

*Instructions***No. 222-10  
CONTROL SWITCHES**

DESIGNED TO MEET THE REQUIREMENTS AND WITHSTAND THE TEST FOR GRADE A CLASS 1 TYPE B OF NAVAL SEA SYSTEMS COMMAND MILITARY SPECIFICATIONS MIL-S-901 FOR HI-SHOCK, MIL-C-2212 FOR A.C. AND D.C. SWITCHING DEVICES, MIL-E-2036 FOR WATERTIGHT AND MIL-R-16743 FOR REFRIGERATION EQUIPMENT.

ENCLOSURE: WATERTIGHT  
SERVICE: NAVY A  
SHOCK: CLASS HI



Fig. 1 — Screwdriver adjustment model.

The 222-10 Controls incorporate a seamless metallic bellows power element which, when actuated by pressure or temperature, operates the switch mechanism to open or close an electrical circuit. A permanent magnet in the switch mechanism provides a positive snap-action on both the opening and closing cycles. This snap-action prevents excessive arcing at the contacts.

**ALARM PANEL (MIL-A-17196)**

The switch may be used on vessels having an annunciator panel (Spec. MIL-A-17196) with a supervisory circuit continuously indicating whether ship's wiring between the panel and the alarm switch is in working order. To provide for this feature a Navy approved type resistor is connected across the switch terminal screws. This resistor is easily removed when switch is used on panels without this supervisory circuit.

**INSTALLATION**

Do not attach a pressure or direct connection temperature control by turning the case. Use a wrench on the power element hex.

**Pressure Controls**

Pressure controls may be installed directly at the point where the pressure is to be controlled, or mounted remotely and connected with standard pipe and fittings.

**NOTE:** On steam pressures over 15 pounds, a siphon (water seal) must be used to prevent damage to the control.

**Temperature Controls, Direct Connection**

Direct connection temperature controls must be installed with the thermal bulb in a free circulation of the medium to be controlled. Do not place the bulb in a dead end of pipe or any other location where it will not encounter the average temperature of the medium. Make certain there is sufficient room for the bulb in order that it will not be damaged by coming in contact with the bottom or side of the opening.

**Temperature Controls, Remote Connection**

Remote connection temperature controls are furnished with flexible tubing between the control and the thermal bulb. This permits mounting the control on a wall or any other convenient support.

Model NL (solid) thermal bulb must be installed within 75 Deg. of vertical pointing downward (with flexible tube coming out of upper end of bulb). Model NN (large coil) bulb must be installed within 75 Deg. of vertical upward (with flexible tube coming out of lower end of bulb).

**NOTE:** See below for standard temperature bulb illustrated mounting position.

The thermal bulb must be located in a free circulation of the liquid or other substance to be controlled. Do not place the bulb in a dead end of pipe or any other place where it will not meet the average temperature of the liquid or substance to be controlled.

Care should be taken not to put sharp bends in the flexible tube or damage the bulb by trying to install it where there is insufficient room.

Do not twist the flexible tube. When installing a control with a demountable union, assemble the union on the tubing, leaving it loose enough to turn freely on the tubing. After the bulb has been inserted to the desired position and the union has been screwed into place, tighten packing to prevent leakage. Be careful not to damage the tubing when tightening the union packing.

**SETTING**

The adjusting screw for setting the differential operating point, if adjustable differential is specified, is located inside the case and is exposed when the watertight cover is removed. Range adjustments may be made without removing the cover. This control is available with either screwdriver or knob range adjustment, located on the end of the case.

**RANGE ADJUSTMENT:** Screwdriver or knob adjustment establishes the point at which the switch will close. Range on screwdriver adjustment models is adjustable over the entire range of the control, while only one third of the range is normally adjustable on knob adjustment models.

If it is desired to adjust the knob adjustment models over the full range of the element, loosen range adjusting knob lock screw "A", Fig. 2. Remove screw "B", Fig. 2, and pull the knob out until the stop clears the locking clamp. Turn the stop on the knob past the clamp and replace the knob. Three full turns of the knob cover the entire range of the element.

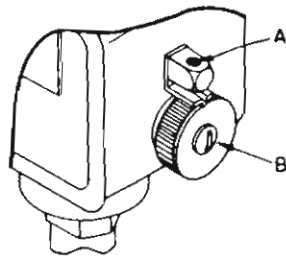


Fig. 2. Knob adjustment.

**DIFFERENTIAL ADJUSTMENT** (single pole, single throw only): Governs the point at which the switch opens, but does not affect the point at which the switch closes. The differential will vary with changes in range adjustment on *temperature* types but will remain constant on *pressure* types.

**SWITCHES WHICH OPEN THE CIRCUIT WITH INCREASING TEMPERATURE OR PRESSURE ARE ADJUSTED AS FOLLOWS:**

**To Set:** Turn differential screw counter-clockwise against stop for minimum differential. Bring temperature or pressure to point where circuit is to close. If contacts are open, turn range screw slowly clockwise until contacts just close. If contacts are already closed, turn range screw counter-clockwise until contacts open; then turn slowly clockwise until contacts just close. This fixes the closing point. Differential screw, which governs the point at which the contacts open, may be turned clockwise to widen the differential slightly.

**SWITCHES WHICH CLOSE THE CIRCUIT WITH INCREASING TEMPERATURE OR PRESSURE ARE ADJUSTED AS FOLLOWS:**

**To Set:** Turn differential screw counter-clockwise against stop for minimum differential. Bring temperature or pressure to point where circuit is to close. If contacts are open, turn range screw slowly counter-clockwise until contacts just close. If contacts are already closed, turn range screw clockwise until contacts open; then turn slowly counter-clockwise until contacts just close. This fixes the closing point.

Differential screw which governs the point at which the contacts open, may be turned clockwise to widen the differential slightly.

Types other than single pole - single throw are adjusted for opening or closing setting as described above but the differential is factory set and should not be adjusted in the field.

**NOTES:** When adjusting temperature switches, all types, allow several minutes for thermal bulb to acquire proper temperature before making settings.

After adjusting all switches, check adjustments by observing an operating cycle.

When adjusting double throw switches all references to "contacts opening" or "contacts closing" refer to the **UPPER CONTACTS ONLY**.

ELECTRICAL RATINGS IN AMPS

VOLTAGE	INDUCTIVE		LOCKED ROTOR	
	A.C.	D.C.	A.C.	D.C.
115	16.0	9.6	96.0	96.0
230	8.0	4.8	48.0	48.0
440	4.0	2.5	25.0	25.0
550	3.2	2.0	19.2	20.0

\* Lower Contact is rated at 1 amp D.C. and 16 amps A.C. at 115 V. Upper Contact is capable of direct control of motors up to 1 HP designed for voltages from 115 to 550 A.C. and D.C.

**PRESSURE OPERATED**

Models NA-1  
NB-1 and NB-4

Models NB-3  
NB-6, NB-7 and NB-12

Models NC-1  
and NC-2

Models NC-3  
and NC-4

**MOUNTING POSITION**  
**TEMPERATURE OPERATED (STANDARD BULBS)**  
Mount bulbs within 75° of position shown

Model NN

Model NL

Model NH-1

Model NH-2\*

\*H-2 Bulb tip must be horizontal or below