
En1	<u>1ST STAGE ENTHALPY COOLING REFERENCE LOCKOUT</u>	15 Btu/lb to 40 Btu/lb	29	
En2	<u>2ND STAGE ENTHALPY COOLING LOCKOUT</u>	0 to 20 Btu/lb (differential add to EN1)	5	
En3	<u>3RD STAGE ENTHALPY COOLING LOCKOUT</u>	0 to 20 Btu/lb (differential add to EN2)	5	
nSu	Night Set Up – Cooling	0 to 35°F	9°F	
nSb	Night Set Back – Heating	0 to 35°F	9°F	
iCt	Heating Integration Constant	0 to 999 seconds	0	
dAo	Space Sensor Calibration	Used to offset sensor wire resistance	-1	
rHe	Reheat Enabled or Disabled during Unoccupied Mode	Yes or No (allows reheat based on RH input)	Not Applicable	
Put	<u>PULL UP TIME - HEATING</u>	0 to 15 minutes	15	

(continued)

WORKSHEET (cont'd) for Adjustable Parameters Using a Wall-Mounted Space Sensor (Option CL53)

(See pages 4-6 for explanations.)

(If installation does not include an optional wall-mounted space sensor, use Worksheet on page 10.)

Display	Parameter (BOLD FACE = Typical Adjustments; <u>UNDERLINED</u> = Most Typical)	Adjustable Range	DEFAULT Setting	Field Value
dCH	<u>STD DISCHARGE COOLING SETPOINT</u>	50 to 115°F	70°F	
dHL	<u>STD DISCHARGE HEATING SETPOINT</u>	40 to 120°F	70°F	
OH2	Outdoor Reset Dry Bulb Heating - High Setting	20 to 70°F (corresponds to dHL, part load heating)	60°F	
OH3	Outdoor Reset Dry Bulb Heating - Low Setting	-40 to 65°F (corresponds to dHL, design load heat)	20°F	
OC2	Outdoor Reset Dry Bulb Cooling - High Setting	70 to 130°F (corresponds to dCL, design load cool)	75°F	
OC3	Outdoor Reset Dry Bulb Cooling - Low Setting	58 to 85°F (corresponds to dCH, part load cool)	60°F	
H1	Event Schedule 1 - Hour	0 to 23 hours	6	
t1	Event Schedule 1 - Minutes	0 to 59 minutes	0	
H2	Event Schedule 2 - Hour	0 to 23 hours	18	
t2	Event Schedule 2 - Minutes	0 to 59 minutes	0	
H3	Event Schedule 3 - Hour	0 to 23 hours	6	
t3	Event Schedule 3 - Minutes	0 to 59 minutes	0	
H4	Event Schedule 4 - Hour	0 to 23 hours	18	
t4	Event Schedule 4 - Minutes	0 to 59 minutes	0	
UOT	Unoccupied Override Mode	0 to 800 minutes	240	

Application and Instructions for Field Adjustment of the Control (Model FX06)
in Digital Control Option D12A, Space Control with Discharge Air Reset

Applies to Reznor MAPS®II Models RCA, RDA, RDCA, RDDA, RECA and REDA

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Introduction

The microprocessor unit (Model FX06) in control Option D12A is custom programmed for the Reznor Modular Air Processing System (MAPS®II). Control features include:

- Custom 3-step control sequence of cooling, dehumidification (reheat), and heating
- 3:1 Gas heating turndown or 6:1 gas heating modulation control
- Fully integrated outdoor ambient lockouts based on outdoor dry bulb/dewpoint or enthalpy
- Alarm and equipment shutdown features
- Service/Commissioning Test Mode
- Integrated timer functions for cooling and heating

There are four buttons that can be used for adjusting setpoints, viewing unit status, and enabling unit test or shut down modes. (See page 3.) The controller display will indicate unit status (on, off, or alarm), discharge air temperature, outdoor air temperature, dewpoint, and enthalpy. When equipped with a wall-mounted sensor, space temperature will be displayed.



FX06

General Sequence of Operation

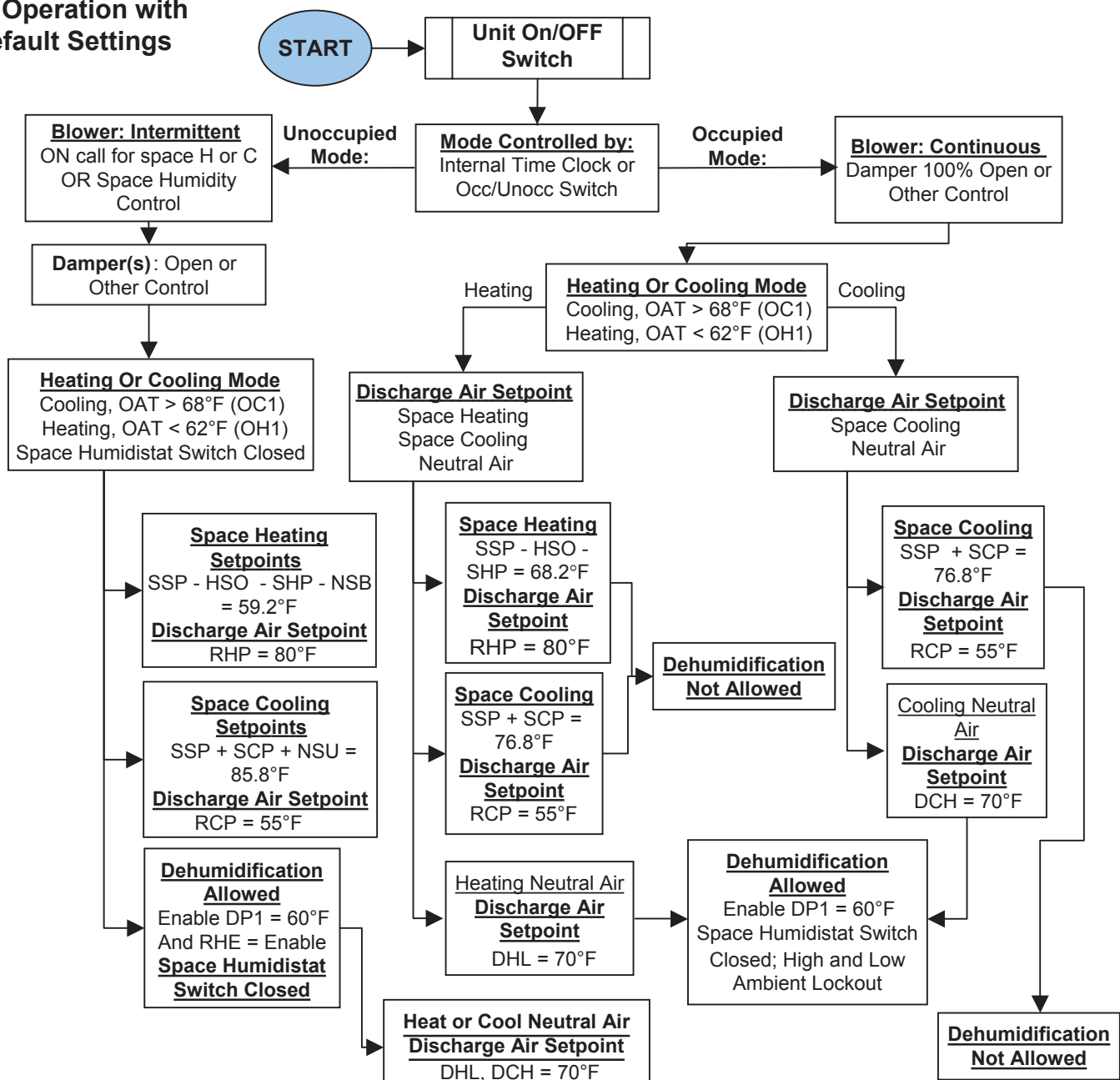
When the unit is called to operate, the main blower will run continuously in occupied mode and intermittently in unoccupied mode. The unit operates based on four **Discharge Air Temperature Setpoints** listed below.

1. Standard (Neutral) Heating Discharge Air Temperature Setpoint
2. Space Heating Discharge Air Temperature Setpoint
3. Standard (Neutral) Cooling Discharge Air Temperature Setpoint
4. Space Cooling Discharge Air Temperature Setpoint

The heating and cooling equipment will cycle to maintain the active discharge air temperature setpoint for occupied and unoccupied modes. Heating and cooling may be locked out of operation based upon outdoor air temperature and enthalpy conditions.

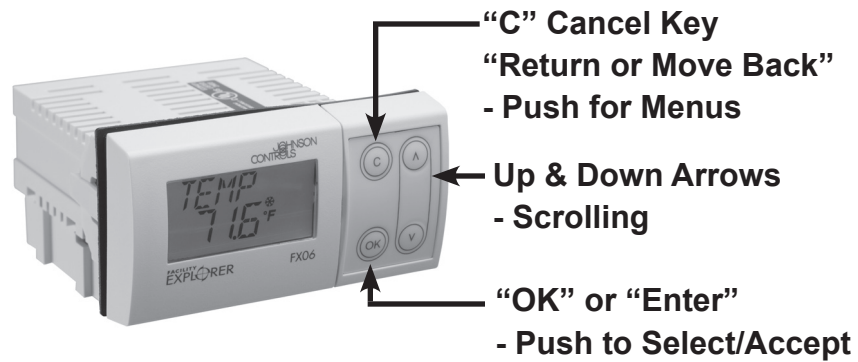
If equipped with reheat, the control will also activate the dehumidification circuit to maintain a neutral discharge air temperature setpoint and related dewpoint based upon outdoor air and space conditions.

FIGURE 1 - Sequence of Operation with Default Settings



FX06 Display

**FIGURE 2A - FX06
Controller**



Upon start-up or power on, the FX06 controller provides data from the home page variables. Pressing the up and down arrows will display one item from the home page menu.

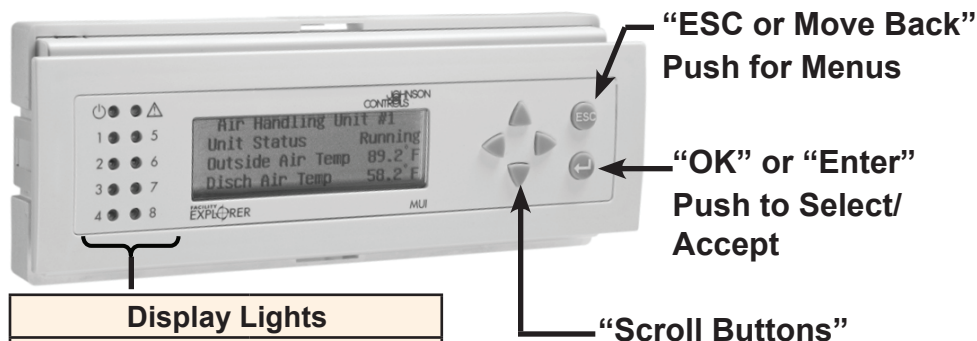
- » The control once powered up will operate based upon the time schedule or occupancy physical point state. Press and hold the "C" key to turn the controller OFF/ON.
- » Pressing the "C" button, displays the menu pages. Use the "Up" or "Down" to move between menu selections. Press the "OK" button to view menu variables.
- » Press the "OK" key to select a variable to change. Use the "up" or "down" button to change the values. Press the "OK" key again to accept the change or the "C" key to move back to previous level.

Menu Options	
<u>Item</u>	<u>Description</u>
Home Page	Unit ON/OFF Status
01	Unit Status & Modes
02	Temperature Setpoints
03	OA Reset Schedule
04	Commissioning Parameters
05	Sensor Calibration
06	Controller Setup: Time, Address, Date
07	Time Schedules
08	Alarm Events
See Variable list for location and functionality of all parameters. See pages 14-19.	

FX06 Display (cont'd)

FIGURE 2B - Optional Remote Medium User Interface, Option RB2A, P/N 223125

The remote user interface display mimics all menus and functions on the FX06 controller except the "Test Function".



Display Lights	
Symbol and 1 - 8	
Unit ON/OFF	Alarm
Comp #1 ON	Reheat ON
Comp #2 ON	-
Stg #1 Heat ON	-
Stg #2 Heat ON	-

The remote user interface display is a four-line, backlit unit requiring 24Vac/dc power and a two wire network connection between the unit controller and the display. The display receives all of its programming and functionality from the controller located in the unit. The display can be mounted 500 ft (152M) away from the controller. (Consult the factory for longer distances.) Refer to the wiring diagram for details.

Upon start-up or power on, the remote display provides data from the home page variables. Pressing the up and down arrows will display four lines of text, a single variable and data per line.

- » Pressing the "ESC" button displays the menu pages. Use the "left" or "right" arrows to move between menu pages. Press the "return" key to select a menu. The menu options are the same for the local and remote display.
- » Some menus have more than one page of data. You can use the left/right arrows to move between pages and use the up/down arrows to scroll between variable data.
- » Press the "OK" key to select a variable to change. Use the "up" or "down" button to change the values. Press the "OK" key again to accept the change or the "ESC" key to move back to previous level.
- » Pressing the ESC for 10 seconds will reset the FX06 controller which clears the alarms.

Installation Warnings and Notes

DANGER: Risk of Electrical Shock - To avoid possible electrical shock or equipment damage, disconnect power supply before making electrical connections.

IMPORTANT INSTALLATION NOTES

1) All Installations - The FX06 control is DC voltage. DC voltage wires must not be run in the same conduit as the 24V or line voltage wiring. Use of shielded cable wire is required for DC voltage. All field-installed DC sensor wiring must be in shielded cable.

2) Units equipped with HEAT (Models RDCA, RDDA, RECA, and REDA) - The discharge air sensor is factory wired in the low voltage control box. The installer must relocate the discharge air sensor to the supply ductwork for proper heating discharge air control. Center the sensor and sensor holder on the bottom or top of the supply duct or plenum. (See instructions on page 23.)

3) Installation with an optional communication card insert (Option BHB2 or BHB3) - Always remove controller power when installing or removing a communication card insert.

IMPORTANT: The Model FX06 controller is designed for use only as an operating control. Where an operating control failure would result in personal injury or loss of property, it is the responsibility of the installer to add devices (safety and/or limit controls) or systems (alarm and/or supervisory systems) that provide protection from or warning of control failure.

Unit Power and Blower Operation

General Operation

The unit is supplied with a disconnect switch. The FX06 controller also has an ON/OFF button (function key). When the FX06 (on/off) input (Point BI-3) is closed, the unit will operate in either occupied or unoccupied mode. When the occupied / unoccupied switch (Point BI-4) is closed, the unit will run in occupied mode; otherwise the unit operates in unoccupied mode.

Time Clock

An FX06 controller has a built-in real-time clock that supports all real-time functions including the display of time and date on the screen and the time stamping of each event. The unit will switch between occupied and unoccupied mode based upon a time of day schedule.

The unit will run in occupied mode when either BI-4 or the time clock calls for occupied mode. If both the internal time clock and external contacts are used, the physical input (point BI-4) will override the air handler to occupied mode if the physical point is closed. If the physical point is open, the internal time clock dictates the state.

Time Clock NOTE 1: Space sensor is required for unoccupied mode.

Time Clock NOTE 2: Make sure the BI-4 jumper is open when the internal time clock is used to avoid conflict of settings.

Occupied Mode

Blower operation is continuous in occupied mode. The FX06 contact BO-1 will close providing power for the outside air damper to open. If equipped with a 2-position damper, the outdoor air damper is electrically interlocked with the blower circuit. When the damper actuator opens to 80%, the blower is allowed to run. If power is lost, the mechanical spring will drive the damper closed.

If the unit is equipped with return air dampers, the blower control relay is not interlocked with the dampers.

Unoccupied Mode

The blower cycles ON/OFF with a call for either heating or cooling from the space sensor. Once the space heating or cooling unoccupied setpoints are satisfied, the blower will continue to run for 60 seconds, then shut OFF.

During the Unoccupied Cycle the space setpoints will increase as follows:

$$\begin{aligned}\text{Space Cooling Setpoint (SSP)} &= \\ (\text{SSP} + \text{SCP} + \text{NSU}) &= 75^{\circ}\text{F} + 1.8 + 9^{\circ}\text{F} = 85.8^{\circ}\text{F}\end{aligned}$$

$$\begin{aligned}\text{Space Heating Setpoint} &= \\ (\text{SSP} - \text{HSO} - \text{SHP} - \text{NSB}) &= 75^{\circ}\text{F} - 5^{\circ}\text{F} - 1.8 - 9^{\circ}\text{F} = 59.2^{\circ}\text{F}\end{aligned}$$

(NSU and NSB default value = 9°F, adjustable from 0-35°F)

Unoccupied Override Mode

If the space override dial on the space sensor is turned during an unoccupied period, the air handling unit will operate in occupied mode for a period of four hours. (UOT = 240 minutes)

Heating and Cooling Control Modes

The unit operates based upon four **Discharge Air Temperature Setpoints**.

1. Standard (Neutral) Heating Discharge Air Setpoint
2. Space Heating Discharge Air Setpoint
3. Standard (Neutral) Cooling Discharge Air Setpoint
4. Space Cooling Discharge Air Setpoint

With the space sensor installed, the unit will operate to maintain the space heating and cooling setpoints as required. When the space temperature sensor is satisfied (or not installed), the unit will operate to maintain the standard (neutral) discharge air setpoint. The space cooling setpoint (SSP) default value is 75°F. The space heating setpoint is a given differential (HSO) below the space cooling setpoint. The differential (HSO) can be adjusted from 1-30°F. The default value of 5°F makes the default heating setpoint 70°F.

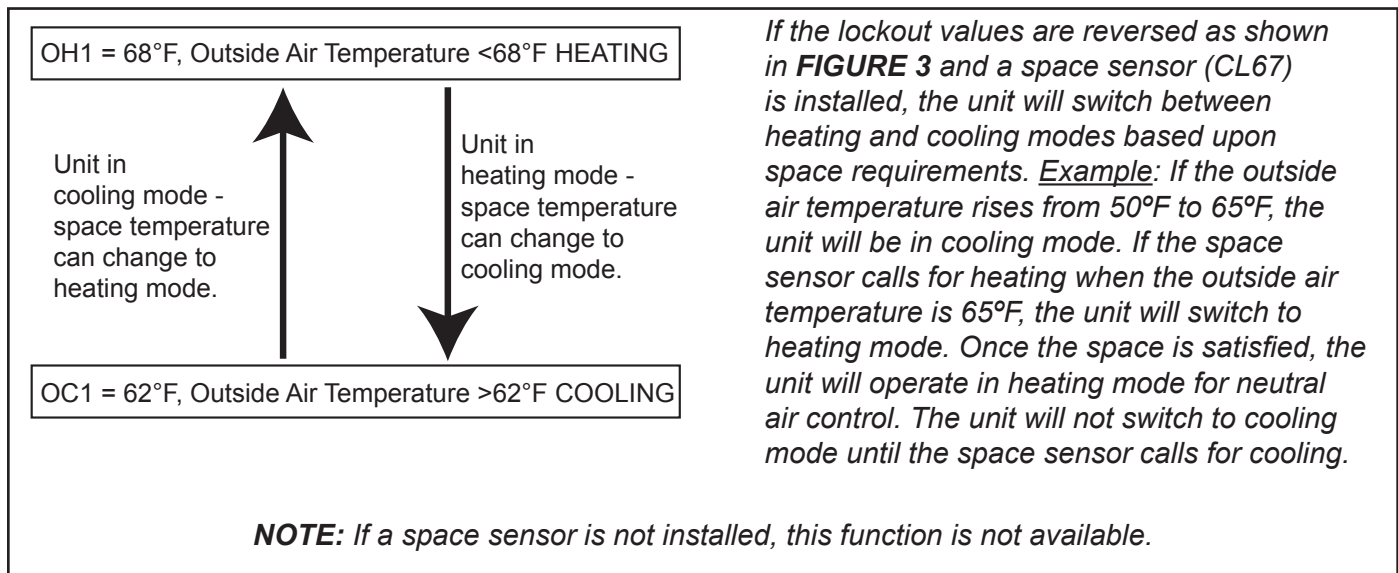
When the space temperature sensor is satisfied (or not installed), the unit will discharge standard (neutral) air. The default cooling mode setpoint (DCH) value is 70°F. The default heating mode setpoint (DHL) is 70°F. These setpoints can automatically be adjusted by a user defined reset schedule.

The heating or cooling mode is determined by outside air conditions and mode lockout values. If the outside air temperature value (Point AI-3) is greater than the cooling mode lockout value (OC1, default 68°F), the unit is in cooling mode. If the outside air temperature is lower than the heating mode lockout value (OH1, default 62°F), the unit is in heating mode (gas or electric).

Unit is in Cooling Mode when outside air temperature **rises** above OC1.

Unit is in Heating Mode when outside air temperature **falls** below OH1.

FIGURE 3 - Reverse Lockout Values to switch between heating and cooling based on space temperature (instead of outside air temperature).

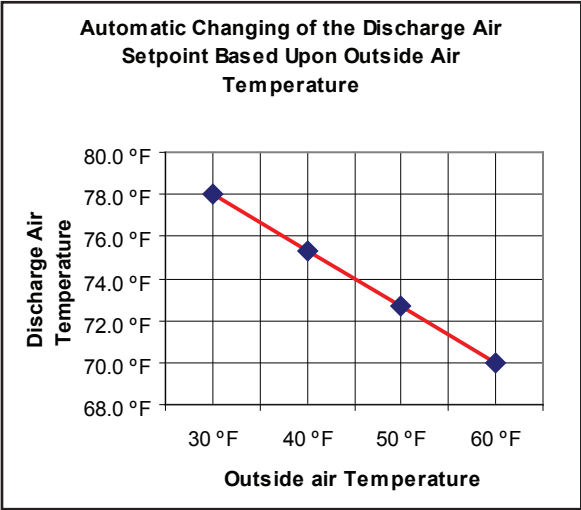


Heating Mode

When the unit is in heating mode, the unit will discharge air based upon the neutral air discharge heating setpoint point (DHL) or the room discharge air heating setpoint (RHP). If the space sensor is not installed, the unit will operate to provide neutral air only.

FIGURE 4 - Outside Air Reset (DHH) allows automatic changing of discharge air temperature based on outside air temperature.

Discharge Air Setpoint	Outside Air Temperature
DHL = 70°F	OH2 = 60°F
DHH = 55°F	OH3 = 20°F



Variable Name	Description	Default Value (Range)
DHL	<u>Standard (Neutral) Heating Discharge Air Temperature Setpoint (Primary Setpoint)</u> If the reset option is disabled, the DHL becomes the primary neutral air heating discharge air temperature setpoint. If the reset option is active, this is the lowest heating value based on outdoor air conditions. The discharge air temperature will not change to a lower value than DHL regardless of the outside air temperature.	70°F (50 to 115°F)
DHH	<u>Outdoor Reset Option – Duct Discharge Air Temperature Heating Setpoint</u> When used in conjunction with DHL, OH2 and OH3, the neutral discharge air heating setpoint will be adjusted based on the outdoor air temperature. If DHH is higher than DHL, the controller will reset the discharge air temperature setpoint from the low value of DHL to the high value of DHH as the outdoor air goes from the high value of OH2 to the low value of OH3. The default value disables this feature..	55°F (50 to 115°F)
OH2	<u>Outdoor Reset Dry Bulb Heating – High Setting</u> The value of the outside air temperature corresponding to the DHL low heating setpoint value..	60°F (20 to 70°F)
OH3	<u>Outdoor Reset Dry Bulb Heating – Low Setting</u> The value of the outside air temperature corresponding to the DHH high heating setpoint value..	20°F (-40 to 65°F)
NOTE: Making the DHH value lower than the DHL value disables the reset functionality.		

Heating and Cooling Control Modes (cont'd)

Heating Mode (cont'd)

If a local space sensor is installed, the unit will change the neutral air discharge setpoint to the room discharge air heating setpoint (RHP) whenever the space requires heating. Whenever the space temperature is below the setpoint by a value greater than the space heating proportional band (SHP), then space heating is required. The SHP default value is 1.8°, adjustable from 1° to 8°.

Example:

Space heating setpoint = $(SSP - HSO) = 75^{\circ}\text{F} - 5^{\circ}\text{F} = 70^{\circ}\text{F}$

Space heating proportional band (SHP) = 1.8°F (Range 1° to 8°F)

Space heating active $[(SSP - HSO) - SHP]: 70^{\circ}\text{F} - 1.8^{\circ}\text{F} = \underline{68.2^{\circ}\text{F}}$

Room discharge air temperature heating setpoint (RHP) = 80°F

During the Unoccupied Cycle the space setpoints will change as follows:

Space Heating Setpoint =

$(SSP - HSO - SHP - NSB) = 75^{\circ}\text{F} - 5^{\circ}\text{F} - 1.8 - 9^{\circ}\text{F} = 59.2^{\circ}\text{F}$

(NSB default value = 9°F; adjustable from 0 to 35°F)

When the space temperature is more than SHP above the setpoint (70 + 1.8 = 71.8°F), the unit will switch to neutral air control and space heating requirements will be OFF. The neutral discharge air control setpoint value will be the DHL value.

It may be useful to change the neutral air setpoint if the indoor ambient comfort conditions significantly change based upon outdoor air conditions. The discharge air setpoint can be set to automatically adjust between the DHL and the DHH values depending upon the outside air conditions.

Example: Elder care centers tend to require higher space temperatures during the winter season (example 78°F). Therefore, when the outside air is 60°F, the unit can deliver 70°F neutral air. And, when the outside air temperature drops to 30°F, the unit can provide 78°F neutral air. The higher neutral air setpoint provides neutral air matching the space temperature, thus better comfort control.

Heat Staging - 3:1 Turndown, Option AG55

Upon a call for heat, to maintain the active discharge air setpoint, the unit will enable a stage when the discharge air temperature is more than 1/2 of the heating proportional band (HPP) below the setpoint. Default HPP value is 10°F.

Example: Active setpoint = 70°F. A stage is enabled when the discharge air temperature (DAT) is less than 65°F. Likewise, if the discharge air temperature is above 75°F, an active stage of heating is turned OFF.

If the discharge air temperature rises above 1/2 HPP value above the setpoint (70°F + 5°F = 75°F) after initially starting, the 1st stage will remain ON for 180 seconds, then turn OFF.

After the first 180 seconds from the 1st stage activating, if the discharge air temperature does not increase above 1/2 of the band (HPP), the controller will turn on the 2nd stage. The 2nd stage closes (DO-3), and the 1st stage (DO-2) remains ON for 20 seconds. The system uses the 1st stage to ignite the 2nd stage and vice versa. After twenty seconds, stage 1 will turn OFF.

The 2nd stage has a minimum run time of 100 seconds. If the discharge air temperature is still less than 1/2 of HPP after 100 seconds, then the system will activate the 3rd stage. Stage 3 heating is stage 1 and 2 combined (DO-2 and DO-3 closed), providing 100% heating.

If the discharge air temperature increases above 75°F, then the stages start turning OFF in the reverse sequence. If the DAT remains between the propor-

tional band (HPP = 10, 65°F to 75°F), the unit will not add or subtract a stage of heating. Stage 3 does not have a minimum run time.

For 6:1 modulating gas heat, Option AG57, the same sequence applies with the following addition. When the unit is in any stage of heating other than OFF, the gas modulating value will vary from 100% open to 50% open based upon the heating discharge air proportional band (HPP).

Example: If the discharge air temperature (DAT) is 4.9°F above the setpoint, AO-1 output will provide 50% gas. If the DAT is 4.9°F below the setpoint, the gas valve will modulate to provide 100% gas. When heating is not required, the analog output will be 10V, 50% open. (The gas valve converts the control signal voltage: $10V - 0V = \text{signal at the valve} = 3 \text{ VDC} = 100\% \text{ open}$, $7 \text{ VDC} = 50\% \text{ open}$).

Heating Mode Lockout

If the Discharge Air Temperature (Point AI-4), does not rise above LSP (36°F) in 600 seconds after blower enables, the unit will shut down. Upon a rise in discharge air temperature ($LSP + 30^\circ\text{F} = 66^\circ\text{F}$), the unit is enabled. Three consecutive lockouts within one hour will result in a continuous lockout state (24 VAC power must be cycled to reset the controller). If the Outdoor Air Temperature sensor fails, the blower will operate without cooling, reheat, or heating equipment active. If the Outdoor Air Temperature rises above the OH1 heating lockout (62°F), the heating equipment will be turned OFF after the minimum run time.

Cooling Mode

When the unit is in cooling mode, the unit will discharge air based upon the neutral air cooling setpoint point (DCH) and the room discharge air cooling setpoint (RCP). If the space sensor is not installed, the unit will operate to provide neutral air only.

If a space sensor is installed, the unit will change from the neutral discharge air temperature setpoint to the room discharge air heating setpoint (RCP) value whenever the space requires cooling. Whenever the space temperature is above the setpoint by a value greater than the space cooling proportional band (SCP), the space will call for space cooling to be ON. The SCP default value is 1.8°.

Example:

Space cooling setpoint SSP = 75°F (Default)

Space cooling proportional band (SCP) = 1.8°F (adjustable 1 to 8°F)

Space cooling active above: $(SSP + SCP) = 75^\circ\text{F} + 1.8^\circ\text{F} = \underline{76.8^\circ\text{F}}$

Space cooling discharge air setpoint (RCP) = 55°F

During the Unoccupied Cycle the space setpoints will increase as follows:

Space Cooling Setpoint = $(SSP + SCP + NSU) = 75^\circ\text{F} + 1.8^\circ\text{F} + 9^\circ\text{F} = 85.8^\circ\text{F}$

(NSU default value = 9°F, adjustable from 0-35°F)

When the space temperature is more than SCP below the setpoint ($75 - 1.8 = 73.2^\circ\text{F}$), the unit will switch to neutral air control. The control setpoint value will be the DCH value.

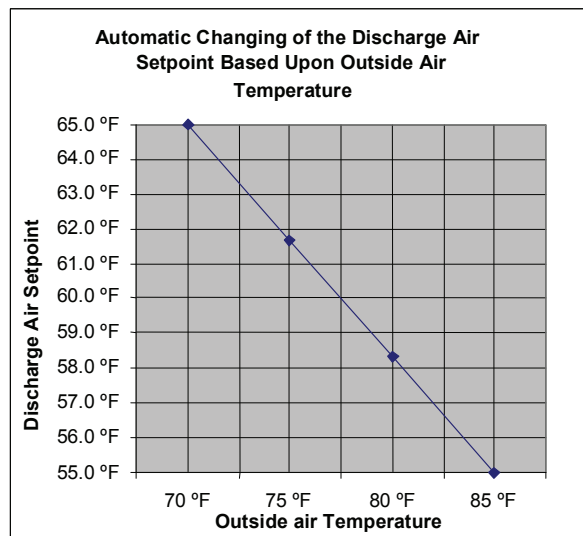
The neutral air setpoint can be automatically adjusted based on outside air values. The discharge air setpoint will float between the DCL value and the DCH value depending upon the outside air conditions. In low humidity applications where the unit may serve other mechanical equipment directly, it may be beneficial to automatically adjust the setpoint to minimize the use of mechanical equipment. **NOTE: This function is not recommended for humidity sensitive applications.**

Heating and Cooling Control Modes (cont'd)

Cooling Mode (cont'd)

FIGURE 5 - Outside Air Reset (DCL) allows automatic changing of discharge air temperature based on outside air temperature.

Discharge Air Setpoint	Outside Air Temperature
DCL = 80°F	OC2 = 75°F
DCH = 70°F	OC3 = 60°F



Variable Name	Description	Default Value (Range)
DCH	<u>Standard Discharge Air Setpoint (Primary Setpoint)</u> DCH is the value of the discharge air cooling setpoint when the outside air temperature is at its coldest value to allow minimum cooling. The discharge air temperature will not change to a higher value than DCH regardless of the outside air temperature. If the reset option is disabled, the DCH becomes the primary neutral air cooling discharge air setpoint.	70°F (50° to 115°F)
DCL	<u>Outside Air Reset Option</u> The value of the neutral discharge air cooling setpoint when the outside air temperature is at its warmest value to allow maximum cooling. The discharge air temperature will not change to a lower value than DCL regardless of the outside air temperature. The default value disables reset functionality	80°F (50° to 115°F)
OC2	<u>Outdoor Reset Dry Bulb Cooling – High Setting</u> The value of the outside air temperature corresponding to the DCL coldest cooling setpoint..	75°F (70° to 130°F)
OC3	<u>Outdoor Reset Dry Bulb Cooling – Low Setting</u> The value of the outside air temperature corresponding to the DCH warmest cooling setpoint.	60°F (58° to 85°F)
NOTE: Making the DCL value higher than the DCH value disables the reset functionality.		

Cooling Staging

Upon a call for cooling mode to maintain the active discharge air setpoint, the unit will enable a stage when the discharge air temperature is more than 1/2 of the cooling proportional band (CPP) above the setpoint. (Default CPP value is 10°F.)

Example: Active setpoint = 70°F. The 1st stage enables when the discharge air temperature is greater than 75°F. Likewise if the discharge air temperature is below 65°F, an active stage of cooling is turned OFF.

The system has intra-stage time delays of 4.5 minutes. Thus, compressors have a minimum ON and OFF time of 4.5 minutes. After the first stage has been turned ON and the discharge air temperature is still 5°F greater than the setpoint (½ CPP) and 4.5 minutes has passed, the unit will turn on stage 2 cooling. Because the unit has 33%, 66%, and 100% staging, compressor 1 will turn OFF and compressor 2 will turn ON.

If after 4.5 minutes the same condition exists, stage 3 will be active and both compressors 1 and 2 will be ON. If the discharge air temperature value is within the cooling proportional band (CPP is 65°F to 75°F), the active stage will remain ON. If the DAT falls 5°F below the setpoint, the staging control will act in reverse, turning OFF stages.

Cooling Mode Lockout

The unit is equipped with a manual reset high pressure switch and an auto-reset low pressure switch for each compressor circuit. If any pressure switch trips, that particular mechanical cooling circuit is disabled. Each circuit on the evaporator coil has an auto-reset froststat which will disable the cooling circuit if the temperature drops below 36°F.

To reduce compressor cycling, the compressors are enabled to run based upon outdoor dry bulb temperature and enthalpy settings. No mechanical cooling is allowed to operate if the outside air temperature is below the cooling mode lockout (OC1). Default OC1 setting is 68°F; adjustable range is 58° to 130°F. If the compressors are enabled and the temperature falls below the OC1 setting, the minimum run time will keep the compressors ON. **ALL** compressors will immediately turn OFF after the current minimum run time expires; the unit does not stage down.

If the unit is equipped with an outdoor air humidity sensor (Point AI-2), the compressors are locked out until the outside air enthalpy value rises above the lockout settings

- ❖ Stage 1 compressor is locked out when the outdoor air enthalpy is below EN1 settings.
- ❖ Stage 2 compressor is locked out when the outdoor air enthalpy is below EN2 setting.
- ❖ Stage 3 compressors are locked out when the outdoor air enthalpy is below EN3 settings.

Dehumidification (Reheat)

Reheat control is enabled based on the outdoor dewpoint temperature setpoint (DP1). If the outside air dewpoint is above the setpoint (DP1 = 60°F), BO-4 will be ON activating the reheat system. The reheat circuit adds 7 to 17°F to the discharge air temperature after it leaves the main cooling section of the unit. The reheat control output will be OFF based upon any of the following conditions:

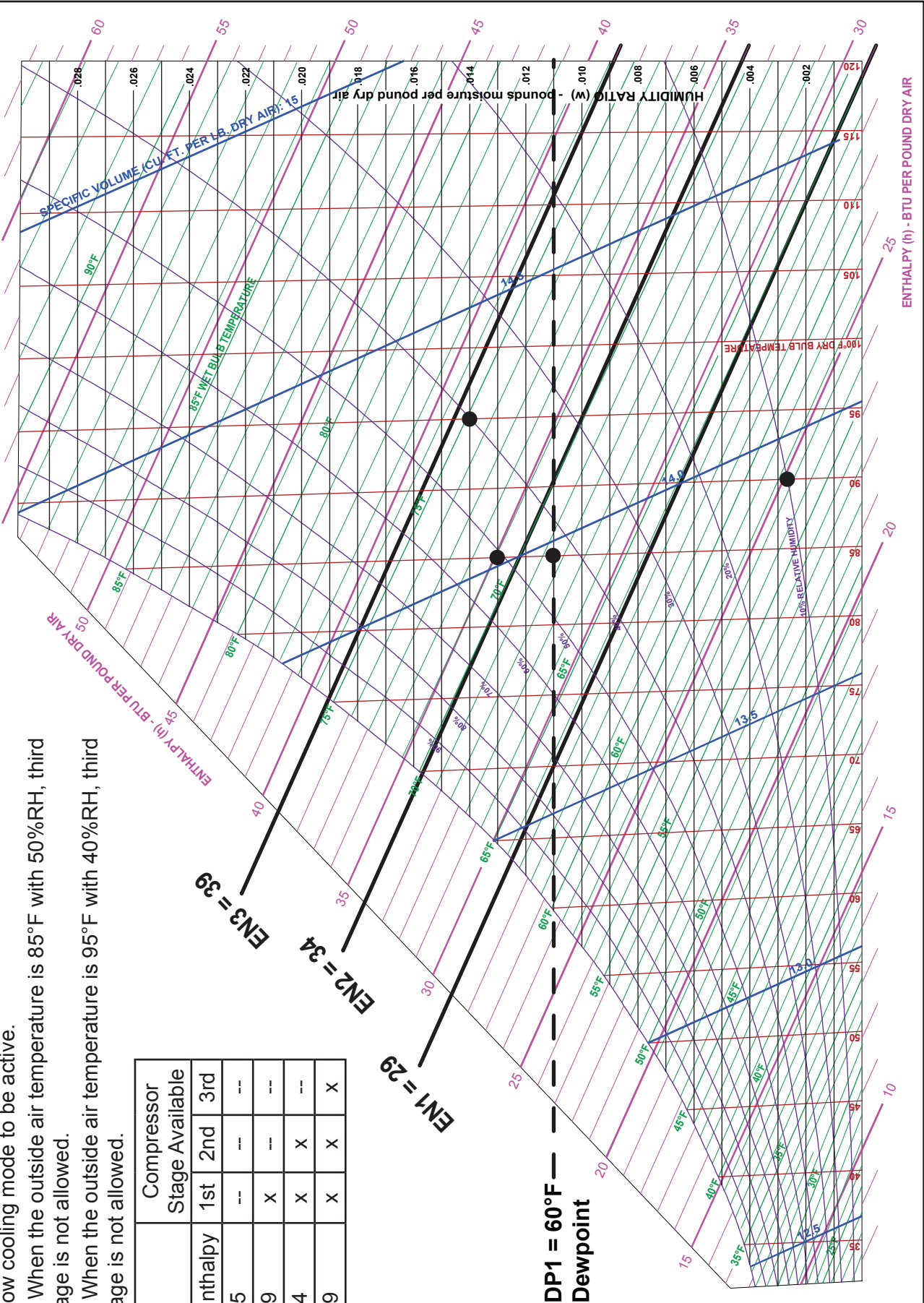
1. The space temperature sensor calls for the unit to provide space cooling. In this mode the reheat is OFF. Once space cooling (SSP) is satisfied, reheat can restart.
2. The unit is equipped with a space humidistat with setpoint control. If the humidistat is not calling for dehumidification, thus the switch is open to BI-2, the reheat circuit is OFF.
3. If the outdoor air temperature is below the low ambient lockout (ROL), the reheat circuit will be OFF. The ROL default value is 65°F.
4. If the outdoor air temperature is above the high ambient lockout (ROH), the reheat circuit will be OFF. The ROH default value is 120°F.
5. If the unit is in unoccupied mode and the (RHE) reheat value is NO, reheat is not allowed in the unoccupied mode. If the RHE default value is YES, reheat is allowed in the unoccupied mode based upon space humidistat. If a space humidistat is not installed, the contact is wired closed thus allowing reheat in the unoccupied mode.
6. If the outdoor air temperature sensor fails, cooling, reheat, and heating equipment are not allowed to operate.

FIGURE 6 - Optional humidity transmitter measures outdoor air humidity and controls compressor operation based on enthalpy settings EN1, EN2, EN3

Example:

- 1) When the outside air temperature is 90°F with 10%RH, the enthalpy is ~25. The standard enthalpy setting EN1 (29) will not allow cooling mode to be active.
- 2) When the outside air temperature is 85°F with 50%RH, third stage is not allowed.
- 3) When the outside air temperature is 95°F with 40%RH, third stage is not allowed.

Enthalpy	Compressor Stage Available		
	1st	2nd	3rd
25	--	--	--
29	X	--	--
34	X	X	--
39	X	X	X



Dehumidification (Reheat) (cont'd)

Control Adjustment Guidelines for a Reheat System

NOTE: Does not apply to
Option AU25 reheat.

The discharge air temperature can be adjusted when the reheat point is ON.
When reheat is ON, the discharge air temperature can be reset as follows.

$$\text{DCH} = \text{DCH} + \text{RSP}$$

NOTE: If outdoor reset is used, DCL must replace DCH.

NOTE: It is important that RSP be used when the DCH value is lower than 65°F. Because the reheat system adds 7 to 17°F of reheat, a DCH setpoint of 55°F must discharge 40°F from the main coil to maintain a 55°F setpoint value. This low discharge temperature may damage the unit.

There are many ways to combine settings based on each application. The type of reheat application will determine the setting for **DCH** and **RSP**. The typical application requires RSP to be 0°F when DCH is 70°F. The unit will discharge a dewpoint of 52 to 55°F at 70°F discharge air temperature.

EXAMPLE 1) Neutral Air Application (corridor or kitchen makeup air)

Since the unit reheat override is based primarily on space temperature, the reheat override parameter ROH will be adjusted outside of operating range. Below are the proposed settings:

DP1 = 58; reheat enabled above 58°F dewpoint

ROL = 58; reheat compressor locked out below 58°F dry bulb

OC1 = 65; cooling compressors locked out below 65°F (Assumes reheat pump alone is adequate.)

EN1 = 29; 1st stage cooling compressor enabled above 29 btu/lb

OH1 = 70; Heating locked out above 70°F ambient

DCH = 70; cooling duct discharge air setpoint with RSP = 0 (use DCL with outdoor reset)

RSP = 0; Regardless of ambient dewpoint, the duct discharge air temperature setting is 70°F.

ROH = 115; High ambient reheat override is set where reheat is not disabled

RCP = 55; if the space temperature exceeds the cooling setpoint, reheat is disabled and discharge air is supplied at 55°F.

EXAMPLE 2) Neutral Air Application (Space Temperature Override – RH input Jumpered and Reheat Override)

If space sensible loads increase with outdoor ambient dry bulb, it may be preferred to override reheat mode by using the **ROH** reheat override in conjunction with space temperature override. Below are the proposed settings:

DP1 = 58; reheat enabled above 58°F dewpoint

ROL = 58; reheat compressor locked out below 58°F dry bulb

OC1 = 68; cooling compressors locked out below 68°F (Assumes reheat pump alone is adequate.)

EN1 = 29; 1st stage cooling compressor enabled above 29 btu/lb

OH1 = 72; Heating locked out above 72°F ambient

DCH = 62; cooling duct discharge air with reheat overrides (use DCL with outdoor reset)

RSP = 8; The duct discharge air temperature setting with reheat is 70°F (62 + 8).

ROH = 92; Reheat mode is disabled over 92°F ambient dry bulb with a supply air temperature of 62°F.

RCP = 55; if the space temperature exceeds the cooling setpoint, reheat is disabled and discharge air is supplied at 55°F.

In this mode, if the dewpoint is below 58°F, the unit will discharge 62°F air to the space in neutral air mode. If the dewpoint rises above 58°F, the unit will discharge 70°F air to the space in neutral air mode. If the space requires cooling, the unit will discharge 55°F air to the space until the space setpoint is satisfied.

NOTE: If AU25 option is installed, reheat is available only when the first stage compressor is running. Option AU25 cannot enable a compressor.

Menu Pages

To access Menu Pages, press the "C" Key, and choose Menu #1 - Unit Status.

Menu 01	Unit Status and Modes	
Display Name	Control Variable Description	Reading or Status
SPCT or RM-T	Space Temperature Value from Sensor (Option CL67) "--" if not installed	XXX.X°F
DAT	Discharge Air Temperature	XXX.X°F
OAT	Outside Air Temperature	XXX.X°F
Enth	Outside Air Enthalpy Value (BTU/LBS)	XXX.X
DP	Outside Air Dewpoint Temperature	XXX.X°F
OA HUM PERC	Outside Air Relative Humidity Percent	XXX.X%
DA WHSP	The active discharge air heating setpoint for the given conditions	Status only
DA WCSP	The active discharge air cooling setpoint for the given conditions	Status only
MODE	The active stages of cooling or heating the controller has requested. Cooling Stage 1 = CLG1, CLG2, CLG3; Heating = HGT1, HGT2, HTG3; Reheat	Status only
OCC STATUS	Current Unit Mode - Occupied or Unoccupied	Status only
OCC OVRD STAT	<u>Temporary Occupied Override</u> - When the wall switch occupied button is pushed, the unit switches from unoccupied mode to occupied mode for the given time	Status only
SHUTDOWN	<u>Normal Operation or Shutdown</u> - When the remote ON/OFF contact closure is open, the unit will be OFF (SHUTDOWN). If the contact closure is closed, the unit will follow its sequence of operation.	Status only
DA CNTRL MODE	<u>Active Discharge Air Control Mode</u> - Neutral Air Heating (DAH), Neutral Air Cooling (DAC); Room Air Cooling (RMC), Room Air Heating (RMH)	Status only
RM WHSP	<u>Active Space Heating Setpoint</u> - Displays the active setpoint determined by occupied or unoccupied mode.	XXX.X°F
RM WCSP	<u>Active Space Cooling Setpoint</u> - Displays the active setpoint determined by occupied or unoccupied mode.	XXX.X°F
HTG OUTPUT PCT	<u>Percentage of Heating Output</u> - Displays the percentage of heating output from 0-100%.	0-100%

FX06 Commissioning Parameters Level

Menu 02 Setpoint Page			
Display Name	Temperature Setpoints	Default Value	Range
SSPHI	The maximum value that the space setpoint dial can be set	78°F	60° to 80°F
SSPLO	The minimum value that the space setpoint dial can be set	72°F	60° to 80°F
SSP	<u>Space Cooling Temperature Setpoint (SSP)</u> This is a setpoint from the space sensor (Option CL67) above which the unit will begin to initiate space cooling. As the space temperature increases above this value, the space cooling discharge air setpoint will become active (RCP). The range of the dial is governed by the high (SSPHI) and low (SSPLO) values above.	Status Only	
HSO	<u>Space Heating Setpoint Offset</u> This value is subtracted from the SSP value to calculate the space heating setpoint. (Example: $SSP - HSO = 75^\circ - 5^\circ = 70^\circ$.) As the space temperature drops below 70°F, the space heating discharge air setpoint will become active (RHP).	5°F	1° to 30°F
DP1	<u>Reheat Enabled Setpoint – Ambient Dewpoint</u> At dewpoints below this value, reheat will not be enabled	60°F	52° to 80°F
DCH	<u>Standard (Neutral) Cooling Discharge Air Temperature Setpoint (Primary Setpoint)</u> If the reset option is disabled, the DCH becomes the primary neutral air cooling discharge air temperature setpoint. If the reset option is active, this is the maximum cooling value based on outdoor air conditions. The discharge air temperature will not change to a higher value than DCH regardless of the outside air temperature..	70° F	50° to 115°F
DHL	<u>Standard (Neutral) Heating Discharge Air Temperature Setpoint (Primary Setpoint)</u> . If the reset option is disabled, the DHL becomes the primary neutral air heating discharge air temperature setpoint. If the reset option is active, this is the lowest heating value based on outdoor air conditions. The discharge air temperature will not change to a lower value than DHL regardless of the outside air temperature.	70°F	50° to 115°F
RCP	<u>Room (space) Discharge Air Cooling Temperature Setpoint</u> When a space temperature sensor is installed and the temperature in the space increases above the space cooling setpoint (SSP) through the space cooling prop band (SCP), the RCP value will become the active discharge air setpoint. The value of RCP will only be used by the unit if a space temperature sensor is used.	55°F	50° to 115°F
RHP	<u>Room Discharge Air Temperature Heating Setpoint</u> When the temperature in the space decreases below the space heating setpoint (SSP-HSO) through the space heating prop band (SHP), the RHP value will become the active discharge air setpoint. This value will only be used by the unit if a space temperature sensor is installed.	80°F	50° to 115°F

FX06 Commissioning Parameters Level (cont'd)

Menu 03		OA Reset Page		
Display Name	Control Variable Description	Default Value	Range	
DCL	<u>Outside Air Reset Option</u> The value of the neutral discharge air cooling setpoint when the outside air temperature is at its warmest value to allow maximum cooling. The discharge air temperature will not change to a higher value than DCL regardless of the outside air temperature. The default value disables reset functionality.	80°F	50° - 115°F	
DCH	<u>Standard (Neutral) Cooling Discharge Air Temperature Setpoint (Primary Setpoint)</u> If the reset option is disabled, the DCH becomes the primary neutral air cooling discharge air temperature setpoint. If the reset option is active, this is the maximum cooling value based on outdoor air conditions. The discharge air temperature will not change to a higher value than DCH regardless of the outside air temperature.	70° F	50° - 115°F	
DHL	<u>Standard (Neutral) Heating Discharge Air Temperature Setpoint (Primary Setpoint)</u> If the reset option is disabled, the DHL becomes the primary neutral air heating discharge air temperature setpoint. If the reset option is active, this is the lowest heating value based on outdoor air conditions. The discharge air temperature will not change to a lower value than DHL regardless of the outside air temperature.	70° F	50° to 115°F	
DHH	<u>Outdoor Reset Option – Duct Discharge Air Temperature Heating Setpoint</u> When used in conjunction with DHL, OH2 and OH3, the neutral discharge air heating setpoint will be adjusted based on the outdoor air temperature. If DHH is higher than DHL, the controller will reset the discharge air temperature setpoint from the low value of DHL to the high value of DHH as the outdoor air goes from the high value of OH2 to the low value of OH3. The default value disables this feature.	55°F	50°to115°F	
OH2	<u>Outdoor Reset Dry Bulb Heating – High Setting</u> The value of the outside air temperature corresponding to the DHL low heating setpoint value.	60°F	20° to 70°F	
OH3	<u>Outdoor Reset Dry Bulb Heating – Low Setting</u> The value of the outside air temperature corresponding to the DHH high heating setpoint value.	20°F	-40° to 65°F	
OC2	<u>Outdoor Reset Dry Bulb Cooling – High Setting</u> The value of the outside air temperature corresponding to the DCL coldest cooling setpoint.	75°F	70° to 130°F	
OC3	<u>Outdoor Reset Dry Bulb Cooling – Low Setting</u> The value of the outside air temperature corresponding to the DCH warmest cooling setpoint.	60°F	58° to 85°F	

Menu 04
Commissioning Parameters

Display Name	Control Variable Description	Default Value	Range
SCP	<u>Space Cooling Proportional Band</u> This value determines when the unit switches between space cooling and neutral air control. When the space temperature rises or falls greater than this amount, the unit switches states. Example: $SSP + SCP = 75^{\circ} + 1.8^{\circ} = 76.8^{\circ}$, space cooling mode. Example: $SSP - SCP = 75^{\circ} - 1.8^{\circ} = 73.2^{\circ}$, neutral air cooling mode.	1.8°F	1° to 8°F
SHP	<u>Space Heating Proportional Band</u> This value determines when the unit switches between space heating and neutral air control. When the space temperature rises or falls greater than this amount, the unit switches states. Example: $(SSP - HSO) + SHP = 70^{\circ} + 1.8^{\circ} = 71.8^{\circ}$, neutral air heating mode. Example: $(SSP - HSO) - SHP = 70^{\circ} - 1.8^{\circ} = 68.2^{\circ}$, space heating mode.	1.8°F	1° to 8°F
CPP	<u>CPP - Cooling Discharge Air Prop Band</u> The value of CPP is divided in half around the value of DCH (duct discharge cooling setpoint). When the discharge air temperature goes above $DCH + 1/2 CPP$, a stage of cooling is activated. When the discharge air temperature goes below $DCH - 1/2 CPP$ value, a stage of cooling is deactivated.	10.0°F	2° to 40°F
HPP	<u>Heating Discharge Air Proportional Band</u> The value of HPP is divided in half around the value of DHL (duct discharge heating setpoint). When the discharge air temperature goes below $DHL + 1/2 HPP$, a stage of heating is activated. When the discharge air temperature goes below $DHL - 1/2 HPP$ value, a stage of heating is deactivated.	10°F	4° to 30°F
ICT	<u>Heating Integration Constant</u> This adjustable parameter defines the integration time used with proportional-integral (PI) control of discharge air.	0	0 to 999 seconds
HDB	<u>Space Heating Dead Band</u> The space heating dead band is a value around the heating setpoint at which nothing will occur -- hence "dead band". For instance, if the space heating setpoint is 70°F and the Space Heating Dead Band has a value of 2°, then the temperature in the space drops below 70° ($SSP - HSP - 1/2 HDB$) to 67.2° before the unit will switch to space heating control. Likewise, a value of 72.8° will switch back to neutral air heating control.	0	0 to 4
OC1	<u>Cooling Mode Lockout – Ambient Dry Bulb</u> If the outdoor air temperature is less than the value of OC1, cooling mode will be disabled. When the outside air temperature rises above OC1, the unit will be in cooling mode.	68°F	58° to 130°F
OH1	<u>Heating Mode Lockout - Ambient Dry Bulb</u> If the outside air temperature is greater than the value of OH1, heating mode is disabled. When the outside air falls below OH1, the unit will be in heating mode.	62°F	52° to 80°
DP1	<u>Reheat Enabled Setpoint – Ambient Dewpoint</u> At dewpoints below this value, reheat will not be enabled..	60°F	52° to 80°F
ROL	<u>Low Ambient Reheat Override – Dry Bulb</u> If the outdoor air temperature is below this setpoint, the reheat will not be enabled.	65°F	54° to 75°F
ROH	<u>High Ambient Heat Override – Dry Bulb</u> If the outdoor air temperature is above this setpoint, the reheat will not be enabled.	120°F	60° to 120°F
LSP	<u>Low Limit Freeze Protection Setpoint</u> If the discharge air temperature sensor senses discharge air temperature below the value of LSP for 600 seconds, the blower will be disabled and the outside air damper will close. The control will reset when the discharge air sensor senses discharge air 30° above the value of LSP. If this sequence occurs three times within one hour, the control will go to continuous lockout.	36°F	-40° to +40°F

continued

FX06 Commissioning Parameters Level (cont'd)

Menu 04 (cont'd) Commissioning Parameters (cont'd)			
Display Name	Control Variable Description	Default Value	Range
EN1	<u>1st Stage Enthalpy Cooling Reference Lockout</u> If the outdoor enthalpy is below this value, cooling mode is not allowed. Above this value, 1st stage cooling is allowed.	29	15 to 40
EN2	<u>2nd Stage Enthalpy Cooling Lockout</u> Provides an enthalpy differential to the EN1 setting (add this differential to the EN1 value). If outdoor enthalpy is below this value, the 2nd or 3rd stage cooling control is not allowed	5	0 to 20
EN3	<u>3rd Stage Enthalpy Cooling Lockout</u> EN3 provides an enthalpy differential to the EN2 setting (add this differential to the EN2 value). If outdoor enthalpy is below this value, the 3rd stage of cooling is not allowed.	5	0 - 20
NSU	<u>Night Setup - Cooling</u> This value is added to the space cooling setpoint (SSP) for unoccupied periods. If the cooling setpoint (SSP) is 75° during the occupied mode, and NSU is 9, then during unoccupied modes, the cooling setpoint will be 84°F (75 + 9).	9	0 - 35
NSB	<u>Night Set Back – Heating</u> This value is the amount subtracted from the space heating setpoint in the unoccupied mode. Example: SSP - HSO - NSB ~ 75 - 5 - 9 = 61°F, which is the space heating setpoint in the unoccupied mode.	-9	-35 to 0
RCP	<u>Room (space) Discharge Air Cooling Temperature Setpoint</u> When the space temperature sensor is installed and the temperature in the space increases above the space cooling setpoint (SSP) through the space cooling prop band (SCP), the RCP value will become the active discharge air setpoint. The value of RCP will be used by the unit only if a space temperature sensor is used.	55°F	50° to 115°F
RHP	<u>Room (space) Discharge Air Heating Temperature Setpoint</u> When the space temperature sensor is installed and the temperature in the space falls below the space heating setpoint (SSP - HSO) by a difference of the space heating prop band (SHP), the RHP value will become the active discharge air setpoint. The value of RHP will only be used by the unit if a space temperature sensor is installed.	80	45 to 120
RSP	<u>Reheat Setpoint Offset</u> If the unit is equipped with reheat and conditions are such that reheat is being called for, the neutral air cooling setpoint value will increase by RSP amount. This value should not be used unless the neutral air discharge air temperature setpoint (DCH) is lower than 65°F.	0	0 to 30
UOT	<u>Temporary Occupied Button Timer</u> Amount of time the system will remain in occupied mode when the occupancy override button is pressed with the system in an occupied condition.	240	0 to 240
HHR	<u>Humidity High Range</u> This allows adjustment of the humidity sensor range. The default is 5 for a 0-5v sensor. Adjusting this value to 10 will allow a 0-10v humidity sensor to be used.	5	0 to 10

Menu 05 Sensor Calibration (DO NOT change these default values unless advised by the factory.)			
Display Name	Control Variable Description	Default Value	Range
RMTO	<u>Space Temperature Sensor Calibration</u> Allows a small sensor offset when space wires add significant resistance. Used to offset wire resistance..	-1.1	-20 to 20
DAO	<u>Discharge Air Temperature Sensor Calibration</u> Allows a small sensor offset when space wires add significant resistance. Used to offset wire resistance.	-1.1	-20 to 20

Menu 06**Controller Set-up**

Display Name	Control Variable Description	Default Value	Range
UNIT OF MEASURE	Degree F or Degree C	°F	-
N2 ADDRESS	Network Communication Address	255	0 to 255
YEAR	4 digit Year code	-	
MONTH	2 Digit Month code	-	01 to 12
DAY OF MONTH	2 digit day code	-	01 to 31
HOUR	24 hour time code	-	1 to 24
MINUTE	Standard Minute code	-	01 to 60
HTG POLARITY	Setting the Parameter allows the 0-100% analog heating output to be direct acting or reverse acting. The default setting is reverse acting.	REV	REV or DIR
HTGOUTLOWLIMIT	Low limit for the heating output. This value should not be changed.	25	0 to 30
HTGOUTHIGHLIMIT	High limit for the heating output.	70 (gas heat) 100 (electric heat)	60 to 100

There is a 10-day battery backup to maintain the clock time during brief power outages. If the power is off for greater than ten days, the time and date must be reset.

Menu 07**Schedule (See paragraph below.)**

Display Name	Control Variable Description	Default Value	Range
--01--	Occupancy Schedule 1	-	00:00 to 24:00
--02--	Occupancy Schedule 2	-	00:00 to 24:00
--03--	Occupancy Schedule 3	-	00:00 to 24:00
--04--	Occupancy Schedule 4	-	00:00 to 24:00
--05--	Occupancy Schedule 5	-	00:00 to 24:00
--06--	Occupancy Schedule 6	-	00:00 to 24:00
--07--	Occupancy Schedule 7	-	00:00 to 24:00
--08--	Occupancy Schedule 8	-	00:00 to 24:00
--09--	Occupancy Schedule 9	-	00:00 to 24:00
--10--	Occupancy Schedule 10	-	00:00 to 24:00
--11--	Occupancy Schedule 11	-	00:00 to 24:00
--12--	Occupancy Schedule 12	-	00:00 to 24:00
--13--	Occupancy Schedule 13	-	00:00 to 24:00
--14--	Occupancy Schedule 14	-	00:00 to 24:00
--15--	Occupancy Schedule 15	-	00:00 to 24:00
--16--	Occupancy Schedule 16	-	00:00 to 24:00
--17--	Occupancy Schedule 17	-	00:00 to 24:00
--18--	Occupancy Schedule 18	-	00:00 to 24:00
--19--	Occupancy Schedule 19	-	00:00 to 24:00
--20--	Occupancy Schedule 20	-	00:00 to 24:00
--21--	Occupancy Schedule 21	-	00:00 to 24:00

Time Schedule

If no schedule is provided, the unit will run in occupied mode. The schedule is a given time start / stop time assigned to any day of a seven day week. (The holiday is not used)

To access the schedule from the controller display, press the “C” key until the display shows “menu” in small letters. Press the up/down arrows until you reach Menu 07 with a scrolling “schedule” message.

Press the “OK” key to select the schedule menu

FX06 Commissioning Parameters Level (cont'd)

Time Schedule (cont'd)

At this point, choose from the 1-21 time schedules. Each time schedule has a single starting and stopping time using standard 24 hour and 60 minute time increments. This time can be individually assigned to any day of a 7-day week plus a holiday.

1. Press the up/down arrows until you reach the time schedule that you want to view/set. Press "OK" to enter that time schedule.
2. Press the up/down arrows to view the settings. The unit scrolls from start time; end time; sun-sat; holiday.
3. At any point, press the "OK" key to select an item to be changed. Use the up/down arrow to change the value. Press "OK" to accept the value. When assigning a time to a day, the display will show the day with or without an asterisk next to it (MON*, TUE, WED*....). Days with an asterisk have been assigned to use the given start stop.

Upon selecting a value, the screen will show a start time or "FROM" time. Press OK to change that time. Press the up/down arrow to move to the end time or "TO" time. To change the time, press the OK button. The hours will flash as the up/down arrows change the hour settings; press OK to accept the hour setting. The unit will then allow the minutes to be changed. The minutes will flash as they are changed.

Menu 08		Events	
Display Name	Control Variable Description	Default Value	Range
Event Summary	Shows all current Alarms		
Event History	Stores alarms that are no longer active		

Alarm Displays

When an alarm is triggered, one of the following codes will flash on the FX06 display window.

AP	Air Proving
FS	Low Limit Freeze Protection Lockout
ST	Discharge Air Temperature Sensor Failure
OT	Outdoor Air Temperature Sensor Failure
EE	FX06 Controller Low Voltage Lockout
Phase Loss Switch (optional) - Nothing Displayed (Lockout)	

AP – Air Proving - When the blower is called to be ON (point BO-1), the blower starts, and the blower status switch must close proving blower operation. If the blowers status does not show blower operation within 180 seconds, the unit shuts down. The unit must be restarted by cycling power to the FX06 controller or opening/closing the "Unit ON/OFF" switch (point BI-3).

During normal operation after initial blower startup, if the blower status input shows open for more than three seconds, the unit will shut down cooling and heating equipment. If the AP input continues to remain open for an additional 180 seconds, the blower is shutdown, and the FX06 controller will be in lockout mode. The controller can be reset by cycling power to the FX06 controller or toggling the BI-3 system on/off switch. If the blower status switch is made before the unit reaches lockout mode, cooling and heating operation will restart.

Troubleshooting - A flashing AP is caused due to an open circuit on Terminals 48 and 46. Check the air proving switch to ensure it is operational (be sure the blower cabinet door is closed). If equipped with an Option BF15 phase loss monitor (in the high voltage box), check the indicator light. The green light indicates the unit is in phase. Red light indicates out of phase. Recycle power to the unit to clear out the alarm.

FS – Low Limit Freeze Protection Lockout - When the blower is called to be ON and the discharge air temperature is below the low limit freeze setpoint (LSP = 36°F) for 600 seconds, the unit is shutdown (blower OFF). The display will flash “FS”. When the discharge air rises above the low limit freeze setpoint plus 30°F, the low limit freeze lockout is disabled, allowing the unit to operate. Three (3) consecutive lockouts within one hour will result in a continuous lockout state. The FX06 power must be cycled before operation can continue. Toggling the BI-3 input will **not** reset the unit.

Troubleshooting - A flashing FS indicates the unit has encountered a low discharge air temperature (below 36°F) for over 7 minutes. Investigate the heating system and recycle the power to clear out the alarm. Verify that the gas valve is open and the heating board is operational.

Sensor Failures (flashing “OT” or “ST”) - If a temperature sensor value reads (999) or open circuit, the sensor is in a failed condition.

If the discharge air dry bulb sensor fails, the controller will lock out the unit. No mechanical equipment will be allowed to run. The display will flash “ST”. Installing or replacing the sensor will allow immediate restarting of the equipment.

A failed outdoor air sensor (flashing “OT”) will lock out cooling mode and heating operation. However, the blower will continue to operate.

Troubleshooting - A flashing ST means the discharge air sensor may not be connected (check for two white wires on terminals 54 and 57). To check the sensor for failure, remove the two wires and check resistance against temperature (See chart on page 23). Make sure that the sensor is properly located in the ductwork.

A flashing “ot” means the outdoor air sensor may not be connected or has failed. Check terminals 54 and 56 and sensor operation.

“EE” – Controller Low Voltage Lockout - If the FX06 controller power drops below the minimum level, the display will read EE, and all controller functions will be OFF. The controller will restart when power level returns to normal.

Phase Loss Switch - No Display (Lockout) - (Option BF14 or BF15 is required.) - If the phase monitor detects a poor power condition, the phase loss switch will cut power to the control circuit. The phase loss switch will automatically reset when the poor power condition is no longer detected.

Test Mode Keys

To force the unit into a test mode, at the home page, press both the up and down arrows for 2 seconds. The display will scroll “unit test.” If no other action is taken the unit will cycle through the outputs in one minute intervals.

1. Blower ON
2. Blower plus 1st stage Heating ON (display HTGSTG 1)
3. Blower plus ALL Heating ON (display HTGSTG 2)
4. Blower plus reheat pump ON (display Reheat Compressor)
5. Blower plus 1st stage compressor ON (display CLGSTG 1)
6. Blower plus 2nd stage compressor ON (display CLGSTG 2)

Using the following keys will change

1. Press the “Up” for 1 second to Extend Test Mode (15 minutes).
2. Press the “Down” key for 1 second to cancel the test mode.
3. Press the “OK” key for 1 second to manual Jump test mode.
4. Pressing the “C” will take you out of the menu but the unit will remain in test mode.

Sensor Data and Application

Optional Space (Wall-Mounted) Sensors

FIGURE 7 - Optional Wall-Mount Space Air Sensor, Option CL67, P/N 222052



Communication Space Temperature Sensor - The wall mounted sensor should be located on an interior wall (avoid direct placement in the sun) with the wall opening insulated to prevent cold drafts. Locate the sensor where it will sample representative space air.

The optional space sensor with set-point adjust uses communication to transfer the data back to the unit controller. The sensor requires 24VAC power and two wire communication. See the unit wiring diagram for wiring details.

The unit displays the current space temperature. When the dial is turned, the space cooling setpoint (SSP) will be displayed. The user can turn the dial to adjust the space cooling setpoint. The space heating setpoint is a given differential below the cooling setpoint. See variable HSO for details.

Room RH Input with Reheat Mode - Since reheat is already enabled based on outdoor dewpoint, a room RH control is typically not required for units that condition 100% outside air. A wall mounted RH control (**FIGURE 8**) is typically specified when internal latent loads vary considerably, the rooftop is applied with return air, or an unoccupied space RH control is desired. When applied with an RH input, reheat is enabled if space RH is above setpoint and the

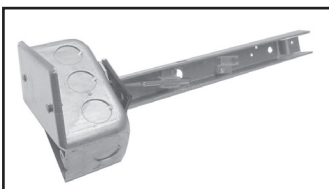
FIGURE 8 - Wall-Mounted Dehumidistat, Option CL47, P/N 177231



space cooling load is satisfied. During unoccupied mode, a rise in room RH will enable the dehumidification and reheat circuit. If there is no call for space cooling, only the reheat pump is enabled (cooling compressors are locked out).

Discharge/Duct Sensor

FIGURE 9A - Discharge Air Sensor, P/N 206112, and Holder, P/N 115850, for Ductwork Installation



All systems have a discharge air sensor. The discharge sensor element on cooling only or cooling with reheat systems (Models RCA/RDA) is attached to the discharge opening of the system. On systems with a heat section (Models RDCA/RDDA/RECA/REDA) or Models RCA and RDA with Option DU1, the sensor is temporarily installed for heater startup but must be relocated to the ductwork.

When installed in the ductwork the sensor must be housed in a mixing tube which is attached to a 2x4 electrical box. The assembled parts (See **FIGURE 9A**) are shipped in the control compartment. Read the instructions below and follow carefully to relocate the discharge air temperature sensor.

Discharge Air Temperature Sensor Location - Apply to all Models RDCA/RDDA/RECA/REDA and Models RCA/RDA with Option DU1

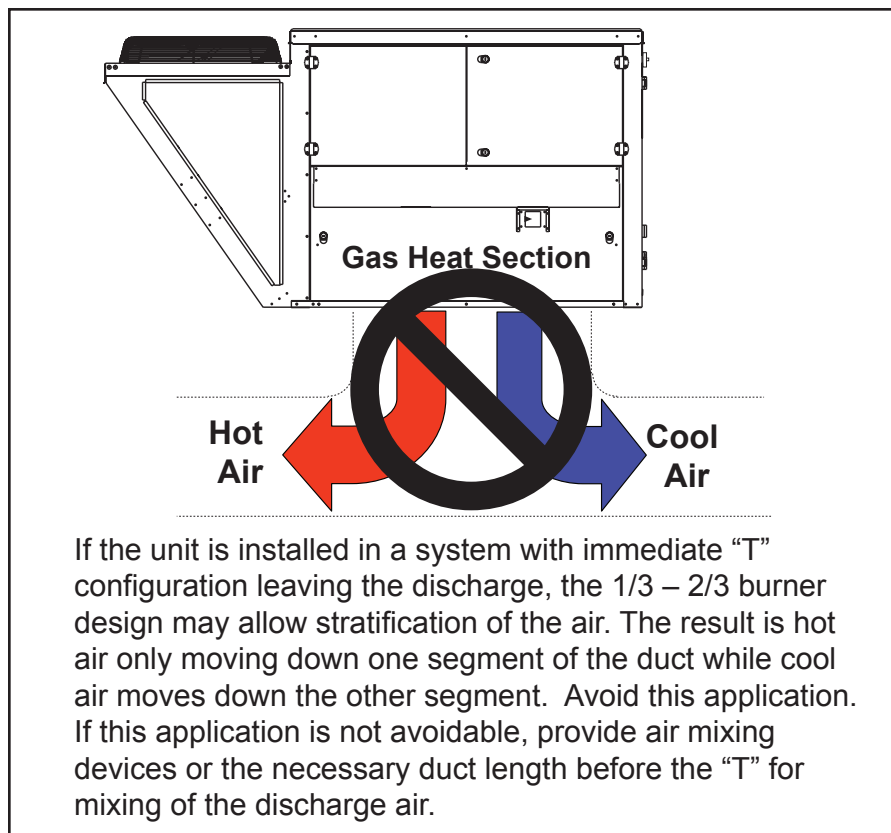
Placement of the discharge air sensor in the ductwork is critical to the correct operation of a MAPS II system in both the cooling and heating modes.

Due to the split burner and dual heat exchanger features of the gas heat section, duct configuration and sensor location are extremely important in the heating mode with a gas heat section. The gas heat section of the MAPS II unit is designed to conserve fuel by only firing a portion of the burner or one of the dual heat exchangers as required to supply the demand for heat. Improperly locating the sensor can result in poor control of discharge temperature.

FIGURE 9B - On units with a gas heat section, avoid an immediate “T” in the discharge duct

Sensor Data for Johnson A99 Series Temperature Sensors - Resistance vs Temperature (applies to both discharge and outside air sensor)

°F	°C	Ohms
-40	-40	613
-31	-35	640
-22	-30	668
-13	-25	697
-4	-20	727
5	-15	758
14	-10	789
23	-5	822
32	-0	855
41	5	889
50	10	924
59	15	960
68	20	997
77	25	1035
86	30	1074
95	35	1113
104	40	1153
113	45	1195
122	50	1237
131	50	1279
140	60	1323
149	65	1368
158	70	1413
167	75	1459
176	80	1506
185	85	1554
194	90	1602
203	95	1652
212	100	1702
221	105	1753
230	110	1804
239	115	1856
248	120	1908



Instructions for Installing Sensor in Discharge Duct

1. Determine the appropriate distance from the unit. Be sure there is sufficient distance from the outlet to have a good mixture of discharge air temperature. According to the latest edition of AMCA Standard 201, in straight ducts, the air is typically well mixed a minimum of five equivalent duct diameters from the discharge of the unit with equivalent duct diameter defined as equal to the square root of $4AB/3.14$. “A” and “B” are the duct cross-sectional dimensions.

Example: Supply ductwork cross-sectional dimension is 24” x 12” (610mm x 305mm).

$$5 \times \sqrt{\frac{4 \times 12 \times 24}{3.14}} = 96'' \quad 5 \times \sqrt{\frac{4 \times 305 \times 610}{3.14}} = 2435\text{mm}$$

Locate the sensor a minimum of 96” (2435mm) from the outlet of the unit.

Important NOTES: If the length of the discharge duct is less than 12 ft (3.7M), a mixing vane is recommended for mixing the discharge air.

Do not mount the sensor in the ductwork after a split in the supply as that will cause loss of control in the duct that does not house the sensor.

2. **Determine the location and orientation of the sensor holder assembly.**

The position of the sensor holder in the duct is also important.

In horizontal ductwork, locate the sensor assembly in the top, middle of the duct with the sensor holder extending vertically down into the center of the airstream.

In vertical ductwork, locate the sensor assembly in the middle of the side of the duct that corresponds with the top middle of the discharge outlet. The sensor holder will extend horizontally into the center of the airstream.

Push the sensing element into the clip attached to the inside of the sensor holder. Turn the metal holder so that the element will be shielded from

Sensor Data and Application (cont'd)

Maximum Sensor Wire Length for less than 1°F Error

Wire Gauge	Maximum Sensor Wire Length	
AWG	Feet	Meters
14	800	244
16	500	152
18	310	94
20	200	61
22	124	38

NOTE: Wire supplied with the sensor is 22 AWG.

direct airflow and will sense the temperature in the airstream as it flows through the holes in the sensor holder.

At the location selected, mark the diamond-shaped hole required for the sensor holder. Cut the hole no larger than required for the holder, approximately 1" x 1" (25mm x 25mm).

In the electrical box portion of the sensor holder, determine where the sensor wire should come through the box and remove the knockout at that location.

3. Attach the sensor holder assembly. Slide the sensor holder into the opening in the ductwork. Using four field-provided No. 6 sheetmetal screws, attach the box to the ductwork. Attach a field-supplied cable connector to the box, run the sensor wire out, and attach the cover to the box.

4. Run the sensor wire to the unit. Digital control inputs are low-current, resistance-based signals. The manufacturer recommends for optimum temperature control performance that the analog and digital inputs (zone sensors, discharge air sensors, etc.) that are connected to the FX06 controller be routed to the unit in one of the following manners:

- In separate field-supplied conduits, isolated from 24VAC controls and line voltage power to the unit,

OR

- If the FX06 wires are to be run in the same field-supplied conduit as the 24 VAC control wiring, the FX06 wiring must be completed using shielded cable and bundled separately from 24 VAC control wiring. The shield must be drained at the unit and taped on the opposite end.

Outside Air Sensors

FIGURE 10A - Outside Air Dry Bulb Sensor, P/N 206112



FIGURE 10B - Outside Air Relative Humidity Transmitter, Option DT5, P/N 206081



Outside Air Dry Bulb Sensor and Dewpoint or Enthalpy Permissive Control

The outside air sensor (**P/N 206112**) for the FX06 is the same as the discharge sensor. The Johnson A99 Series Temperature Sensor Chart on page 23 applies to both the discharge and outside air sensors.

If the application uses mixed air (return and outside air), the outside air temperature sensor and optional humidity transmitter (**FIGURE 10B**) must be mounted together to sense outdoor air conditions. Verify that factory mounted positions provide acceptable performance.

Sensor Accuracy and Outside Air Changeover Differential

Dry bulb sensor accuracy is within 1°F between 5° and 167°F. Outside air dewpoint is calculated based on a humidity transmitter (**FIGURE 10B**) input. Accuracy is rated as follows:

Humidity transmitter $\pm 3\%$ RH for 20 to 80% RH at 77°F and $\pm 5\%$ RH for 10 to 20% and 80 to 90% RH at 77°F. The dewpoint calculation is within 1% error at sea level. Hysteresis and the rate of moisture change also have an impact on sensor accuracy. Prolonged periods of high humidity (above 95% RH) can affect sensor accuracy (the bias is towards a higher RH reading than actual). *The calculated outdoor dewpoint should be verified on an annual basis to ensure proper changeover operation.*

Wall-Mounted Sensor and Communication Wire Installation

Before connecting or disconnecting any wires, ensure that all power supplies have been switched off and all wires are potential-free to prevent equipment damage and avoid electric shock.

IMPORTANT: The FX06 control wiring control inputs are low-current, resistance-based signals. The control manufacturer recommends for optimum temperature control performance that the analog and digital inputs (space sensor,

discharge air sensors, etc.) that are connected to the FX06 controller be routed to the unit in one of the following manners:

- In separate conduits, isolated from 24VAC controls and line voltage power to the unit.

OR

- If the FX06 wires are to be run in the same conduit as the 24VAC control wiring, the FX06 wiring must be completed using shielded cable and bundled separately from 24VAC control wiring. The shield must be drained at the unit and taped on the opposite end.

Control Wiring

Wiring terminations in space sensor, Option CL67 (**FIGURE 7**), are made at the terminal blocks in the base of the module. Those terminal blocks will accept up to 1.5 mm² (AWG 16) wires. To access the terminals, remove the cover from the base of the module by inserting a pointed tool into the small hole at the center top of the cover. While pressing down gently, pry the cover away from the base. As the two parts separate, remove the tool and continue to pull the cover away from the base until the cover is free.

All wiring to the module is at extra low (safe) voltage and must be separated from line voltage wiring. All field-installed DC sensor wiring must be in shielded cable. Do not run wiring close to transformers or high frequency generating equipment such as a lighting ballast.

Complete and verify all wiring connections before applying power to the controller connected to the module. Under the lateral cover on the space sensor, service connector pins provide for serial connection if the optional serial card (N2Open or LON) is inserted in the FX06 controller and properly connected to the room command module pins 10, 11, and 12.

Physical Point List

When the FX06 controller is “on” and operational, the FX06 controller will operate the Reznor MAPS air handling equipment based upon the following physical points list and D12A control sequence.

Controller Physical Points List						
Point Description	AI	AO	BI	BO	Elec Component	Comment
Occupied Override Switch (BI-1)			√		CL67 Push button	The wall-mounted temperature sensor with override push button.
Relative Humidity Switch (BI-2)			√		CL 47 Humidistat	
On/Off Switch (BI-3)			√		External dry contact	Factory jumper wire installed
Occupied Switch (BI-4)			√		External dry contact	
Air Proving (BI-5)			√		Differential Pressure Switch	
Outdoor Air Humidity (AI-2)	√				Humidity Sensor	0-5V = 0-100% RH
Outdoor Air Temperature (AI-3)	√				A99 Thermistor	Resistance = −40 to 100°C
Discharge Air Temperature (AI-4)	√				A99 Thermistor	
Modulating Gas Valve (AO-1)		√			Gas Valve / SCR Power Controller	0-10V = 100-0% open converted at valve to 3V- 7V ~ 100%-50% open
Fan Start/Stop (Damper) (BO-1)				√	Relay	OA Damper Interlock to Fan
1st Stage Heating (On/Off) (BO-2)				√	Relay	Triac outputs to mechanical relays
2nd Stage Heating (On/Off) (BO-3)				√	Relay	
Reheat (BO-4)				√	Contactor	
1st Stage Cooling (BO-5)				√	Contactor	
2nd Stage Cooling (BO-6)				√	Contactor	
NOTE: AI = Analog Input, AO = Analog Output, BI = Binary Input, BO = Binary Output.						

BAS Card Options

Note: Option CL47 (FIGURE 8, page 20) room dehumidistat is a mechanical control. Room Rh is not available as a BAS point. For return air applications (with return air dampers), there is no BAS output to override motorized damper operation during unoccupied mode.

Lon Card, Option BHB3

The LON Serial Card is a plug-in card that allows the FX06 control to be connected to a LON network. The connection to the network is made by means of the 3 pins on the plug-in connector. **P/N for Option BHB3 with software is 223121.**

The network cable must be laid along a low voltage cable path. It must be placed at least 12" (30 cm) from cables carrying high voltages or currents (>230V or >30A). If strong interference fields are expected, the cable must be located at the greatest distance possible from the source. The TP/FT-10 network is designed to support free topology wiring, and will accommodate bus, star, loop or any combination of these topologies. FTT-10A transceivers can be located at any point along the network wiring.

LON network: Doubly-Terminated Bus Topology; Free topology (single terminator required).

Cable Type	Length with FTT-10 devices	
	Bus topology	Free topology
Belden 85102	8858 ft (2700m)	1640 ft (500m)
Belden 8471	8858 ft (2700m)	1640 ft (500m)
Level IV 22 AWG	4593 ft (1400m)	1312 ft (400m)

Power link topology supported.

Pin	Twisted pair
1	NET A
2	NET B
3	COM

Lon Network Points List

Nodes: 64 (if repeaters are not used), FTT-10 nodes only.

Network Variables:

Name	Direction	SNVT Type	Unit of measure	COV apply to NVO	RCVHRTBT apply to NVI	Index	SISD
nviRequest	Input	92 - obj_request			False	0	@0 1
nvoStatus	Output	93 - obj_status		False		1	@0 2
nvoFileDirectory	Output	114 - address	#	False		2	@0 8
nviUnitEnable	Input	95 - switch			False	3	@1 1
nvoTempOccupiedStatus	Output	22 - lev_disc		False		4	@1 2
nvoSpaceTemp	Output	105 - temp_p	°F	False		5	@1 3
nvoDewPoint	Output	105 - temp_p	°F	False		6	@1 4
nvoEnthalpy	Output	51 - count_f	#	False		7	@1 5
nvoClgTimerStatus	Output	22 - lev_disc		False		8	@1 6
nvoRH_Status	Output	22 - lev_disc		False		9	@1 7
nvoTimeclockStatus	Output	22 - lev_disc		False		10	@1 8
nvoOA_Humidity	Output	81 - lev_percent	%	False		11	@1 9
nvoOA_Temperature	Output	105 - temp_p	°F	False		12	@1 10
nvoDA_Temperature	Output	105 - temp_p	°F	False		13	@1 11
nviUnitShutdown	Input	22 - lev_disc			False	14	@1 12
nvoWHSP	Output	105 - temp_p	°F	False		15	@1 13
nvoWCSP	Output	105 - temp_p	°F	False		16	@1 14
nvoRm_Clg_SP	Output	105 - temp_p	°F	False		17	@1 15
nvoRm_Htg_SP	Output	105 - temp_p	°F	False		18	@1 16
nvoRoomHumiditySwitch	Output	22 - lev_disc		False		19	@1 17
nvoOn_OffInputSwitch	Output	22 - lev_disc		False		20	@1 18
nvoOcc_UnoccSwitch	Output	22 - lev_disc		False		21	@1 19
nvoAirProvingSwitch	Output	22 - lev_disc		False		22	@1 20
nvoFan_DamperStatus	Output	22 - lev_disc		False		23	@1 21
nvoHtgStg1Status	Output	22 - lev_disc		False		24	@1 22
nvoHtgStg2Status	Output	22 - lev_disc		False		25	@1 23
nvoClgStg1Status	Output	22 - lev_disc		False		26	@1 24
nvoClgStg2Status	Output	22 - lev_disc		False		27	@1 25
nvoSpaceClgSetpt	Output	105 - temp_p	°F	False		28	@1 26
nviUnitOccupied	Input	95 - switch			False	29	@1 27
nvoHtgOutput	Output	81 - lev_percent	%	False		30	@1 28
nviHtgOffsetSetpt	Input	51 - count_f	#		False	31	@1 29
nviDaClgSetpt	Input	105 - temp_p	°F		False	32	@1 30
nviDaHtgSetpt	Input	105 - temp_p	°F		False	33	@1 31
nviReHtDpSetpt	Input	105 - temp_p	°F		False	34	@1 32

Configuration Parameters:

Name	Default value	SNVT Type	Unit of measure	Index	SISD
cpSendHeartBeat	30	107 - time_sec	s	0	0,,0x80,49,2,1
cpSpaceTmpOffset	-0.6	147 - temp_diff_p	°F [dif]	1	1,1,6x80,1,2,1
cpDATmpOffset	-0.6	147 - temp_diff_p	°F [dif]	2	1,1,6x80,2,2,1
cpOccOvrTimeMn	240	123 - time_min	min	3	1,1,6x80,3,2,1
cpHSPOffset	2.8	147 - temp_diff_p	°F [dif]	4	1,1,6x80,4,2,1
cpDaHtgDb	0	147 - temp_diff_p	°F [dif]	5	1,1,6x80,5,2,1
cpNightSetup	5	147 - temp_diff_p	°F [dif]	6	1,1,6x80,6,2,1
cpNightSetback	-5	147 - temp_diff_p	°F [dif]	7	1,1,6x80,7,2,1
cpZoneClgPb	1	147 - temp_diff_p	°F [dif]	8	1,1,6x80,8,2,1
cpZoneHtgPb	1	147 - temp_diff_p	°F [dif]	9	1,1,6x80,9,2,1
cpOaHtgLow	-6.67	105 - temp_p	°F	10	1,1,6x80,10,2,1
cpOaHtgHigh	15.56	105 - temp_p	°F	11	1,1,6x80,11,2,1
cpOaClgLow	15.56	105 - temp_p	°F	12	1,1,6x80,12,2,1
cpOaClgHigh	23.9	105 - temp_p	°F	13	1,1,6x80,13,2,1
cpRmDaClgSp	12.8	105 - temp_p	°F	14	1,1,6x80,14,2,1
cpDAClgHigh	21.1	105 - temp_p	°F	15	1,1,6x80,15,2,1
cpDaClgLow	26.67	105 - temp_p	°F	16	1,1,6x80,16,2,1
cpDaHtgLow	21.1	105 - temp_p	°F	17	1,1,6x80,17,2,1
cpDaHtgHigh	12.8	105 - temp_p	°F	18	1,1,6x80,18,2,1
cpCalcBtu	7.68	51 - count_f	#	19	1,1,6x80,19,4,1
cpClgOaSetpt	20	105 - temp_p	°F	20	1,1,6x80,20,2,1
cpReheatDpSetpt	15.56	105 - temp_p	°F	21	1,1,6x80,21,2,1
cpHtgOaSetpt	16.67	105 - temp_p	°F	22	1,1,6x80,22,2,1
cpReheatSetptLoLow	18.33	105 - temp_p	°F	23	1,1,6x80,23,2,1
cpReheatSetptHiLow	48.9	105 - temp_p	°F	24	1,1,6x80,24,2,1
cpEnthalpySp	29	51 - count_f	#	25	1,1,6x80,25,4,1
cpEnthalpy2Diff	5	51 - count_f	#	26	1,1,6x80,26,4,1
cpEnthalpy3Diff	5	51 - count_f	#	27	1,1,6x80,27,4,1
cpRhtSpOffset	0	147 - temp_diff_p	°F [dif]	28	1,1,6x80,28,2,1
cpLowLimSetpt	2.2	105 - temp_p	°F	29	1,1,6x80,29,2,1
cpDaPropBand	5.56	147 - temp_diff_p	°F [dif]	30	1,1,6x80,30,2,1
cpDaDeadBand	0	147 - temp_diff_p	°F [dif]	31	1,1,6x80,31,2,1
cpDaIntTime	0	107 - time_sec	s	32	1,1,6x80,32,2,1
cpDaLowSatTime	60	107 - time_sec	s	33	1,1,6x80,33,2,1
cpDaHighLimit	70	81 - lev_percent	%	34	1,1,6x80,34,2,1
cpDaLowLimit	25	81 - lev_percent	%	35	1,1,6x80,35,2,1
cpDaClgPropBand	5.56	147 - temp_diff_p	°F [dif]	36	1,1,6x80,36,2,1
cpClgLowLimSp	9.44	105 - temp_p	°F	37	1,1,6x80,37,2,1
cpClgBoost	-1.67	147 - temp_diff_p	°F [dif]	38	1,1,6x80,38,2,1
cpHtgBoost	2.2	147 - temp_diff_p	°F [dif]	39	1,1,6x80,39,2,1
cpRmDaHtgSp	26.67	105 - temp_p	°F	40	1,1,6x80,40,2,1
cpWrmupTmMin	15	123 - time_min	min	41	1,1,6x80,41,2,1
cpUncRhtEna	1, LOG_ON	10149 - UNVT_logic		42	1,1,6x80,42,1,1
cpAlarmReset	0, LOG_OFF	10149 - UNVT_logic		43	1,1,6x80,43,1,1
cpnciOnOffSched	-	40060 - UNVT_OnOffSched		44	1,1,6x80,44,126,1
cpNoModHeat	0, LOG_OFF	10149 - UNVT_logic		45	1,1,6x80,45,1,1
cpSpaceSetptHighLimit	25.56	105 - temp_p	°F	46	1,1,6x80,46,2,1
cpSpaceSetptLowLimit	22.2	105 - temp_p	°F	47	1,1,6x80,47,2,1
cpHeatPolarity	1, Reverse	5019 - Polarity_t		48	1,1,6x80,48,1,1
cpHum_Hi_Range	5	51 - count_f	#	49	1,1,6x80,49,4,1

N2 Open Card, Option BHB2

Pin	RS485
1	COM
2	RT-
3	RT+

The N2Open serial card is a plug-in, optional card that allows the controllers of the FX06 line to be connected in a N2Open serial network through the RS485 standard. The connection to the network is made by means of the 3 pins on the plug-in connector. **The P/N for N2 Open Card for FX06 Control, Option BHB2, is 206077.**

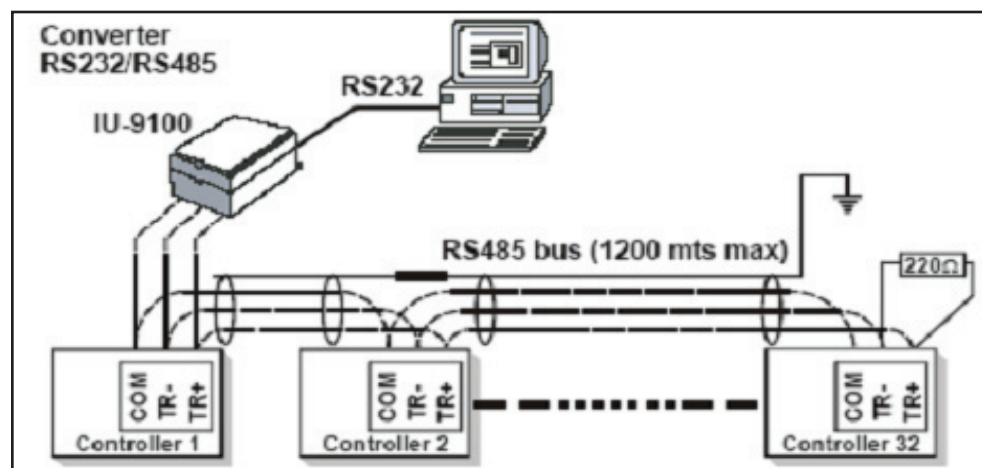
The network cable must be laid along a low voltage cable path. It must be placed at least at 12" (30 cm) from cables carrying high voltages or currents (>230V or >30A). If strong interference fields are expected, the cable must be located at the greatest distance possible from the source. The communication line must be laid out on the multi-drop line principle, i.e. from one controller to the next until the last controller has been connected. The line must be terminated at both ends with a 220 Ohm resistor between RT+ and RT-.

N2 Open Card, Option BHB2

RS485 line: maximum length without repeater: 3937 ft (1200 M), AWG26 twisted pair with shield.

RS232C line: maximum length: 33 ft (10 m)

Devices: maximum of 32 per 3937 ft (1200 m) bus segment



N2 Network Points List

Points List Notes:

*When applied with N2open systems, the BD points are multistage and mapped as an Msi point.

Room Discharge air heating setpoint = Supply air temperature to offset heating losses in the space

Room Discharge Air Cooling Setpoint = Supply air temperature to offset heat gains in the space

Duct Discharge Air Cooling Setpoint = Supply air value when there is no call for cooling from the space (typically equals the space temperature)

Duct Discharge Air Heating Setpoint = Supply air value when there is no call for heat from the space (typically equals the space temperature)

N2Open View

Point Type	Point Address	Direction	Long name	Short name	Default value	Unit of measure
ADF	1	Output	SpaceTemp	OSPCTSpa	-	°F
ADF	2	Output	DewPoint	ODWPDewP	-	°F
ADF	3	Output	Enthalpy	ONTHenth	-	#
ADF	4	Output	OA_Humidity	O_HMDOA_	-	%
ADF	5	Output	OA_Temperature	O_TMPRTR	-	°F
ADF	6	Output	DA_Temperature	OD_TMPRT	-	°F
ADF	7	Output	WHSP	OWHSP	-	°F
ADF	8	Output	WCSP	OWCSP	-	°F
ADF	9	Output	Rm_Clg_SP	ORM_CLG_	-	°F
ADF	10	Output	Rm_Htg_SP	ORM_HTG_	-	°F
ADF	11	Output	SpaceClgSetpt	OSPCCLGS	-	°F
ADF	12	Output	HtgOutput	OHTGTPhT	-	%
ADF	13	Input	nviSpcSetptLL	ISPCSTPT	-	°F
ADF	14	Input	nviSpcSetptHL	ISADF_13	-	°F
ADF	15	Input	nviHtgOffset	IHTGFFST	-	#
ADF	16	Input	nviDAHtgSetpt	IDHTGSTP	-	°F
ADF	17	Input	nviDAClgSetpt	IDCLGSTP	-	°F
ADF	18	Input	FloatZero	PFLTZFlo	0.000000	#
ADF	19	Input	FloatOneHundred	PFLTNHND	100.000000	#
ADF	20	Input	SpaceTmpOffset	PSPCTMPF	0.0	°F [dif]
ADF	21	Input	DATmpOffset	PDTMPFFS	-1.1	°F [dif]
ADF	22	Input	HSPOffset	PHSPFFST	5.0	°F [dif]
ADF	23	Input	DaHtgDb	PDaHtgDb	0.0	°F [dif]
ADF	24	Input	NightSetup	PNGHTSTP	9.0	°F [dif]
ADF	25	Input	NightSetback	PNGHTSTB	-9.0	°F [dif]
ADF	26	Input	ZoneClgPb	PZNCLGPB	1.8	°F [dif]
ADF	27	Input	ZoneHtgPb	PZNHTGPB	1.8	°F [dif]
ADF	28	Input	OaHtgLow	POaHtgLo	20.0	°F
ADF	29	Input	OaHtgHigh	PHTGHOaH	60.0	°F
ADF	30	Input	OaClgLow	POaClgLo	60.0	°F
ADF	31	Input	OaClgHigh	PCLGHOaC	75.0	°F
ADF	32	Input	RmDaClgSp	PRMDCLGS	55.0	°F
ADF	33	Input	DAClgHigh	PDCLGHGH	70.0	°F
ADF	34	Input	DaClgLow	PDCLGLDa	80.0	°F
ADF	35	Input	DaHtgLow	PDHTGLDa	70.0	°F
ADF	36	Input	DaHtgHigh	PDHTGHGH	55.0	°F
ADF	37	Input	CalcBtu	PCalcBtu	7.680000	#

ADF	38	Input	ClgOaSetpt	PCLGSTPT	68.0	°F
ADF	39	Input	ReheatDpSetpt	PRHTDPST	60.0	°F
ADF	40	Input	HtgOaSetpt	PHTGSTPT	62.0	°F
ADF	41	Input	ReheatSetptLoLow	PRHTSTPT	65.0	°F
ADF	42	Input	ReheatSetptHiLow	PRADF_41	120.0	°F
ADF	43	Input	EnthalpySp	PNTHLPYS	29.000000	#
ADF	44	Input	Enthalpy2Diff	PNTHLPY2	5.000000	#
ADF	45	Input	Enthalpy3Diff	PNTHLPY3	5.000000	#
ADF	46	Input	RhtSpOffset	PRHTSPFF	0.0	°F [dif]
ADF	47	Input	nciFloat15	PFloat15	0.0	°F [dif]
ADF	48	Input	LowLimSetpt	PLWLMSTP	36.0	°F
ADF	49	Input	DaPropBand	PDPRPBND	10.0	°F [dif]
ADF	50	Input	DaDeadBand	PDDDBDaD	0.0	°F [dif]
ADF	51	Input	DaIntTime	PDNTTDaI	0.0	s
ADF	52	Input	DaLowSatTime	PDLWSTTM	60.0	s
ADF	53	Input	DaHighLimit	PDHGHLMT	70.00	%
ADF	54	Input	DaLowLimit	PDLWLMDa	25.00	%
ADF	55	Input	DaClgPropBand	PDCLGPRP	10.0	°F [dif]
ADF	56	Input	ClgLowLimSp	PCLGLWLM	49.0	°F
ADF	57	Input	ClgBoost	PCLGBClg	-3.0	°F [dif]
ADF	58	Input	HtgBoost	PHTGBHtg	4.0	°F [dif]
ADF	59	Input	RmDaHtgSp	PRMDHTGS	80.0	°F
ADF	60	Input	nciFloat14	PFloat14	5.000000	#
ADF	61	Input	SpaceSetptHighLimit	PSPCSTPT	78.0	°F
ADF	62	Input	SpaceSetptLowLimit	PSADF_61	72.0	°F
ADF	63	Input	Hum_Hi_Range	PHM_H_RN	5.000000	#
ADI	1	Input	OccOvrTimeMn	PCCVRDTM	240	min
ADI	2	Input	WrmupTmMin	PWRMPTMM	15	min
BD	1	Input	UnitEnable.State	INTNBL.S	-	
BD	2	Output	TempOccupiedStatus	OTMPCCPD	-	
BD	3	Output	ClgTimerStatus	OCLGTMRs	-	
BD	4	Output	RH_Status	ORH_STTS	-	
BD	5	Output	TimeclockStatus	OTMCLCKS	-	
BD	6	Input	UnitShutdown	INTSHTDW	-	
BD	7	Output	State	OState	-	
BD	8	Output	RoomState	ORMSTRoo	-	
BD	9	Output	Occupied	OCCOccup	-	
BD	10	Output	RoomHumiditySwitch	ORMHMDTY	-	
BD	11	Output	On_OffInputSwitch	ON_FFNP	-	
BD	12	Output	Occ_UnoccSwitch	OCC_NCCS	-	
BD	13	Output	AirProvingSwitch	ORPRVNGS	-	
BD	14	Output	Fan_DamperStatus	OFN_DMPr	-	
BD	15	Output	HtgStg1Status	OHTGSTG1	-	
BD	16	Output	HtgStg2Status	OHTGSTG2	-	
BD	17	Output	ClgStg1Status	OCLGSTG1	-	
BD	18	Output	ClgStg2Status	OCLGSTG2	-	
BD	19	Input	UnitOccupied.State	INTCCPD.	-	
BD	20	Output	RemoteOnOffStat	ORMTNFFS	-	
BD	21	Input	TestStart	PTSTSTRT	0, LOG_OFF	
BD	22	Input	TestKill	PTSTKTeS	0, LOG_OFF	
BD	23	Input	TestExtend	PTSTXTND	0, LOG_OFF	
BD	24	Input	ManualJump	PMNLJMan	0, LOG_OFF	
BD	25	Input	UncRhtEna	PNCRHTNU	1, LOG_ON	
BD	26	Input	AlarmReset	PLRMRSaI	0, LOG_OFF	
BD	27	Input	NoModHeat	PNMDHNOM	0, LOG_OFF	
BD	28	Input	HeatPolarity	PHTPLRTY	1, Reverse	

WORKSHEET for FX06 Commissioning Parameters Level

Display Name	Control Variable Description	Default Value	Field Value
Menu 02 - Setpoint Page			
SSPHI	The maximum value that the space setpoint dial can be set	78°F	
SSPLO	The minimum value that the space setpoint dial can be set	72°F	
SSP	<u>Space Cooling Temperature Setpoint (status only)</u>	Status Only	
HSO	<u>Space Heating Setpoint Offset</u>	5°F	
DP1	<u>Reheat Enabled Setpoint – Ambient Dewpoint</u>	60°F	
DCH	<u>Standard Cooling (Neutral) Discharge Air Temperature Setpoint (Primary Setpoint)</u>	70° F	
DHL	<u>Standard (Neutral) Heating Discharge Air Temperature Setpoint (Primary Setpoint)</u>	70°F	
RCP	<u>Room (space) Discharge Air Cooling Temperature Setpoint</u>	55°F	
RHP	<u>Room Discharge Air Temperature Heating Setpoint</u>	80°F	
Menu 03 - OA Reset Page			
DCL	<u>Outside Air Reset Option</u>	80°F	
DCH	<u>Standard (Neutral) Cooling Discharge Air Temperature Setpoint (Primary Setpoint)</u>	70° F	
DHL	<u>Standard (Neutral) Heating Discharge Air Temperature Setpoint (Primary Setpoint)</u>	70° F	
DHH	<u>Outdoor Reset Option – Duct Discharge Air Temperature Heating Setpoint</u>	55°F	
OH2	<u>Outdoor Reset Dry Bulb Heating – High Setting</u>	60°F	
OH3	<u>Outdoor Reset Dry Bulb Heating – Low Setting</u>	20°F	
OC2	<u>Outdoor Reset Dry Bulb Cooling – High Setting</u>	75°F	
OC3	<u>Outdoor Reset Dry Bulb Cooling – Low Setting</u>	60°F	
Menu 04 - Commissioning Page			
SCP	<u>Space Cooling Proportional Band</u>	1.8°F	
SHP	<u>Space Heating Proportional Band</u>	1.8°F	
CPP	<u>Cooling Discharge Air Prop Band</u>	10°F	
HPP	<u>Heating Discharge Air Proportional Band</u>	10°F	
ICT	<u>Heating Integration Constant</u>	0	
HDB	<u>Space Heating Dead Band</u>	0°F	
OC1	<u>Cooling Mode Lockout – Ambient Dry Bulb</u>	68°F	
OH1	<u>Heating Mode Lockout - Ambient Dry Bulb</u>	62°F	
DP1	<u>Reheat Enabled Setpoint – Ambient Dewpoint</u>	60°F	

Display Name	Control Variable Description	Default Value	Field Value
Menu 04 - Commissioning Page (cont'd)			
ROL	<u>Low Ambient Reheat Override – Dry Bulb</u>	65°F	
ROH	<u>High Ambient Heat Override – Dry Bulb</u>	120°F	
LSP	<u>Low Limit Freeze Protection Setpoint</u>	36°F	
EN1	<u>1st Stage Enthalpy Cooling Reference Lockout.</u>	29	
EN2	<u>2nd Stage Enthalpy Cooling Lockout</u>	5	
EN3	<u>3rd Stage Enthalpy Cooling Lockout</u>	5	
NSU	<u>Night Setup - Cooling</u>	9°	
NSB	<u>Night Set Back – Heating</u>	-9	
RCP	<u>Room (space) Discharge Air Cooling Temperature Setpoint</u>	55°F	
RHP	<u>Room (space) Discharge Air Heating Temperature Setpoint</u>	80°F	
RSP	<u>Reheat Setpoint Offset.</u>	0°F	
UOT	<u>Temporary Occupied Button Timer</u>	240	
HHR	<u>Humidity High Range</u>	5	

Menu 05 - Calibration Page (DO NOT change these default values unless advised by the factory.)			
Display Name	Control Variable Description	Default Value	Field Value
RMTO	<u>Space Temperature Sensor Calibration.</u>	-1.1	
DAO	<u>Discharge Air Temperature Sensor Calibration</u>	-1.1	

Menu 06 - Set-up Parameters Page			
Display Name	Control Variable Description	Default Value	Field Value
UNIT OF MEASURE	Degree F or Degree C	°F	
N2 ADDRESS	Network Communication Address	255	
YEAR	4 digit Year code		
MONTH	2 Digit Month code	-	
DAY OF MONTH	2 digit day code	-	
HOUR	24 hour time code	-	
MINUTE	Standard Minute code	-	
HTG POLARITY	Setting the Parameter allows the 0-100% analog heating output to be direct acting or reverse acting. The default setting for a MAPS II unit is reverse acting..	REV	
HTGOUTFLOWLIMIT	Low limit for the heating output. This value should not be changed.	25	
HTGOUTHIGHLIMIT	High limit for the heating output. This variable should not be changed.	70 - gas heat	
		100 - electric heat	

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