

**SPECIFICATIONS**

<b>OPERATING MODE PILOT</b>	Pneumatic	Non-Bleeding, Throttle
	Electric	15 AMPS, 460 VAC Non-Inductive, SPDT. Switches are UL approved for Splash Proof Service (NEMA Types 1,2,3,4 & 5) or Explosion Proof (Class 1 Groups C & D, Class 2 Groups E,F & G).
<b>OPERATING MODE ACTION</b>	Direct	Rising Temperature Increases Output
	Indirect Action	Field Reversible with No added parts
<b>TEMPERATURE LIMITS</b>	0° F to 650° F	
<b>PRESSURE LIMIT</b>	3000 PSI	
<b>SEALS</b>	Diaphragm	Buna-N
<b>ACCURACY</b>	2%	
<b>PROPORTIONAL BAND</b>	Fixed and Linear Through Full Temperature Range	
<b>PROBE LENGTHS</b>	8, 9, 10 & 12 Inch	
<b>PROCESS CONNECTION</b>	0.75 NPT & 1.00 NPT	
<b>SUPPLY PRESSURE</b>	15-30 psi (Pneumatic Pilot 0.25 NPT)	
<b>SUPPLY CONNECTION</b>	Pneumatic Pilot	0.25 NPT
	Electric Pilot	0.50 NPT
<b>OUTPUT CONNECTION</b>	Pneumatic Pilot	0.25 NPT
	Electric Pilot	0.50 NPT
<b>BODY MATERIAL</b>	Carbon Steel, Plated	
<b>PROBE MATERIAL</b>	304 Stainless Steel	
<b>CALIBRATION</b>	One Dial Division Equals 200 F Temperature Change with a 12.00 Probe	
<b>OPTIONS</b>	316 Stainless Steel Material	
	Special Probe Lengths	
	Separable Sockets	

**PRINCIPLE OF OPERATION**

The Series 5000 Temperature Control is actuated by differential expansion of dissimilar metals in the temperature sensing element. The forces and motion resulting from this differential expansion actuates either a force balance non-bleeding pneumatic pilot or an electric pilot. The control mode can be either direct acting (increasing temperature increases output) or indirect acting (increasing temperature decreases output). The temperature sensing element is made of 1/8 inch stainless steel pipe which permits the control to be used to a maximum pressure of 3000 PSI through a temperature range of 0-650 F.

**INSTALLATION AND START-UP**

Upon receiving the Series 5000 Temperature Control, inspect the unit to verify it has not been damaged during shipment. The unit may be assembled in either a direct or indirect acting mode. It also may be furnished with a pneumatic or electric pilot and with a variety of probe lengths. Check the nameplate information to establish that the unit is correct for the intended application. The Series 5000 Temperature Control is factory assembled, tested and ready for use as shipped and requires no pre-adjustments before installation.

Installation is achieved by threading the tapered pipe threads on the probe body into the process connection. Apply Jet-Lube KOPPER-KOTE high temperature thread lubrication or an equivalent to the threads to prevent seizing. When a The supply and output connections for the pneumatic pilot separable socket is used, install the socket into the process connection first and then follow with the installation of the temperature control. are 0.25 inch NPT. The supply connection is located on top of the pilot via a street elbow and the output connection is directly behind the 0-30 PSI output gage.

The electric pilot is provided with a 0.50 inch NPT connection on the switch housing. To gain access to the switch terminals, remove the front cover of the switch housing. Lift up the insulator flap to expose the terminals. The flap is conveniently marked with the identity of each terminal designating common lug, normally open and normally closed. To wire the control for a direct acting mode (increasing temperature actuates the switch), use the normally open terminal. For the indirect acting mode, use the normally closed terminal.

**NOTE:** The Series 5000 Temperature Control with electric pilot is assembled in the indirect mode only to maximize the switch operation. The output mode is established by the appropriate switch wiring only.

Once the piping or wiring of the unit is complete, the process media temperature and pressure may be raised. With the system now under heat and pressure, the adjustments to the control may begin.

#### **ADJUSTMENTS**



Calibration is accomplished by the use of a reference thermometer placed at the temperature control point.

Begin calibration by turning the range adjusting screw until the pressure shown by the output gage starts changing. For direct acting mode, clockwise rotation of the adjusting screw, as viewed from directly above the control, will increase the temperature set point. Wait for the output pressure to stop changing or reverse the direction of the adjusting screw until a reversal in output pressure is reached. A reversal in the output signal means that the fluid around the probe is near the temperature for which the control is set. The temperature probe of the control has a faster response to the temperature change than the reference thermometer. Avoid turning the adjusting screw when the pilot output pressure is changing rapidly. When the temperature is changing rapidly, as when a heater is initially started, the output pressure from the control may change the full scale while the reference thermometer reads considerably below the actual

#### **MAINTENANCE**

Because of its inherently simple design, the Norriseal Series 5000 Temperature Control requires minimal routine maintenance. Visual external inspection of the unit is the only necessary maintenance required on a routine basis. If a performance problem occurs, refer to the troubleshooting section for the appropriate action. A guideline for maintenance practices is listed below.

1. For pneumatic pilot, use clean, filtered and regulated supply air - 15 to 30 psi. For electric pilot, always disconnect power supply before performing any maintenance. The switch rating is 15 Amps, 460 VAC.
2. Operate unit within the design limits as described under "Specifications".
3. Inspect unit periodically based on operating conditions.
4. Replace seals with new parts whenever unit is disassembled.

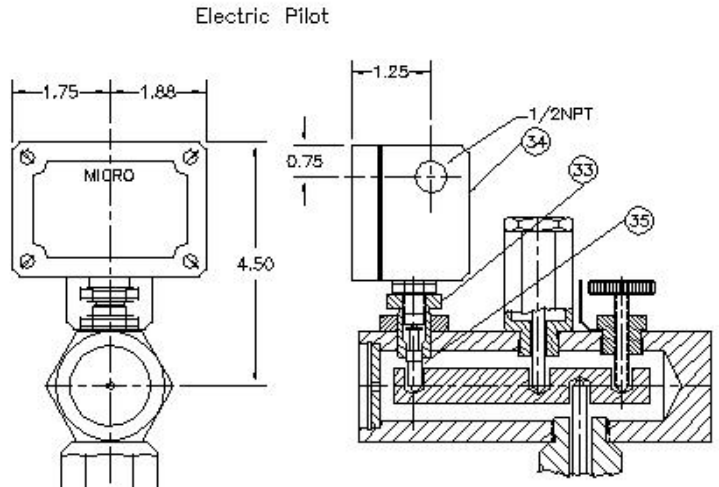
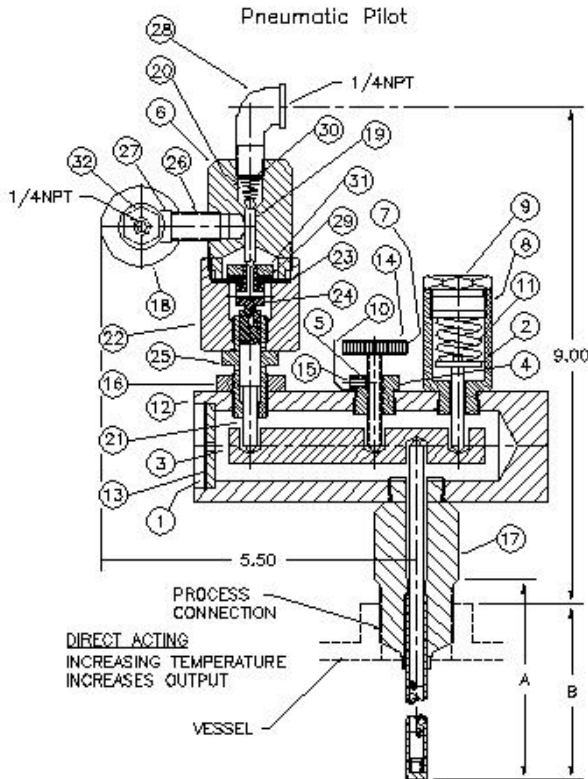
**TROUBLESHOOTING**
*Pneumatic Pilot*

CONSTRAINT	POSSIBLE CAUSE	CORRECTIVE PROCEDURE
CONTROL OPERATES ERRATICALLY OR DOES NOT FUNCTION AT ALL	The torque bar inside the control body is mis-aligned and is binding at its pivot points.	Remove the retaining ring (Item 1) from the open end of the control body. Remove the closure (Item 13) exposing the square end of the torque bar (Item 3). Using a pair of needle nose pliers or suitable tool, align the torque bar so that it sits square within the body interior. Observe that the pivot points of the torque bar are not binding. Replace the closure and snap ring.
	The pilot does not function due to trash lodged in its interior areas.	Remove the piping to the pilot assembly. Unscrew the valve block (Item 6) from the base (Item 22). This will expose the moving seat and diaphragm (Items 23, 24, 29 & 31) which may now be removed. Inspect the interior of the base and the moving seat assembly. Clean as needed using a mild solvent. Unscrew the street elbow (Item 28) from the valve block. CAUTION: There is a small flat washer (Item 30) directly behind the street elbow which is loaded by the peanut spring (Item 20). Exercise care when removing the street elbow so as not to lose the washer. With the elbow and washer removed, the peanut (Item 19) and peanut spring may be removed from the valve block. Inspect the interior of the valve block and clean as needed with a mild solvent. Re-assemble unit in reverse order of the disassembly. Keep clean, do not apply grease to pilot parts. NOTE: When replacing the moving seat/diaphragm assembly, the jam nut of the assembly must be facing upward in view as the diaphragm sits flat within the base. The small nib protruding from the lower portion of the moving seat assembly must engage its mating hole in the thrust pin (Item 21). Reconnect the piping to the pilot and check its thrust pin (Item 21). Reconnect the piping to the pilot and check its operation by manually actuating the torque bar and observing the output.
	Probe is damaged.	Replace probe assembly. The probe may be unscrewed from the control body without removing any other parts. When installing a new probe, be certain to engage the inner bar of the probe into the mating hole in the torque bar. Once the probe is installed, alignment of the torque bar may be necessary. See the beginning of this section for the procedure required for this operation.
OUTPUT SIGNAL IS OPPOSITE OF WHAT IS INTENDED	Control was originally assembled with an operating mode opposite of what is required.	To reverse the operating mode of the control, merely exchange positions of the spring housing assembly (Items 2, 8, 9 & 11) with the adjusting screw assembly (Items 4, 5, 7, 10 & 15). When installing the assemblies in their new positions, be certain to engage the stems into each of their respective holes in the torque bar. Once the assemblies are in place, alignment of the torque bar may be necessary. See section A-1 for the procedure for this operation.
OUTPUT SIGNAL CONSTANTLY BLEEDS	Control is not adjusted properly.	See section on adjustments.
EXHAUST BLEEDS WHILE PILOT HAS OUTPUT SIGNAL	Pilot diaphragm is leaking.	Remove the piping to the pilot assembly. Unscrew the valve block (Item 6) from the base (Item 22). This will expose the moving seat and diaphragm (Items 23, 24, 29 & 31) which may now be removed. Inspect this assembly for any tears or pin holes in the diaphragm and notice if the assembly is securely fastened together. Replace the diaphragm is necessary by unscrewing the jam nut (Item 31) from the moving seat (Item 24) and removing the nylon washer (Item 29). Remove the faulty diaphragm and replace it with a new one. Assemble the unit in reverse order of the disassembly procedure. NOTE: When replacing the moving seat/diaphragm assembly, the jam nut of the assembly must be facing upward in view as the diaphragm sits flat within the base. The small nib protruding from the lower portion of the moving seat assembly must engage its mating hole in the thrust pin (Item 21).

*Electric Pilot*

CONSTRAINT	POSSIBLE CAUSE	CORRECTIVE PROCEDURE
CONTROL OPERATES ERRATICALLY OR DOES NOT FUNCTION AT ALL	The torque bar inside the control body is mis-aligned and is binding at its pivot points.	Remove the retaining ring (Item 1) from the open end of the control body. Remove the closure (Item 13) exposing the square end of the torque bar (Item 3). Using a pair of needle nose pliers or suitable tool, align the torque bar so that it sits square within the body interior. Observe that the pivot points of the torque bar are not binding. Replace the closure and snap ring.
	Probe is damaged.	Replace probe assembly. The probe may be unscrewed from the control body without removing any other parts. When installing a new probe be certain to engage the inner bar of the probe into the mating hole in the torque bar. Once the probe is installed, alignment of the torque bar may be necessary. See section A-1 for the procedure required for this operation.
OUTPUT SIGNAL IS OPPOSITE OF WHAT IS INTENDED	Switch is wired the opposite of what is required.	Disconnect the power source to the switch. Remove the cover of switch housing. Lift up the insulator flap so the three terminals of the switch are exposed. The insulator flap has a description of each terminal designating common lug, normally closed, and normally open terminals. Reverse the wires at normally closed, and normally open terminals. Replace the insulator flap, and inspect the switch assembly to verify that no bare wires are touching the housing or any other terminals or wires. Replace the housing front cover and re-connect the power source.

EFFECTIVE OCT. 03, 2001  
REVISION: D



INDIRECT ACTING  
INCREASING TEMPERATURE  
DECREASES OUTPUT

All Process Connections  
Shown Are 1" NPT

Nominal Probe Lth.	A	B
6	6.66	6.50
12	12.88	12.50

ITEM NO.	COMM. CODE	MATERIAL	PARTS DESCRIPTION	QTY.
1	490500A114	18-8 SST	RING Retaining Closure	1
2	490500A101	303 SST	PIN Thrust Spring	1
3	490500A119	ALUMINUM	BAR Torque	1
4	490500A133	303 SST	ADAPTER	1
5	490500A123	TEFLON	LOCK Teflon	1
6	490500A107	ALUMINUM	BLOCK Valve	1
7	490500A122	303 SST	SCREW Adjusting Range	1
8	490500A116	ALUMINUM	HOUSING Spring	1
9	490500A121	ALUMINUM	SCREW Cap	1
10	490500A128	302 SST	WASHER Indicator	1
11	490500A100	CSTL	SPRING	1
12	490500A125	12L14CS	BODY	1
13	490500A131	CSTL	CLOSURE	1
14	490500A127	ALUMINUM	DIAL SCALE	1
15	490500A124	CSTL	SCREW SOC HD	1
16	490500A132	GR. 5	NUT Hex Jam	1
**17	490500A117		ASSEMBLY Probe	1

NOTE: All Dimensions in Inches

PROBE ASSEMBLY

COMM. CODE	MATERIAL	NOMINAL LENGTH
490500A118	304 SST	8.00
490500A117	304 SST	12.00

ITEM NO.	COMM. CODE	MATERIAL	PARTS DESCRIPTION	QTY.
18	490500A106	BRASS	GAGE Pressure 0-30 PSI	1
19	490101A150	303 SST	PEANUT	1
20	490500A138	316 SST	SPRING Peanut	1
21	490500A102	303 SST	PIN Thrust Pilot	1
22	490500A108	ALUMINUM	BASE	1
*23	490500A105	BUNA-N	DIAPHRAGM	1
24	490500A104	303 SST	SEAT Moving	1
25	490500A103	303 SST	ADAPTER Pilot	1
26	490503A105	CSTL	NIPPLE Pipe	1
27	490503A108	MALL IRON	TEE Pipe	1
28	490500A135	MALL IRON	ELBOW Street Pipe	1
29	490101A148	NYLON	WASHER Flat Nylon	1
30	490500A130	302 SST	WASHER No. 10	1
31	490101A149	18-8 SST	NUT Hex Reg	1
32	490101A198	316 SST	HEX Bushing	1

ELECTRIC PILOT

33	490500A109	303 SST	ADAPTER Micro Switch	1
34	490101A144	EXQ171	SWITCH Electric SPDT Explosion	1
35	490500A115	CSTL	PLUNGER Actuator Switch	1

\* Recommended Spare Parts \*\* See Chart for Probe Lengths

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