

Application 2324 Unit Conditioner with Six Stages of Cooling

Overview

In Application 2324, the controller energizes a maximum of six stages of cooling in the unit conditioner to control the supply air temperature. Refer to Figures 2324-1 and 2324-2.

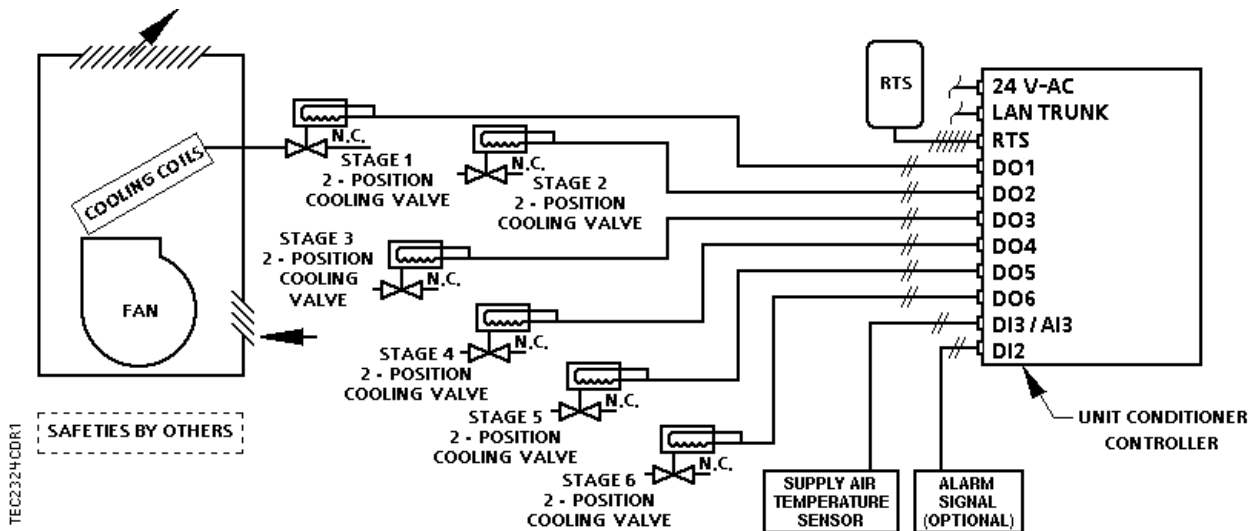
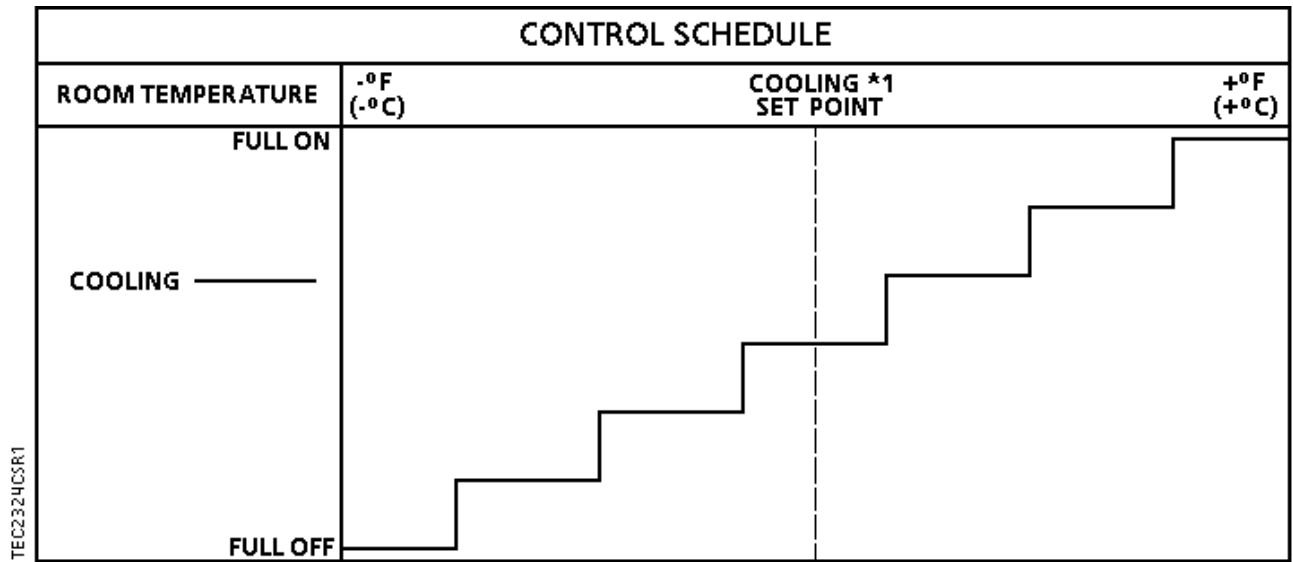


Figure 2324-1. Application 2324 Control Drawing.



NOTES:

1. Refer to Sequence of Operation, "Control Temperature Set Points".
2. Refer to Sequence of Operation, "Cooling Operation".

Figure 2324-2. Application 2324 Control Schedule.

Hardware inputs

analog

- room temperature sensor
- room temperature set point dial (optional)

digital

- night mode override (optional)
- wall switch (optional)

Hardware outputs

analog

- none

digital

- stage 1 cooling (2-position valve actuator); or, cooling compressor
- stage 2 cooling (2-position valve actuator); or, cooling compressor
- stage 3 cooling (2-position valve actuator); or, cooling compressor
- stage 4 cooling (2-position valve actuator); or, cooling compressor
- stage 5 cooling (2-position valve actuator); or, cooling compressor
- stage 6 cooling (2-position valve actuator); or, cooling compressor

Ordering notes

Unit Conditioner Controller with Six Stages – Electronic Output 540-795

Refer to *System 600 Configuration and Sizing Guidelines* (125-1830) for product numbers.

Terminal Equipment Controller Room Temperature Sensor

Point database

Table 2324-1 presents the point database information for Application 2324.

Sequence of Operation

Control temperature set point

The following paragraphs present the sequence of operation for Application 2324, "Unit Conditioner with Six Stages of Cooling".

The set point used to control the supply air temperature is determined by the outside air temperature in the following way.

The point OA TEMP (number 30) is commanded by the field panel. It is the input to a table statement. The output of the table statement is the control set point.

The parameters used in the table statement are the points OA HIGH (number 31), OA LOW (number 32), STPT HIGH (number 33), and STPT LOW (number 34). The table statement is executed in the same way as the following PPCL statement:

Table (OA TEMP, CTL STPT, OA LOW, STPT HIGH, OA HIGH, STPT LOW)

NOTE: The value of the point CTL TEMP (number 87) is the same as the value of the point SUPPLY TEMP (number 15), unless CTL TEMP is overridden.

Control loops

The unit conditioner is controlled by one Proportional, Integral, and Derivative (PID) temperature loop.

Temperature Loop – The temperature loop is a cooling loop. The temperature loop maintains supply temperature at the value in the point CTL STPT (number 93). Refer to "Control Temperature Set Point".

In cooling mode, the controller uses the points CTL STPT (number 93) and CTL TEMP (number 87) as the inputs to the cooling loop. The cooling loop controls up to six stages of cooling as defined by the value of the point CLG STG CNT (number 75).

Cooling operation

The staged cooling operates as follows:

For each stage, if the following conditions are met, it will turn ON:

1. the point CLG LOOPOUT (number 79) must be greater than, or equal to the following point values:
 - stage 1 - CLG STG 1 (number 41) (default value = 10%)
 - stage 2 - CLG STG 2 (number 42) (default value = 26%)
 - stage 3 - CLG STG 3 (number 43) (default value = 42%)
 - stage 4 - CLG STG 4 (number 44) (default value = 58%)
 - stage 5 - CLG STG 5 (number 45) (default value = 74%)
 - stage 6 - CLG STG 6 (number 46) (default value = 90%)
2. The stage must have been OFF for at least as long as the point CLG MIN OFF (number 77).
3. It must have been at least as long as the point STG DELAY (number 26) since any stage changed state.

For each stage, if the following conditions are met, it will turn OFF:

1. CLG LOOPOUT must be less than a fixed loopout value as follows:

stage 1 - CLG STG 1
stage 2 - CLG STG 2
stage 3 - CLG STG 3
stage 4 - CLG STG 4
stage 5 - CLG STG 5
stage 6 - CLG STG 6

2. The stage must have been ON for at least as long as the point CLG MIN ON (number 76).
3. It must have been at least as long as STG DELAY since any stage changed state.

Fail-safe operation

If the supply air temperature sensor fails, then the controller operates using the last known temperature value.

The point ALARM DI (number 24) is provided for reporting purposes only and is not used by the application.

Application notes

1. If the temperature swings in the room are excessive, or if there is trouble in maintaining the set point, then the cooling loop needs to be tuned. Refer to *System 600 Maintenance and Troubleshooting Manual* (125-1855) for more information.
2. The Unit Conditioner Controller with Six Stages – Electronic Output, as shipped from the factory, keeps all associated equipment OFF. Refer to the TEC Custom Solutions Start-up Documentation for this controller.
3. Spare DOs can be used as auxiliary points that are controlled by the field panel after being defined in the field panel's database. All DOs can be used to control the stages of cooling. If less than six stages are being controlled by the application, then the DOs that are not used will be spare. Refer to the TEC Custom Solutions Start-up Documentation for this controller.

Wiring diagrams

The point wiring for Application 2324 is shown in Figure 2324-3.



CAUTION: The Controller's Digital Outputs (DOs) control 24 Vac loads only. The maximum rating is 12 VA for each DO. For higher VA requirements, 110 or 220 Vac requirements, separate transformers used to power the load, or DC power requirements, use an interposing 220 V 4-relay module (P/N 540-147).

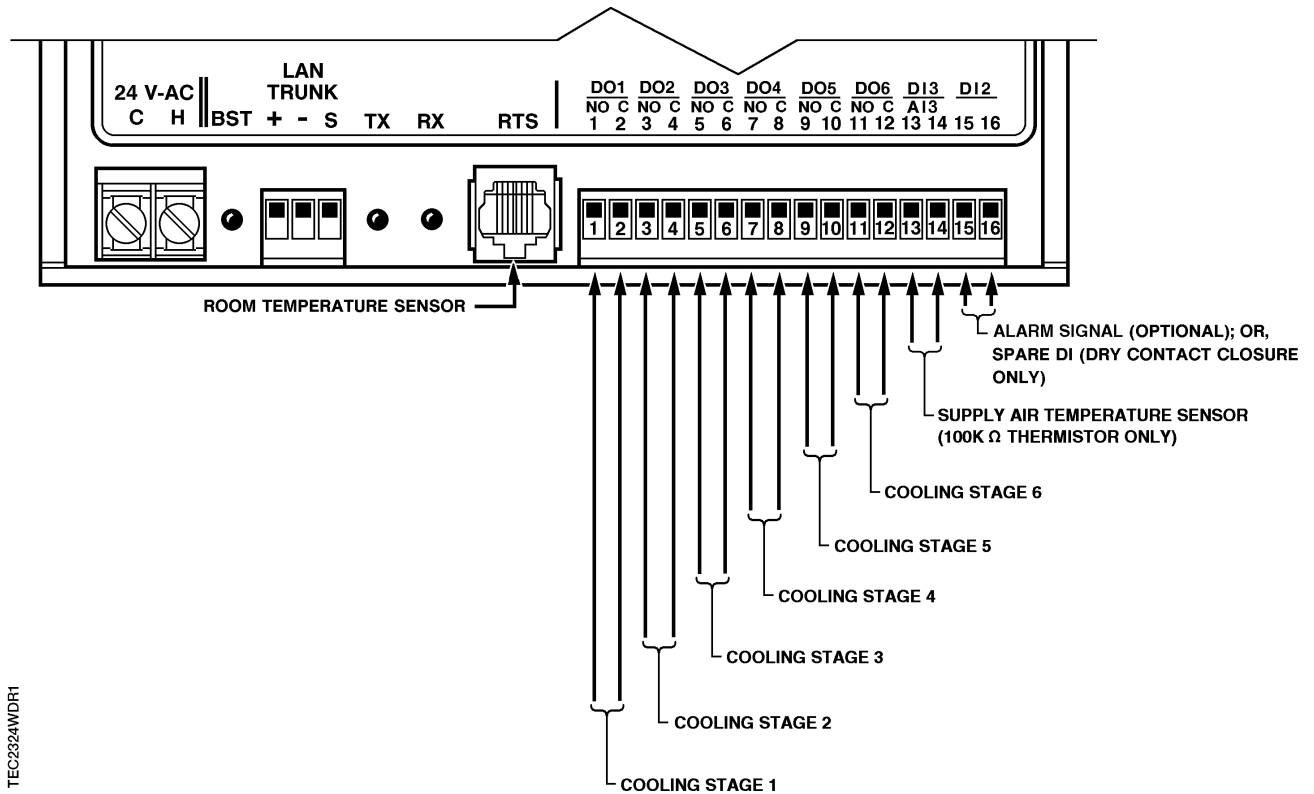


Figure 2324-3. Application 2324 Wiring Diagram.

Table 2324-1. Point Database for Application 2324.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
01	CTLR ADDRESS	99	--	1	0	--	--
02	APPLICATION	2090	--	1	0	--	--
{04}	ROOM TEMP	74.00 (23.44888)	DEG F (DEG C)	0.25 (0.14000)	48.00 (8.88888)	--	--
{13}	RM STPT DIAL	74.00 (23.44888)	DEG F (DEG C)	0.25 (0.14000)	48.00 (8.88888)	--	--
14	STPT DIAL	NO	--	--	--	YES	NO
{15}	SUPPLY TEMP	74.0 (23.495556)	DEG F (DEG C)	0.5 (0.280000)	37.5 (3.055556)	--	--
18	WALL SWITCH	NO	--	--	--	YES	NO
{19}	DI OVRD SW	OFF	--	--	--	ON	OFF
20	OVRD TIME	0	HRS	1	0	--	--
{21}	NGT OVRD	NIGHT	--	--	--	NIGHT	DAY
{24}	ALARM DI	OFF	--	--	--	ON	OFF
{25}	DI 3	OFF	--	--	--	ON	OFF
26	STG DELAY	30	SEC	1	0	--	--
27	CLG 5 ON	74.0	PCT	0.4	0.0	--	--
28	CLG 6 ON	90.0	PCT	0.4	0.0	--	--
{29}	DAY.NGT	DAY	--	--	--	NIGHT	DAY
{30}	OA TEMP	75.0 (24.055555)	DEG F (DEG C)	0.5 (0.280000)	37.5 (3.055556)	--	--
31	OA HIGH	90.0 (32.455555)	DEG F (DEG C)	0.5 (0.280000)	37.5 (3.055556)	--	--
32	OA LOW	40.0 (4.455556)	DEG F (DEG C)	0.5 (0.280000)	37.5 (3.055556)	--	--
33	STPT HIGH	78.0 (25.735556)	DEG F (DEG C)	0.5 (0.280000)	37.5 (3.055556)	--	--
34	STPT LOW	65.0 (18.455557)	DEG F (DEG C)	0.5 (0.280000)	37.5 (3.055556)	--	--
{41}	CLG STG 1	OFF	--	--	--	ON	OFF
{42}	CLG STG 2	OFF	--	--	--	ON	OFF
{43}	CLG STG 3	OFF	--	--	--	ON	OFF
{44}	CLG STG 4	OFF	--	--	--	ON	OFF
{45}	CLG STG 5	OFF	--	--	--	ON	OFF
{46}	CLG STG 6	OFF	--	--	--	ON	OFF
59	DO DIR. REV	0	--	1	0	--	--
63	CLG P GAIN	20.00 (36.00)	--	0.25 (0.45)	0.00 (0.00)	--	--
64	CLG I GAIN	0.010 (0.0180)	--	0.001 (0.0018)	0.000 (0.0000)	--	--
65	CLG D GAIN	0 (0.0)	--	2 (3.6)	0 (0.0)	--	--
66	CLG BIAS	0.0	PCT	0.4	0.0	--	--
71	CLG 1 ON	10.0	PCT	0.4	0.0	--	--
72	CLG 2 ON	26.0	PCT	0.4	0.0	--	--
73	CLG 3 ON	42.0	PCT	0.4	0.0	--	--
74	CLG 4 ON	58.0	PCT	0.4	0.0	--	--

NOTES:

1. Points not listed are not used in this application.
2. A single value in a column means that the value is the same in English units and in SI units.
3. Point numbers that appear in brackets {} may be unbundled at the field panel.

Table 2324-1. Point Database for Application 2324.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
75	CLG STG CNT	1	--	1	0	--	--
76	CLG MIN ON	120	SEC	1	0	--	--
77	CLG MIN OFF	120	SEC	1	0	--	--
{79}	CLG LOOPOUT	0.0	PCT	0.4	0.0	--	--
{87}	CTL TEMP	74.0 (23.495556)	DEG F (DEG C)	0.5 (0.280000)	37.5 (3.055556)	--	--
{93}	CTL STPT	70.0 (21.255556)	DEG F (DEG C)	0.5 (0.280000)	37.5 (3.055556)	--	--
98	LOOP TIME	5	SEC	1	0	--	--
{99}	ERROR STATUS	0	--	1	0	--	--

NOTES:

1. Points not listed are not used in this application.
2. A single value in a column means that the value is the same in English units and in SI units.
3. Point numbers that appear in brackets {} may be unbundled at the field panel.