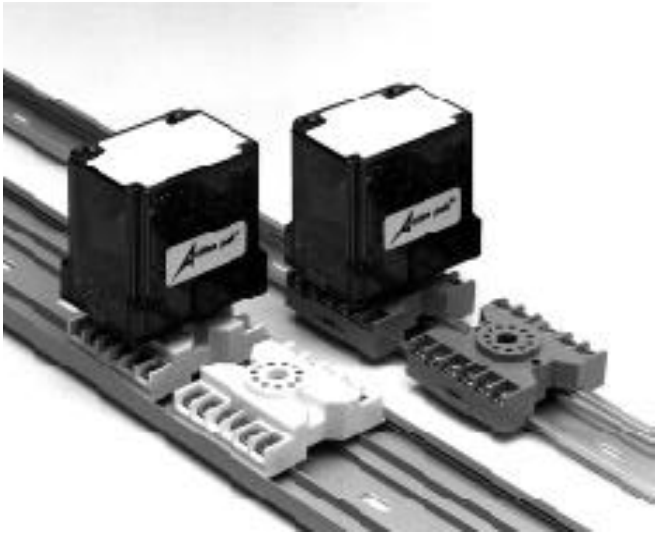
Action Pak®

RTD Input Limit Alarms

Models AP1400, AP1420



Provides Relay Contact Closure(s) at a Preset RTD/Resistance Input Level

- **Exclusive "Dynamic Deadband" Prevents False Trips**
- **"Failsafe" Operation Available**
- **Temperature/Resistance Alarm/Control Applications**
- **Integral Lead-Length Compensation**
- **Single or Dual Setpoints**
- **AC Line Powered**
- **Three Year Warranty**

OUTPUT SELECTION

The two models of RTD Input Limit Alarms reflect two styles of output selection:

AP1400 Single (Hi) Trip, Non-Latching (DPDT, 5A)

AP1420 Dual (Hi/Lo Trip, Non-Latching (SPDT, 5A)

OPERATION

The Single alarm (AP1400) 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 (AP1420) 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. Options X, Y, and M are available to modify these conditions. *See Options.*

All AP1400 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, 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).

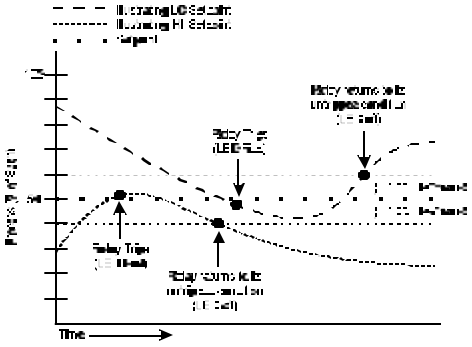


Figure 1: Limit alarm operation and effect of deadband(s)

ACTION INSTRUMENTS

SETPOINT ADJUSTMENT

The RTD input Limit Alarms normally have top-accessed single turn Setpoint adjustment.

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

OPTIONS

H Latching Operation (Dual setpoint model only).

M Top-Accessed, Ten-Turn screwdriver setpoint adjustment pots.

R Reverse Sense (reverses relay energizing operation); Failsafe operation for Dual-limit.

T Transmitter Outputs (0-1VDC Process & Setpoints outputs).

T2 Transmitter Output (4-20mA Process output only).

U Urethane coating of internal circuitry for protection from corrosive atmospheres.

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 setpoint; Dual-limit alarms only).

C620 Factory calibration of input range, set points and ouput relays.

CALIBRATION

Note: To maximize thermal stability, final calibration should be performed in the operating installation, allowing approximately 1-2 hours for warmup and thermal equilibrium of the system.

Setpoint: Set deadband at its minimum (fully CCW) before adjusting the setpoint. With the specified trip Resistance/RTD 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.

Deadband: Set deadband to its minimum (fully CCW). Set setpoint to desired trip. Adjust resistance/RTD input until relay trips. Readjust deadband to 100% (fully CW). Set resistance/RTD 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. 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

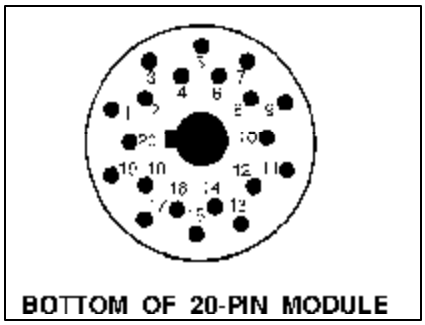


Figure 4: Pin locations

INPUT RANGES

Table 1 lists all the available standard RTD input ranges. For better resolution, non-standard ranges are also available within the limits shown in table 2. Call for factory assistance.

*Table 1: AP1400/AP1420 Standard Inputs**

0-300°F	0-500°F		0-200°C
0-400°F	0-1000°F	0-100°C	0-500°C

*100 ohm Pt RTD, 0.00385 W/W/°C[DIN 43760]

Table 2: AP1400/AP1420 Input Limits

RTD	Usable Range	Minimum Span
100WPt	-328 to 1600°F(-200/870°C)	36°F(20°C)
200WPt	-328 to 1600°F(-200/870°C)	27°F(15°C)
500WPt	-148 to 590°F(-100/310°C)	18°F(10°C)
100WNi	-148 to 590°F(-100/310°C)	27°F(15°C)
120WNi	-112 to 608°F(-80/320°C)	27°F(15°C)
1000WNi	-40 to 550°F(-40/288°C)	9°F(5°C)
1000WNiFe	-58 to 347°F(-50/175°C)	9°F(5°C)
2000WNiFe	-58 to 347°F(-50/175°C)	5°F(3°C)
10WCu	-328 to 500°F(-200/260°C)	180°F(100°C)

RELAY PROTECTION AND EMI SUPPRESSION

When switching inductive loads, maximum relay life and transient EMI suppression is achieved using external protection (see Figure 2 & 3). Place all protection devices directly across the load and minimize all lead lengths. For AC inductive loads, place a properly-rated MOV across the load in parallel with a series RC snubber. Use a 0.01 to 0.1mF pulse film capacitor (foil polypropylene recommended) of sufficient voltage, and a 47W, 1/2W carbon resistor. For DC inductive loads, place a diode across the load (PRV > DC supply, 1N4006 recommended) with (+) to cathode and (-) to anode (the RC snubber is an optional enhancement).

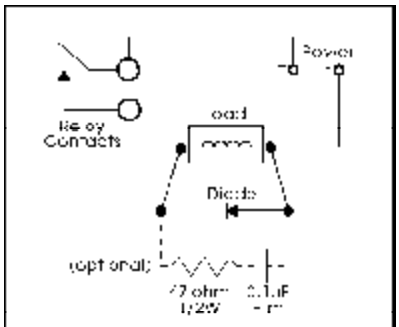


Figure 2: ***DC Inductive Loads***

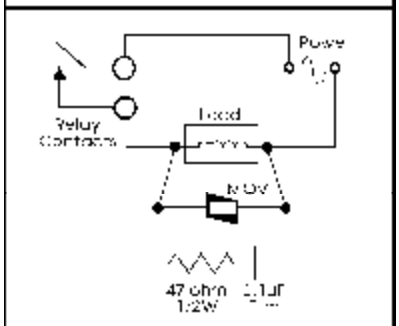


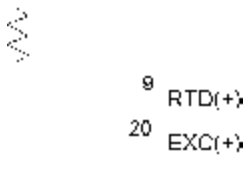
Figure 3: ***AC Inductive Loads***

PIN CONNECTIONS*

1400 (1400T)
1 AC Power (Hot)
2 Shield (Gnd)
3 AC Power (Neu)
4 No Connection
5 No Connection
6 No Connection
7 No Connection
8 (SP Xmtr +)
9 RTD +
10 (Xmtr Common)
11 RTD -
12 (Proc Xmtr +)
13 N.O.
14 C Set 1
15 N.C.
16 No Connection
17 N.O.
18 C Set 2
19 N.C.
20 RTD Exc +

1420 (1420T)
1 AC Power (Hot)
2 Shield (Gnd)
3 AC Power (Neu)
4 No Connection
5 No Connection
6 (Xtmr Common)
7 No Connection
8 No Connection
9 RTD +
10 (Proc Xmtr +)
11 RTD -
12 (LO SP Xmtr +)
13 N.O.
14 C LO
15 N.C.
16 (HI SP Xmtr +)
17 N.O.
18 C HI
19 N.C.
20 RTD Exc +

KEY:
N.O. = Normally Open
C = Common
N.C. = Normally Closed
Proc = Process
Xmtr = Transmitter
Exc = Excitation
CCW = Counterclockwise
W = Wiper
CW = Clockwise
SP = Setpoint



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

Notes:
1. Option T2 pinout (all units): Pin 12 - Process Transmitter (+)
   Pin 10 - Process Transmitter (-)

2. When H option is included, to reset Latch, short pins (4) &(16)

SPECIFICATIONS

RTD Excitation Current (Maximum)
- 100 Ohm Pt: 5mA
- 500 Ohm Pt: 2mA
- 120 Ohm Ni: 5mA
- 10 Ohm Cu: 10mA

Maximum Leadwire Resistance (Per Lead)
- 100 Ohm Pt: 30 Ohms
- 500 Ohm Pt: 100 Ohms
- 120 Ohm Ni: 30 Ohms
- 10 Ohm Cu: 10 Ohms

Leadwire Effect
- Less than 1% of span over entire leadwire resistance range

Input Protection
- Normal Mode: Withstands ±5VDC
- Common Mode: 600VDC or 300VAC max.

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 temperature)

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: 100V, 220V, 240V (±10%, 50-400Hz)

Relay Contacts
- Single: DPDT Denergized @ trip
- Dual: SPDT Energized @ trip
- Current Rating (resistive)
  - 120VAC: 5A
  - 240VAC: 2A
  - 28VDC: 5A
- Material: Gold flash over silver alloy.
- Electrical Life: 10^5 operations at rated load
  - *Note: External relay contact protection is required for use with inductive loads, see figures 2, 3.*
- Mechanical Life: 10^7 operations

Transmitter Outputs (Option T/T2)
- Option T: (0-1V)
- Output Impedance: 50 Ohms
- 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

Weight
- AP1400 0.64lbs
- AP1420 0.64lbs

MOUNTING

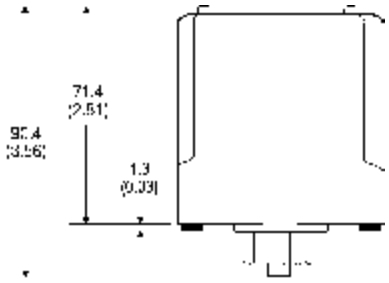
All Action Paks feature plug-in installation. The AP1400-1420 use a 20 pin (M020), mounting socket.

ORDERING INFORMATION

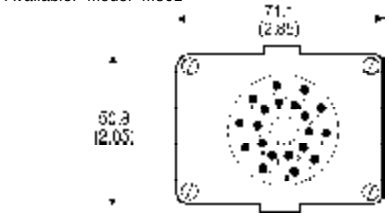
Specify:
1. Model: AP1400 or AP1420
2. Options: H, R, T, T2, U, X, Y (see text)
3. Input Range: see tables 1,2
4. Line Power, see specifications (All power supplies are transformer-isolated from the internal circuitry)

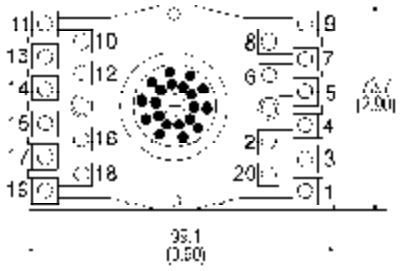
DIMENSIONS

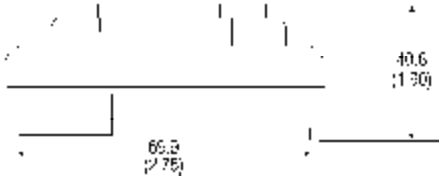
Dimensions are in Millimeters (Inches)



Retaining Spring Available: Model M801







M020 (TRACK)

All Prices and Specifications subject to change without notice

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