

# Action Pak®

## Thermocouple-Input Limit Alarms

### Models AP1200 Through AP1220

#### Provides Relay Contact Closure(s) at a Preset Thermocouple Temperature Input Level

- Exclusive “Dynamic Deadband” Prevents False Trips
- Temperature Alarm/Control Applications
- Integral Cold-Junction Compensation
- Single or Dual Setpoint
- AC Line Powered (DC Optional)
- Three Year Warranty

#### OUTPUT SELECTION

The two modes of Thermocouple-Input Limit Alarms reflect two styles of output selection:

**AP1200-AP1204** Single Hi Trip, (DPDT, 5A)

**AP1220** Dual Hi/Lo Trip, (SPDT, 5A)

#### OPERATION

The Single limit alarm is normally energized when the input is below the setpoint. When setpoint is exceeded, the relay de-energizes to provide a tripped condition. This tripped condition then resets when the input is again below setpoint. The normally energized relay provides “failsafe” operation; a power failure results in a tripped condition.

The Dual alarm is normally de-energized when the input is in between the setpoints. If the input rises above the HI setpoint or falls below the LO setpoint, the HI or LO relay energizes. In either case,

the relay returns to its de-energized state when the input is again between the setpoints. The normally de-energized relay provides “non-failsafe” operation; a power failure will not result in a tripped condition. For proper deadband operation, the HI setpoint must always be set above the LO setpoint.

All AP1200 Series Limit Alarms are equipped with top-mounted LED(s) for trip status indication. LED(s) turn ON in a tripped condition.

#### DYNAMIC/NORMAL DEADBAND

LSI circuitry prevents false trips by repeatedly sampling the input. The input must remain above the setpoint for 100 milliseconds, uninterrupted, to qualify as a valid trip condition. Likewise, the input must fall below the setpoint and remain there for 100 milliseconds to return the alarm to an untripped condition. This effectively results in a “dynamic deadband” -- based

on time -- in addition to the normal deadband.

Normal deadband is the amount of input change required to reset the limit alarm to an untripped condition, it is measured from the point of trip, and expressed as a percentage of the input span. Single and Dual trip limit alarms have adjustable deadband(s) from 0.25% to 100% of span and are normally set at 0.25% (see figure 1).

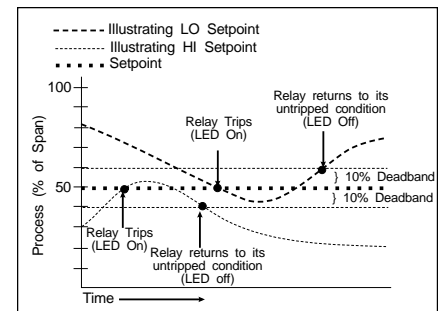


Figure 1: Limit Alarm operation and effect of deadband(s).

## SETPOINT ADJUSTMENT

The two modes of the Thermo-couple Input Limit Alarms have five styles of setpoint adjustment:

- AP1200** Top-Accessed, 1-Turn Screw
- AP1201** Top-Mounted, Single-Turn Dial
- AP1202** Remote Dial connection (1K-100K $\Omega$ )
- AP1204** Top-Mounted, 10-Turn Clockface dial
- AP1220** Two, Top-Accessed, 1-Turn Screws

With all Action Pak limit alarms, the setpoint is adjustable over the entire input span.

## OPTIONS

- CS** Canadian Standards Association Certification (20-pin base not CSA certified).
- B** Downscale Burnout (input to 0% at T/C open).
- H** Latching Operation (dual-limit mode only).
- M** Top-Accessed, Ten-Turn Screw(s) (1XX0 only).
- R** Reverse Sense (reverses relay energizing operation); Failsafe operation for Dual-limit, Non-Failsafe for Single Limit.
- T** Transmitter Outputs (0-1VDC SP(s) and PR outputs).
- T2** Transmitter Outputs (4-20mA PR outputs).

- U** Urethane Coating (environmental protection).
- X** LO or LO/LO Alarm (relay(s) trip when input falls below setpoint, see figure 1).
- Y** HI/HI Alarm (both relays trip when input rises above set point. Dual-limit alarms only).

## CALIBRATION

**Setpoint:** Set deadband at its minimum (fully CCW) before adjusting the setpoint. With the specified trip voltage or thermocouple input applied, adjust setpoint until the relay trips. For HI trip calibration, start with the setpoint above the desired trip. For Lo trip calibration, start below the desired trip. The LED(s) will turn on in a tripped condition.

**Deadband:** Set deadband to its minimum (fully CCW). Set setpoint to desired trip. Adjust voltage/thermocouple input until relay trips. Readjust deadband to 100% (fully CW). Set voltage/thermocouple input to desired deadband position. Slowly adjust deadband until relay untrips. Single deadband potentiometer on Dual alarms adjusts both deadbands. (Note: Deadband not available with Option H.)

**Transmitter Outputs:** With the specified minimum input applied, adjust zero for 0.00V/4.00mA at the transmitter output. With the

specified maximum input applied, adjust span for 1.00V/20.00mA. Transmitter outputs are linear to the thermocouple mV signal. Repeat for best accuracy. (Note: Outputs are not isolated from input.)

**Factory Assistance:** For additional information on calibration, operation and installation please contact Action's Technical Services Group. Call toll-free:

**800-767-5726**

## RELAY PROTECTION

Note: For maximum relay life with inductive loads, external protection is required. For DC inductive loads, place a diode across the load (1N4006 or equivalent) with cathode to (+) and anode to (-), see figure 2. For AC inductive loads, place a MOV across the load, see figure 3.

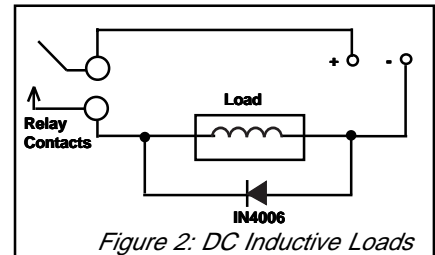


Figure 2: DC Inductive Loads

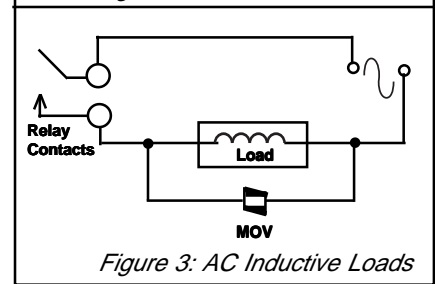


Figure 3: AC Inductive Loads

Table 1: AP1200-AP1220 Standard Inputs

<b>J</b>	-100/+300°F	0-1000°F	<b>K</b>	0-500°F	-200/+100°C
	0-400°F			0-600°F	0-500°C
	0-500°F	0-250°C		0-1000°F	0-1000°C
	0-600°F	0-500°C		0-1500°F	
		0-750°C		0-2000°F	
				0-2500°F	
<b>T</b>	0-400°F	0-250°C	<b>S</b>	0-2500°F	
	0-500°F				
<b>R</b>	0-2000°F	0-1000°C			
	0-2500°F				

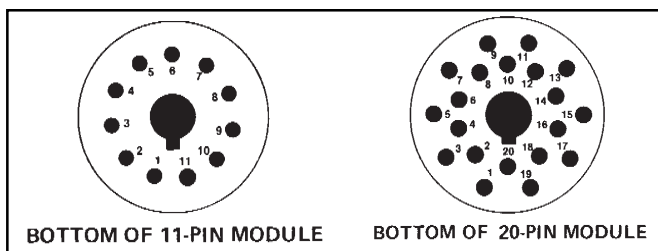


Figure 4: Pin locations

Table 2: AP1200-AP1220 Inputs Limits

TC	Usable Range	Minimum Span
J	-346-1400°F (-210/760°C)	335°F (186°C)
K	-454-2500°F (-270/1372°C)	443°F (246°C)
R	0-3214°F (-5/1768°C)	1732°F (962°C)
S	32-3214°F (0/1768°C)	1865°F (1036°C)
T	-454-750°F (-270/400°C)	383°F (213°C)
B	107-3308°F (42/1820°C)	2610°F (1450°C)
C (W5)	32-4200°F (0/2315°C)	1024°F (569°C)
D (W3)	32-4200°F (0/2315°C)	1073°F (569°C)
E	-454-1832°F (-270/1000°C)	275°F (153°C)
G (W)	32-4200°F (0/2315°C)	2610°F (1450°C)
N	-454-2372°F (-270/1300°C)	574°F (319°C)

\* Type J material undergoes a permanent change above 760°C

# PIN CONNECTIONS\*

1200,1201,1204 1220	1200,1201,1204 With Option T	1202 (1202T)	1220 With Option T
1 AC Power (Hot)	1 AC Power (Hot)	1 AC Power (Hot)	1 AC Power (Hot)
2 Shield (Gnd)	2 Shield (Gnd)	2 Shield (Gnd)	2 Shield (Gnd)
3 AC Power (Neu)	3 AC Power (Neu)	3 AC Power (Neu)	3 AC Power (Neu)
4 Input +	4 No Connection	4 No Connection	4 No Connection
5 Input -	5 No Connection	5 SP Pot CCW	5 No Connection
6 N.O. Set 1 or	6 No Connection	6 SP Pot W	6 No Connection
7 C HI/Dual	7 No Connection	7 SP Pot CW	7 No Connection
8 N.C.	8 SP Xtmr -	8 (SP Xtmr +)	8 No Connection
9 N.O. Set 2 or	9 Input +	9 Input +	9 Input +
10 C LO/Dual	10 Xtmr Common	10 (Xtmr Common)	10 Proc Xtmr +
11 N.C.	11 Input -	11 Input -	11 Input -
KEY:	12 Proc Xtmr +	12 (Proc Xtmr +)	12 LO SP Xtmr +
N.O. = Normally Open	13 N.O.	13 N.O.	13 N.O.
C = Common	14 C Set 1	14 C Set 1	14 C LO Set
N.C. = Normally Closed	15 N.C.	15 N.C.	15 N.C.
Proc = Process	16 No Connection	16 No Connection	16 HI SP Xtmr +
Xtmr = Transmitter	17 N.O.	17 N.O.	17 N.O.
CCW = Counterclock- wise	18 C Set 2	18 C Set 2	18 C HI Set
W = Wiper	19 N.C.	19 N.C.	19 N.C.
CW = Clockwise	20 No Connection	20 No Connection	20 Xtmr Common
SP = Setpoint			

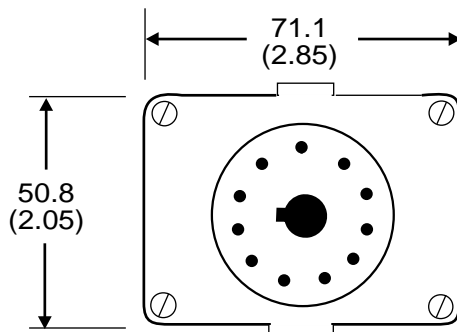
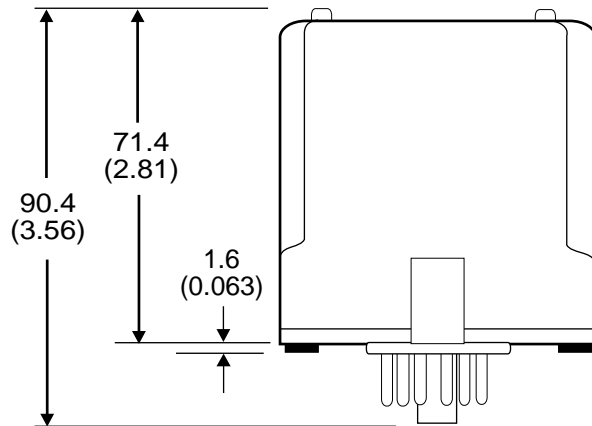
\* Contacts are in the "normal" state when the relay is de-energized.

### Notes:

- Option T2 pinout (all units): Pin 12 - Process Transmitter (+)  
Pin 10 - Process Transmitter (-)
- DC Power: Pin 1 = (+)  
Option Pin 3 = (-)

## DIMENSIONS

Dimensions are in Millimeters (Inches)



## SPECIFICATIONS

### Input Impedance

> 1 Megohm

### Input Bias Current

< 1.5µA, including burnout sense current

### Input Protection

Normal Mode: withstands ±5VDC

Common Mode: withstands 600VDC or 300VAC max., input to ground

### Limit Differentials (Deadbands)

0.25% to 100% of span

### Response Time

Dynamic Deadband

Relay status will change when proper setpoint/process condition exists uninterrupted for 100mSec.

Normal Mode (Analog Filtering) 50mSec.

### Setpoint

Effectivity: Setpoints are adjustable over 100% of the input span

Repeatability: 0.1% (constant temp.)

### Stability

Line Voltage: ± 0.01%/° max.

Temperature: ±0.05% of span/°C typical, ± 0.08% of span/°C max.

### Common Mode Rejection

60 Hz: 120dB

DC: 140dB

### Temperature Range

Operating: 0 to 60°C (32 to 140°F)

Storage: -20 to 85°C (-4 to 185°F)

### Power

Consumption: 2.5W typical, 4W max.

Standard: 120VAC (±10%, 50-400Hz)

Available: 100, 220, 240VAC (±10%, 50-400Hz)

Optional: 24VDC (±8V, inverter-isolated)

### Relay Contacts

Single: DPDT De-energized @ trip

Dual: SPDT Energized @ trip

Current Rating (resistive)

120VAC: 5A

240VAC: 2A

28VDC: 5A

Material: Silver-Cadmium Oxide

Electrical Life: 10<sup>5</sup> operations at rated load

Mechanical Life: 10<sup>7</sup> operations

Note: External relay contact protection is required for use with inductive loads, see figure 2, 3.

### Transmitter Outputs

#### (Option T/T2)

Option T (0-1V):

Output Impedance: 50 Ohm

Output Drive: 2mA, max.

Option T2 (4-20mA):

Output Impedance: >100K Ohms

Output Compliance: 10VDC

Linearity

±0.25% of span typical

±0.50% of span max.

### Latch Reset Time (Option H)

5 Seconds

## MOUNTING

All Action Paks feature plug-in installation, using either molded socket MOXX or DIN socket MDXX. The Limit Alarm Series use either an 11-pin or a 20-pin base, depending on the style of setpoint adjustment and the included options.

## ORDERING INFORMATION

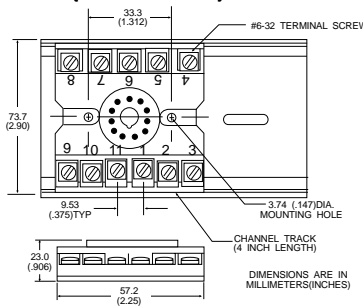
### Specify:

1. Model: AP1200 through AP1224
  2. Options: CS, B, H, M, R, T, T2, U, X, Y (see text)
  3. Input Range: (see tables 1,2)
  4. Line Power (see specs.)
- (All power supplies are transformer isolated from the internal circuitry.)

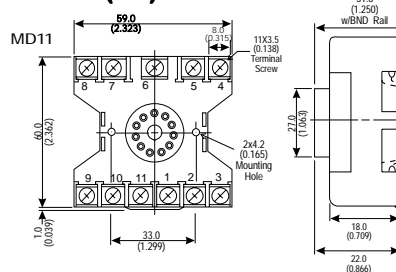


## DIMENSIONS

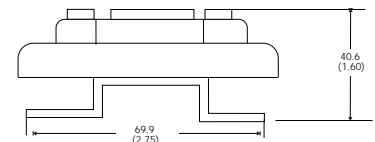
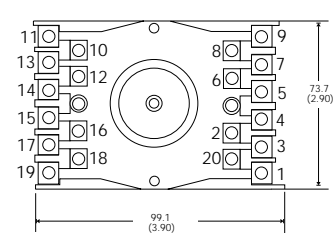
### M011 (Track/Surface)



### MD11 (DIN)



### M020 (Track)



All Prices and Specifications subject to change without notice

For order entry, applications or customer service assistance, call toll-free 800-767-5726

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