

P20, P21 Series Air Conditioning Limit Controls

Application

These air conditioning limit controls are specially designed for package residential or commercial air conditioning units. They are for use with all non-corrosive refrigerants within pressure range of controls -- water or air cooled.

They may also be used for refrigeration applications where a fixed range setting is acceptable.

Models are provided for low side pressure, high pressure or dual pressure and may be supplied with automatic recycle or manual reset.

Features

- Accurate repeat performance and long life. Test strength far above the most severe operating and standby conditions.
- Compact -- less than the size of a cigarette pack.
- Transmission of diaphragm movement is by a stainless steel power lever operating on a stainless steel pivot -- load aligned to reduce friction.
- Trip-free manual reset -- contacts cannot be blocked closed. Reset tab must be released before restart.

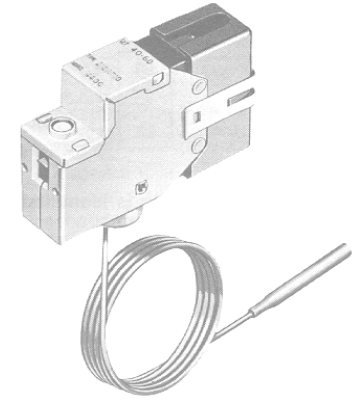


Fig. 1 -- Single function control. Optional insulated terminal cover is shown.

Specifications

P20AA	Single Function, Contacts Open Low
P20BA	Single Function, Contacts Open Low, Lockout Requiring Manual Reset
P20CA	Single Function, Contacts Open High
P20DA	Single Function, Contacts Open High, Lockout Requiring Manual Reset
P20EA	Single Function, SPDT
P20FA	Single Function, SPDT, Lockout Low Requiring Manual Reset
P20GA	Single Function, SPDT, Lockout High Requiring Manual Reset

Type Number

P21CAA	Dual Function, Low Side Contacts Open Low; High Side Contacts Open High
P21CAB	Dual Function, Low Side Contacts Open Low; High Side Contacts Open High, Lockout High Requiring Manual Reset
P21CAC	Dual Function, Low Side Contacts Open Low, Lockout Low Requiring Manual Reset; High Side Open High, Lockout High Requiring Manual Reset
P21CBB	Dual Function, Low Side Contacts Open Low; High Side, SPDT, Lockout High Requiring Manual Reset

Case Material	Single Piece, "U" Channel Frame of .062" (1.57 mm) Cold Rolled Steel, Cadmium Plated With Dichromate Dip
Contact Unit	Enclosed, Dusttight Pennswitch
Manual Reset	Manual Reset is Trip-Free, Contacts Cannot Be Held Closed Either by Accident or Intent
Mounting Bracket	Cold Rolled Steel, Cadmium Plated With Dichromate Dip
Packaging	Controls Normally Supplied for Bulk or Pallet Packaging, Individual Packaging for Service Stock Available on Special Order at Extra Cost
Range and Differential	See Table
Shipping Weight	See Table

- Controls for use on non-corrosive refrigerants.
- Enclosed dusttight Pennswitches.
- A dust gasket prevents sand, dirt and dust from lodging in the diaphragm and diaphragm push-pin area.

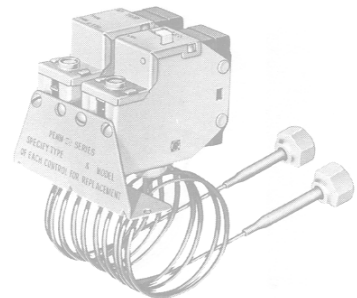


Fig. 2 -- Low pressure and high pressure controls mounted on a common bracket (Series P21).

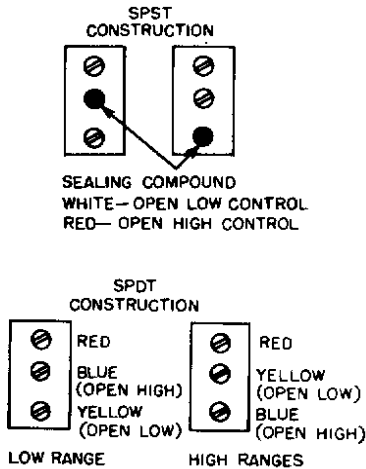


Fig. 3 — Control action is identified by colored sealing compound or terminal markings on switch.

General Description

Series P20 controls feature many desirable advantages not found in any other controls. Exclusive, service proved pressure element (about the size of a quarter) provides accurate repeat performance -- with substantial safety factor for long life under extreme operating and equalized standby pressures. Controls are compact and ideal for panel mounting and all applications where space is at a premium. (See Dimensions, Figs. 13 and 14.)

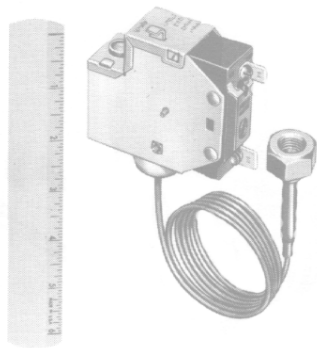


Fig. 4 -- Type P20DA with quick disconnect terminals. Note the contrast in size between control and a six-inch ruler.

The contact unit is the enclosed Pennswitch provided in SPST or SPDT actions (see "Optional Constructions").

Both high and low pressure controls are factory adjusted to equipment manufacturers' specifications for use on non-corrosive refrigerants and are not adjustable in the field. This provides a high pressure limit stop that meets UL requirements at no extra cost.

Optional Constructions

Capillary

Standard 36 in. (914 mm) with .250 in. (6.35 mm) O.D., .190 in. (4.83 mm) I.D., sweat section (Style 34). Available with reduced diameter and shoulder at extra cost, see Fig. 5. Also available with nut and flare (Style 13). Other lengths of capillary, maximum 60 in. (1524 mm), or variations supplied at extra cost. Minimum length is 36 in. (914 mm) when setting is over 100 lbs.

Terminals

8-32 x 1/4 in. binder head screw terminals or single quick disconnect terminals, as specified, at same price. Double quick disconnect terminals may be supplied at no extra cost.

Terminal Cover

Molded black phenolic -- general purpose. Spring clip snap-on attachment. Insulating terminal cover (Part No. 210-604) available at extra cost when specified.

Manual Reset (trip-free)

Provided at extra cost when specified (see "Type Number Selection").

Mounting

Direct by two 6-32 tapped holes on 11/16 in. centers, see Figs. 13 and 14. Mounting bracket available at extra cost for single mounting (Part No. 210-25); choice of eight positions on single controls (Fig. 6). Bracket 211-1 for duals offers choice of four mounting positions (Fig. 7). Bracket 211-5 (upper left, Fig. 14) available at same price as 211-1.

Electrical Jumper

Supplied for dual controls when specified at extra cost.

Contact Action

SPST standard; SPDT also available at extra cost.

Ranges

Range psig (kPa)		Max. Bellow Pressure psig (kPa)	Differential psi (Specify When Ordering)
Minimum	Maximum		
20" Hg. (-70)	100 (700)	250 (1724)	Options AV, BV, CV, DV - Pg. 3
7 (50)	150 (1000)	250 (1724)	Options AL, BL, CL, DL - Pg. 4
100 (700)	450 (3000)	450 (3000)	Options AM, BM, CM, DM - Pg. 5
200 (1400)	450 (3000)	450 (3000)	Option DW* - Pg. 5
400 (3000)	600 (4000)**	600 (4000)	Options BH, CH, DH - Pg. 5

Min. is cutout on "Open Low" controls; cut-in on "Open High" controls. Max. is cut-in on "Open Low" controls; cutout on "Open High" controls.

* Extra cost wide differential constructions.

** Extra cost high range construction.

Electrical Ratings

Motor Ratings A.C.	120 V., 1 Ph.	208 V., 1 Ph.	240 V., 1 Ph.	277 V., 1 Ph.
Full Load Amps.	16.0	9.2	8.0	7.0
Locked Rotor Amps.	96.0	55.2	48.0	42.0
Max. volts 300 A.C. Suitable for 20-24 V. A.C.				

Repairs and Replacement

Field repairs must not be made. For a replacement control contact the nearest Johnson wholesaler.

Ordering Information

1. Specify Product Number and pressure setting.
2. If Product Number is not available, specify the following:
 - a. Type Number, (see "Specifications").
 - b. Range.
 - c. Style of element.
 - d. Cutout setting.
 - e. Differential or differential option.
 - f. Screw or quick disconnect terminals.

- g. Mounting bracket and bracket position if other than standard.
- h. Terminal cover, if required.
- i. Jumper on Series P21, if required.
- j. Packaging required.

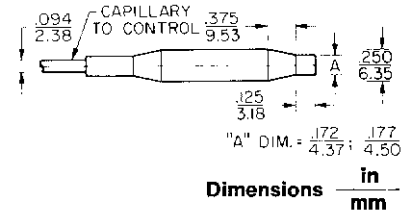


Fig. 5 — Drawing illustrating $\frac{1}{4}$ " section with reduced diameter end.

Shipping Weights — in Lbs., (Kilograms) Approx.

TYPE OF PACK	SERIES P20		SERIES P21	
	Style 13	Style 34	Style 13	Style 34
Individual Pack	.6 (.27)	.55 (.25)	1.4 (.63)	1.35 (.61)
Overpack of 100	31 (14)	29.8 (13.5)	71 (32)	68.7 (31)
Bulk Pack of 30	---	---	30.5 (13.8)	28.2 (12.8)
Bulk Pack of 50	25.0 (11)	23.2 (10)	---	---
Bulk Pack of 100	45.8 (20.8)	42.1 (19)	---	---
Pallet of 2000 (100 units per carton)	946 (429)	901 (409)	---	---

Add $1\frac{1}{4}$ oz. (.035) to each P20 packed with mounting bracket.

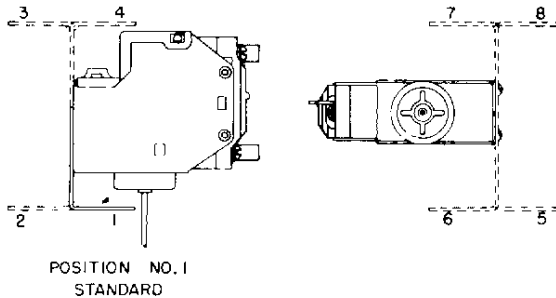


Fig. 6 — Mounting positions for the Series P20 single function controls.

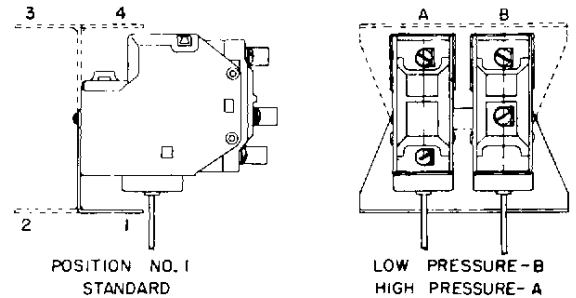


Fig. 7 — Mounting positions for the Series P21 dual controls are shown.

Standard Differential Options

To convert psi to kPa multiply psi by 6.895

HOW TO USE DIFFERENTIAL OPTION TABLES

Critical Setting: Ordinarily the critical setting on air conditioning limit controls (Series P20) is the cutout setting, but factory calibration will be made to **either** cut-in or cutout on original equipment manufacturers' specifications. Tolerances on such settings are shown in the following tables. Opposite or non-critical operating point will then depend on choice of standard available differential options chosen from applicable table.

Example: Suppose a high pressure cutout setting of 400 psig is required. Also suppose 325 psig cut-in is desired. Differential Option CM, Fig. 10, shows nominal differential of 75 psi at 400 psig cutout setting or a nominal cut-in of 325 psig. Note, also, that at 400 psig cutout, Differential Option BM gives a nominal cut-in of 350 psig; Option DM, a nominal cut-in of 292 psig.

Also suppose a low pressure cutout setting of 40 psig is required. If a cut-in of 65 psig is desired, Differential Option CL, Fig. 9, should be selected to provide a nominal cut-in of 70 psig. Option DL at this setting would provide a nominal cut-in of 80 psig; Option BL a nominal cut-in of 62 psig, not high enough to assure coil defrosting on R-22 systems.

Range 20" Hg. Vac to 100 psig (—70 to 700 kPa), Fig. 8

Contacts Open On Pressure Fall

Cutout Setting (1)	Differential Options (2)			
	AV	BV	CV	DV
20" Hg. to 3	14	23	31	39
4, 15, 20	14	23	31	40
25	14	23	31	41
30	14	23	32	41
35, 40	14	23	32	42
45, 50, 55	14	23	32	43
60, 65	14	23	32	—
70, 75	14	23	—	—
80, 85	14	—	—	—

Contacts Open On Pressure Rise

Cutout Setting (1)	Differential Options (2)			
	AV	BV	CV	DV
5	14	—	—	—
10, 15	14	23	—	—
20, 25	14	23	31	—
30	14	23	31	39
35 thru 55	14	23	31	40
60, 65	14	23	32	41
70, 75, 80	14	23	32	42
85 thru 100	14	23	32	43

(1) Set Point Tolerance: $\pm 3\%$ of setting but not less than 3 psig.

(2) Differential Tolerance:

- AV = $\pm 50\%$ of differential.
- BV = $\pm 34\%$ of differential.
- CV = $\pm 24\%$ of differential.
- DV = $\pm 20\%$ of differential.

Range 7 to 150 psig (50 to 100 kPa), Fig. 9

Contacts Open On Pressure Fall

Cutout Setting (1)	Differential Options (2)			
	AL	BL	CL	DL
10, 15	13	22	29	38
20, 25	13	22	30	39
30, 35, 40	13	22	30	40
45 thru 55	13	22	30	41
60, 65	13	22	31	42
70, 75	13	22	31	43
80, 85, 90	12	23	31	44
95, 100	12	23	32	45
105 thru 115	12	23	32	—
120, 125	12	23	—	—
130	12	—	—	—

Contacts Open On Pressure Rise

Cutout Setting (1)	Differential Options (2)			
	AL	BL	CL	DL
20, 25	13	—	—	—
30, 35, 40	13	22	—	—
45 thru 55	13	22	29	—
60, 65	13	22	30	39
70, 75	13	22	30	40
80, 85, 90	12	23	31	41
95 thru 115	12	23	31	42
120 thru 125	12	23	32	43
130, 135, 140	12	23	32	44
145	12	23	32	45
150	12	23	32	46

(1) Set Point Tolerance: $\pm 3\%$ of setting but not less than 3 psig.

(2) Differential Tolerance:

- AL = $\pm 50\%$ of differential.
- BL = $\pm 34\%$ of differential.
- CL = $\pm 24\%$ of differential.
- DL = $\pm 20\%$ of differential.

Range 100 to 450 psig (700 to 3000 kPa), Fig. 10

Contacts Open On Pressure Fall

Cutout Setting (1)	Differential Options (2)			
	AM	BM	CM	DM
100, 105	15	40	60	89
110	15	40	61	90
115	15	41	61	90
120	15	41	61	91
125	16	41	62	91
130, 135	16	41	62	92
140	16	42	62	93
145	16	42	63	93
150, 155	16	42	63	94
160	16	42	64	94
165, 170	16	43	64	95
175, 180	17	43	65	96
185	17	43	65	97
190	17	44	65	97
195 thru 205	17	44	66	98
210	17	44	67	99
215	17	45	67	99
220	17	45	67	100
225	18	45	68	100
230, 235	18	45	68	101
240	18	46	68	102
245	18	46	69	102
250, 255	18	46	69	103
260	18	46	70	103
265, 270	18	47	70	104
275, 280	19	47	71	105
285	19	47	71	106
290	19	48	71	106
295 thru 305	19	48	72	107
310	19	48	73	108
315	19	49	73	108
320	19	49	73	109
325	20	49	74	109
330, 335	20	49	74	110
340	20	50	74	111
345 thru 360	20	50	75	—
365	20	51	75	—
370	20	51	76	—
375 thru 385	21	51	—	—
390, 395	21	52	—	—
400	21	—	—	—
405 thru 430	22	—	—	—

Contacts Open On Pressure Rise

Cutout Setting (1)	Differential Options (2)			
	AM	BM	CM	DM
115, 120	15	—	—	—
125 thru 135	16	—	—	—
140 thru 155	16	40	—	—
160	16	40	60	—
165, 170	16	40	61	—
175 thru 185	17	41	62	—
190	17	42	62	89
195 thru 205	17	42	63	90
210	17	42	64	91
215	17	43	64	91
220	17	43	64	92
225	18	43	65	92
230, 235	18	43	65	93
240	18	44	65	94
245	18	44	66	94
250, 255	18	44	66	95
260	18	44	67	95
265, 270	18	45	67	96
275, 280	19	45	68	97
285	19	45	68	98
290	19	46	68	98
295 thru 305	19	46	69	99
310	19	46	70	100
315	19	47	70	100
320	19	47	70	101
325	20	47	71	101
330, 335	20	47	71	102
340	20	48	71	103
345	20	48	72	103
350, 355	20	48	72	104
360	20	48	73	104
365, 370	20	49	73	105
375, 380	21	49	74	106
385	21	49	74	107
390	21	50	74	107
395 thru 405	21	50	75	108
410	21	50	76	109
415	21	51	76	109
420	21	51	76	110
425	22	51	77	110
430, 435	22	51	77	111
440	22	51	77	112
445	22	52	77	112
450	22	52	78	113

(1) Set Point Tolerances: $\pm 2\%$ of setting but not less than 6 psig.

(2) Differential Tolerances:

AM = $\pm 38\%$ of differential but not less than 6 psi.

BM = $\pm 24\%$ of differential.

CM = $\pm 21\%$ of differential.

DM = $\pm 18\%$ of differential.

Range 200 to 450 psig (1400 to 3000 kPa), Fig. 11

Contacts Open On Pressure Fall

Cutout Setting (1)	Differential Option (2)	
	DW	
200, 205	112	
210, 215	113	
220 thru 230	114	
235, 240	115	
245 thru 255	116	
260, 265	117	
270 thru 280	118	
285, 290	119	
295 thru 305	120	
310, 315	121	
320, 325, 330	122	

Contacts Open On Pressure Rise

Cutout Setting (1)	Differential Option (2)	
	DW	
315	113	
320 thru 330	114	
335, 340	115	
345 thru 355	116	
360, 365	117	
370 thru 380	118	
385, 390	119	
395 thru 405	120	
410, 415	121	
420 thru 430	122	
435, 440	123	
445, 450	124	

(1) Set Point Tolerances: $\pm 2\%$ of setting but not less than 7 psig.

(2) Differential Tolerances: $\pm 18\%$ of differential.

Range 400 to 600 psig (3000 to 4000 kPa), Fig. 12

Contacts Open On Pressure Fall

Cutout Setting (1)	Differential Option (2)		
	BH	CH	DH
400	55	92	128
450	55	93	132
500	55	95	—
550	55	—	—

Contacts Open On Pressure Rise

Cutout Setting (1)	Differential Option (2)		
	BH	CH	DH
400	55	90	120
450	55	91	122
500	55	92	125
550	55	93	128
600	55	95	132

(1) Set Point Tolerances: ± 10 psig.

(2) Differential Tolerances: ± 15 psi.

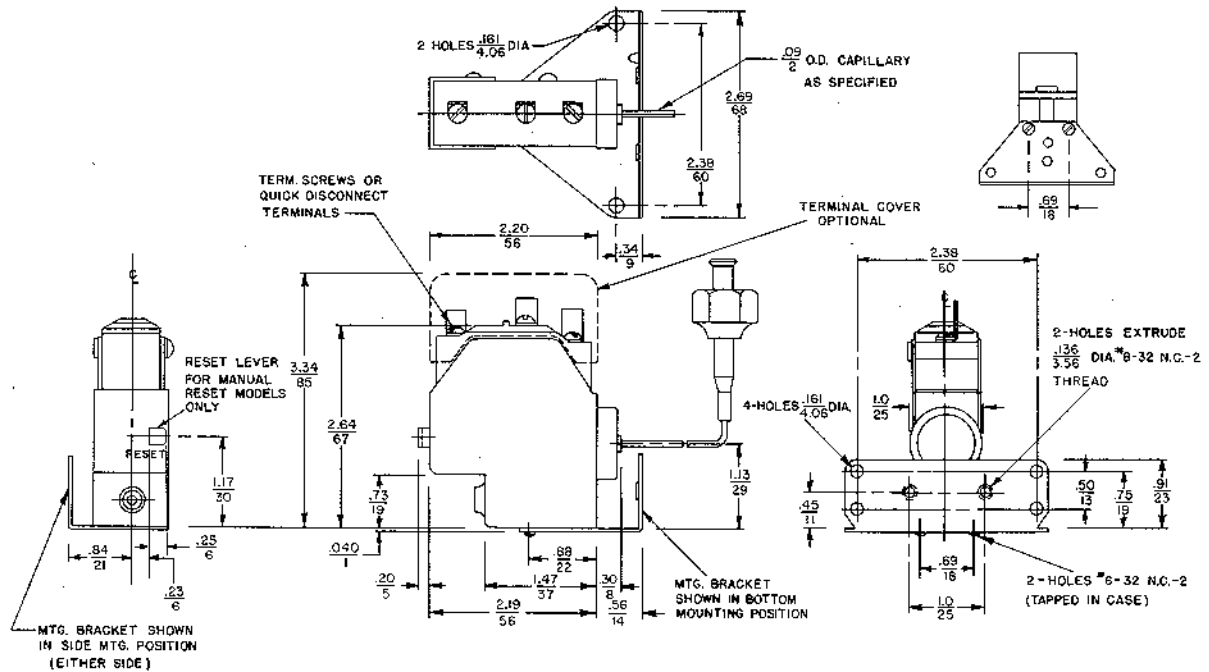


Fig. 13 — Dimension drawing of the Series P20 single function controls.

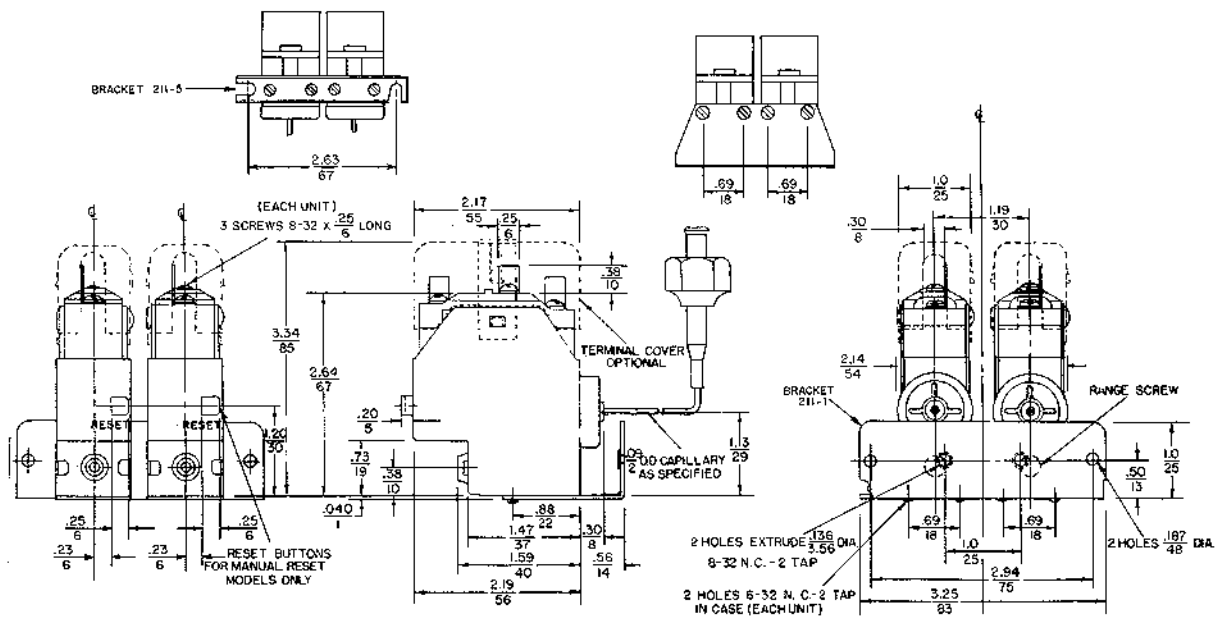


Fig. 14 — Dimension drawing of the Series P21 dual controls.

Dimensions $\frac{\text{in}}{\text{mm}}$

Performance specifications appearing herein are nominal and are subject to accepted manufacturing tolerances and application variables.

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Notes

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CONTROLS

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