

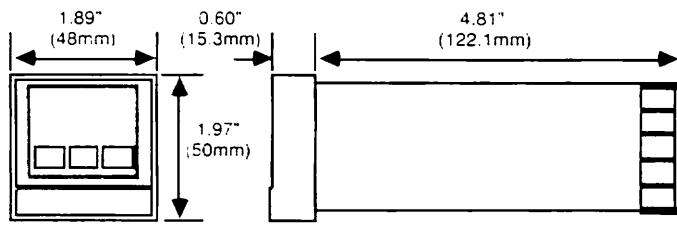
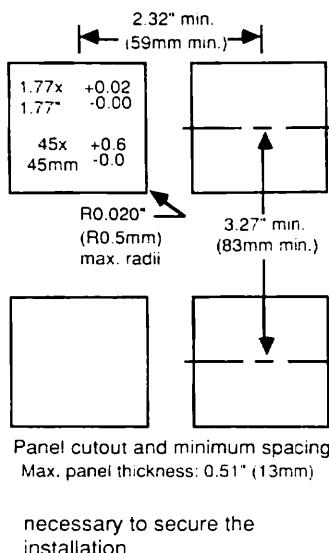
Installation and Operation Manual

Model 81 PID - ON/OFF temperature controller

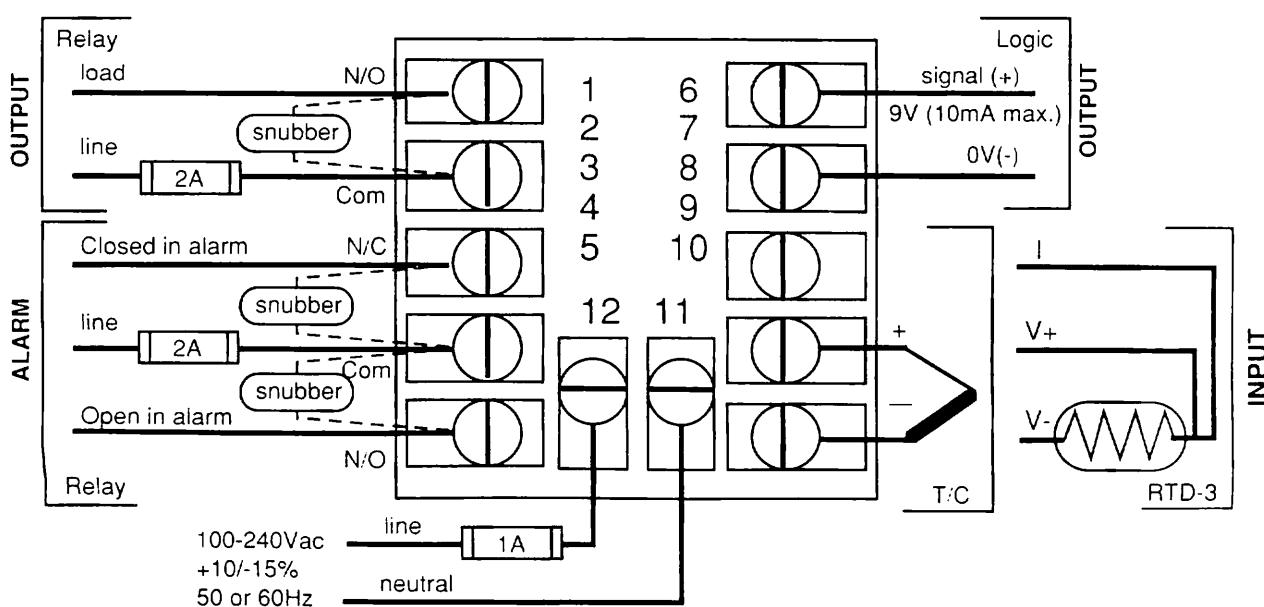
Features marked with an asterisk (*) are available only on units manufactured after January 1993 (Version 3.1).

1. Mechanical installation

- Prepare panel cutout.
- Install the optional front panel gasket if required. Remove the backing from the gasket and apply it around the panel cutout on the *outside of the panel*.
- Slide instrument sleeve into the cutout from the front of the panel.
- Position the mounting bracket on the rear of the instrument sleeve with the 2 clips facing the rear and positioned on the top and bottom of the sleeve.
- While holding the sleeve, slide the mounting bracket towards the panel until the clips engage on the ratchets. While still pulling back on the sleeve, press on the upper left and lower right hand corners of the bracket to seat the mounting bracket. Another push on the clips with a screwdriver might be



Panel depth: with rear terminal cover: 4.96" (126.1mm)
with gasket fitted: less 0.060" (1.5mm)



2. Electrical connections

ELECTRICAL CONNECTIONS

WARNING! Ensure that the maximum voltage which is applied to the unit power supply, between any two isolated circuits, or between any isolated circuit and ground does not exceed 264Vac.

Power

Respect the polarity of the AC power supply: line wire must be connected to terminal 12, and the neutral must be connected to terminal 11.

Output

- Relay: Contact is closed during ON phase of output cycle (yellow "OP" lamp ON). Relay channel operative only when H.ct parameter (heat cycle time) is 5s or greater. A snubber may be required; see below.
- Logic: Signal goes high (current flows) during ON phase of output cycle (yellow "OP" lamp ON). Connect only to opto-isolated device loads. never connect to any grounded circuit. Keep wiring run shorter than 3' (1m) and well away from noise generating circuits.

Alarm relay

The alarm output is failsafe: the relay is de-energized during the

alarm condition or power down. The attached alarm circuit should be designed for failsafe operation and fused appropriately. A snubber may be required; see below.

Snubbers

Connect snubbers (22nf + 100Ω) across the appropriate output or alarm relay contacts when driving AC inductive loads (mechanical contactors and solenoids). *Do not use snubbers when driving high impedance loads.* The snubber passes 1mA in 120Vac circuits, and 2mA in 240Vac circuits; this is sufficient to hold in certain relays with high impedance coils and *should not be used in such installations.*

WARNING! When an alarm contact is to be implemented as part of a failsafe alarm scheme, it is the user's responsibility to verify that the effect of the snubber does not interfere with the operation of the circuit. Certain high impedance circuits are not able to detect a contact opening when the snubber is placed across the contact. In these cases the snubber should not be installed across the relay contact.

Input

WARNING! The input sensor intended for use with this instru-

ment is to be connected uniquely to the input terminals 9 and 10 and never looped to inputs of other instruments. The paralleled inputs of other instruments interfere with proper operation of the sensor break detection circuitry.

NOTE: The input circuit and the logic output are NOT isolated from one another.

Use of shielded, twisted pair is recommended. The shield must be connected to terminal 10 even

when grounded elsewhere.

- Thermocouple: Use appropriate compensation cable. Keep loop resistance as low as possible (1kΩ maximum).
- RTD: Use 3 copper wires of same length and diameter. (20Ω/lead maximum resistance.)

Rear terminal cover

After wiring, attach rear terminal cover with screw.

3. Configuration

CONFIGURATION PROCEDURE

- Cycle power OFF and ON. Self test follows: **tEST** appears followed by **1111, 8888**, then the 4-digit configuration code. Touch and hold secret key *only* after 4-digit configuration code appears to enter configuration mode.
- See configuration code with left digit blinking.

Configuration code

1st (left) digit
alarm function

0	Off (no alarm function)
1	Deviation low alarm
2	Deviation high alarm
3	Deviation band alarm
4	Full scale low alarm
6	Full scale high alarm
5	Sensor break alarm
7	Loop break alarm

- Enter new code (refer to *Configuration code table*):
 - ▼ = select digit position (1 through 4)
 - ▲ = modify digit value.
- To exit configuration mode do one of these:
 - Secret key = accept new configuration; parameter value check follows.**
 - = abort; return to previous configuration.

"Alarm function" assigns alarm type to alarm relay output. Sensor break and loop break alarms are always displayed even if not assigned to alarm relay.

5913

2nd digit
sensor type

2nd digit sensor type	full specified range			
	°F min	°F max	°C min	°C max
0 RTD (units' precision display)	-148	1112	-100	600
1 RTD (tenths' precision display)	-99.9	999.9	-99.9	600.0
2 J—Fe/SAMA constantan	-328	2192	-200	1200
3 K—Chromel TM /Alumel TM	-418	2502	-250	1372
4 L—Fe/Konstantan	-148	1652	-100	900
5 N—NiCroSil/NiSil	32	2372	0	1300
6 R—Pt-13%Rh/Pt	32	3213	0	1767
7 S—Pt-10%Rh/Pt	32	3213	0	1767
8 T—Cu/Adams constantan	-427	752	-255	400
9 Platinet II TM	-418	2543	-250	1395
A* B—Pt-30%Rh/Pt-6%Rh	1112	3308	600	1820

3rd digit	prop. upper range limit	band units	Lower range limit from tables, above.
0	400°C (752°F)	%	• Prop band in % expressed as % of 400°C (or 752°F)
1	400°C (752°F)	°C or °F	• Prop band in % expressed as % of 400°C (or 752°F)
2	800°C (1472°F)	%	• Prop band in % expressed as % of 800°C (or 1472°F)
3	800°C (1472°F)	°C or °F	• Prop band in % expressed as % of full specified range
4	Full specified range	%	
5	Full specified range	°C or °F	

Select "reverse" for heating applications and "direct" for cooling applications.

4th (right) digit	output	control type	action
0 °F	ON/OFF		direct
1 °F	ON/OFF		reverse
2 °F	PID		direct
3 °F	PID		reverse
4 °C	ON/OFF		direct
5 °C	ON/OFF		reverse
6 °C	PID		direct
7 °C	PID		reverse

CONFIGURATION EXAMPLE

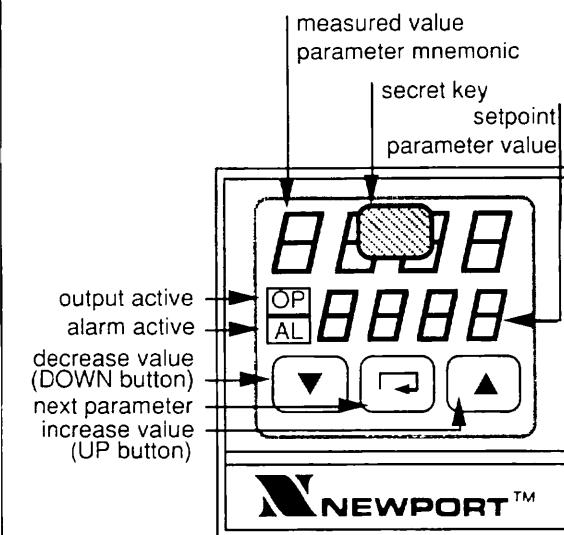
6253:

1st digit (6): full scale (absolute) alarm.
2nd digit (2): type J thermocouple input.
3rd digit (5): full specified range for input and proportional band display in degrees.
4th digit (3): display units in °F, reverse-acting PID control.

4. Operation

BASIC OPERATION

- To light up buttons: touch any button on front panel.
- To modify setpoint: ▲ and ▼.
- To enter protected list: use □ until °C or °F, or AL.SP, then "secret key". Continue with □ to view parameters.
- To return to measured value display when in protected list: "secret key".



ALARMS

Temperature alarms (configuration codes "1" through "4" and "6" for operation)

If the measured value enters the alarm condition as defined by the configuration code, the red "AL" lamp lights up and the alarm relay is de-energized (failsafe operation). The alarm is non latching: the lamp goes out and the alarm relay is re-energized as soon as the measured value enters the "safe" condition.

Sensor break alarm (configuration code "5" for alarm relay output). If the controller has detected that the sensor circuit has failed, then the output power level is forced to 0% and SnSr FAIL is displayed.

A failed sensor is detected:

- if the input signal is out of the selected sensor's range.
- if the input is open circuit, or
- if the controller's operating temperature is outside of the 0-55° operating range (thermocouple inputs only).

Upon reinstatement of the input sensor, the controller resumes controlling with the same output power level used at the moment of the break.

Loop break alarm (configuration code "7" for alarm relay output)

If the unit detects a break in the control loop, then LP.Br is displayed. The display (and optional relay operation) is latching. To reset, touch any key. The output level is determined by the control algorithm during the alarm condition.

To determine starting values for the LP.br parameter:

PID control: Set LP.Br equal to or slightly longer than Int.t.

ON/OFF control: Set LP.Br equal to one period of oscillation around setpoint (ON + OFF times).

For both types of control: increase LP.Br if spurious alarms occur; decrease for greater sensitivity.

NOTE: The above described operation of sensor break and loop break alarms always occurs irrespective of the configuration of the alarm relay.

RAMP-TO-SETPOINT

OPERATION

The setpoint ramping feature is enabled by setting **SP.rr** to any value except **OFF**. Ramping is initiated only by one of two conditions:

- power-up
- change in setpoint.

Upon power up, ramping always starts from the current measured value. The instantaneous setpoint follows a straight line to the target setpoint (the setpoint normally displayed along with the measured value). The speed at which the ramping progresses is selectable by **SP.rr** and remains constant for all ramps until **SP.rr** is changed.

When the measured value follows a ramping setpoint through an alarm region, the alarm is detected, annunciated and output as follows:

- Full scale high and low alarms (configurations "4" and "6"). The alarm is non latching; crossing the alarm setpoint into the "safe" region ends the alarm condition.
- Deviation alarms (configurations "1", "2" and "3"). The deviation alarm follows the ramping setpoint. If the measured value cannot track the setpoint within the bounds of the deviation alarm, an alarm condition is generated.

NOTE: Any value for **SP.rr** except **OFF** inhibits self tuning operation.

Adjustable parameters

Mnemonic	Parameter	Adjustable range	Comments
OPEN LIST			
none	Setpoint	Upper limit: "SP.Hi" Lower limit: "SP.Lo"	Not adjustable during self tuning.
'C or 'F	Display units	View only.	Display units selected in configuration.
tunE	Self tune on demand	Disable self tune: "OFF" Initiate self tune: "on"	Not displayed for ON/OFF control. Not displayed if "SP.rr" enabled.
AL.SP	Alarm setpoint	Configured input sensor range for full scale (absolute temperature) alarms 0 to upper range limit for deviation alarms	Alarm function selected in configuration. "AL.SP" operative only for temperature alarms: configuration codes "1" through "4" and "6". Due to hysteresis, deviation band alarm setting must be at least 2°C (or 4°F).

PROTECTED LIST

ConF	Configuration code	View only in this list	<i>Not accessible if self tuning in progress.</i>
Id	Instrument model ident.	View only.	Can be changed upon power up only.
ProP	Proportional band	2 to 400 °C ('1 to 400 °C), 4 to 720 F ('2 to 720 F), or equivalent in percent	Becomes hysteresis for ON/OFF control. Units (°C, °F or %) selected in configuration.
Int.t	Integral time constant	OFF plus 10 to 2000s	Valid for PID control only
dEr.t	Derivative time constant	OFF plus 1 to 200s	Valid for PID control only
OFSt	Calibration offset	-50.0 to 50.0 °C (-90.0 to 90.0 F)	Display value = measured value + offset
SP.Hi	Setpoint high limit	Configured input sensor range	Must be greater than "SP.Lo"
SP.Lo	Setpoint low limit	Configured input sensor range	Must be less than "SP.Hi"
H.ct	Heat cycle time	0.2 to 60.0s (5s or more for relay output)	Valid for PID control only, but for ON/OFF control disables relay output if set to 4s or less.
SP.rr	Setpoint ramp rate	OFF plus 0.1 to 50.0 °C/min (0.2 to 90.0 F/min.)	Self-tuning inhibited if ramping enabled.
LP.br	Loop break time constant	OFF plus 10 to 4000s	
LinE	Line frequency	50 Hertz: '50' 60 Hertz: '60'	Set to line frequency upon installation.

Display Messages

Message	Display condition	User action/comments
LOOP STATUS MESSAGES		
SnSr FAIL	Sensor fail. Input open or reversed: measured value outside of configured range	Verify input sensor and connections. Message disappears when input signal is reinstated.
measured value LP.br	Loop break. Output at 0 or 100% and measured value moves less than 1/2 of "ProP" setting toward setpoint within time setting of "LP.br".	Verify output device, fuses, wiring and heater. Acknowledge by touching any key.
measured value SP.rr	Setpoint ramping in progress	Setpoint and "SP.rr" parameter still user-adjustable during ramping.
flashing value	Display overrange or out of specified accuracy range	Unit should not be used in this range.
SELF TUNE MESSAGES		
measured value tunE	Self tuning in progress. Message alternates with setpoint.	Annunciation only. Adjustment of setpoint and PID values inhibited during self tuning.
tunE FAIL	Self tuning operation has failed because controller cannot maintain setpoint.	Acknowledge by touching any key. Remove cause of failure e.g. heater fuse blown, etc.
LinE FAIL	Loss of controller power during self-tuning operation renders sampled data questionable.	Acknowledge by touching any key. Verify power supply. Reinitiate self tuning procedure.
SELF DIAGNOSTIC MESSAGES		
tEst 1111	Internal self test upon power up	Replace unit if all four 1's do not light up or fails to go to "8888". Do not touch front panel during self test.
8888 8888	Display test after above self test. Lasts for approximately 3 seconds.	User should verify that all digits and lamps light up to prevent erroneous readings.
EE FAIL	Memory corruption. Message alternates with measured value and setpoint.	Verify and correct all parameter and configuration values. If display persists, replace unit.

