

**5.2 Rotork Electrical Controls**

NOTE: The control circuit operation described herein is for a Rotork Syncropak actuator. This section will familiarize students with basic Rotork control circuit operation. For specific ratings and wiring diagrams, consult Rotork, Inc.

**Components**

1. Motor - Three-phase, 220 VAC, squirrel cage induction. A winding thermostat is included in the "A" range and NA-4 actuators for overload protection. The temperature ratings of the motor thermostat are as follows:

Class B insulation: 125°C  
 Class F insulation 155°C  
 Class H insulation: 175°C

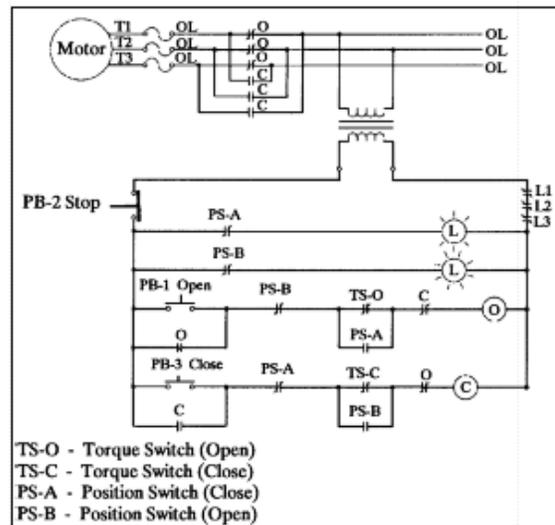
2. Starter - The reversing starter houses mechanically and electrically interlocked reversing contactors with two normally open auxiliary contacts, opening and closing coils, and a fused control transformer.
3. Integral Controls - Open/Stop/Close pushbutton with lockable (padlock) Local/Off/Remote selector switch.
4. Position Indication (Standard) - Mechanical three-position indicator shows open, intermediate, and closed conditions.

5. Torque and Limit Switches - Open and close torque and/or position limit switches plus two auxiliary limit switches at each end of travel.

**Operation**

NOTE: The following description applied to a Rotork Syncropak actuator operated locally.

In the circuit shown in Figure 5-13, control circuit power is transformed off incoming motor leads. The stop button contact is a normally closed contact allowing a current flow path to exist up to the open and close switches.



**Figure 5-13 Syncropak Electrical Schematic**

When the close direction switch is closed, the closing coil is energized. The coil closes the main line contacts to start the motor in the close direction. Energizing the coil also closes the close switch bypass contact and opens the open coil interlock

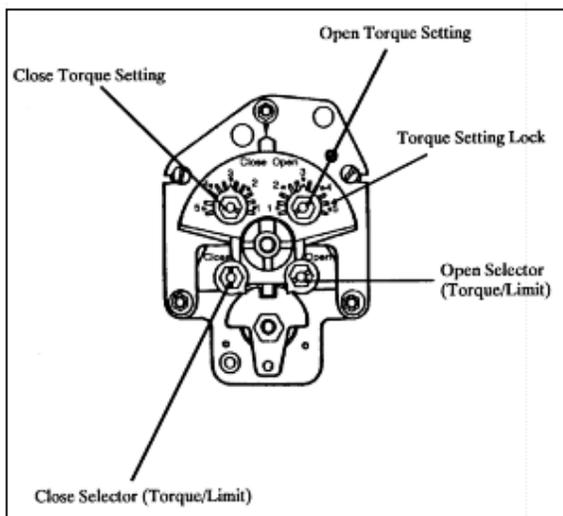
contact. When the torque switch and/or limit switch detect binding or full stem travel, the respective contact opens, de-energizing the close coil, which allows the main line contacts to open, the switch bypass contact opens, and the open interlock contact closes.

The actuator can be operated in the open direction in the same manner as described above. In the mid-position, the actuator can be operated in either direction.

## Adjustments

### Torque or Limit Control

To select torque or limit control, simply align the pointer on the applicable torque/limit selector to the appropriate position. Adjusting Torque Values - Nuclear  
Refer to Figure 5-14



**Figure 5-14 Front View of Switch Mechanism (Nuclear)**

The torque output of the actuator can be adjusted by breaking the sealing on the torque setting locks, bending back the locking fingers, and dialing the desired torque. The torque is calibrated from 1 to 5, with 5 as maximum, during production tests. Results are recorded on a test certificate.

Note that the torque setting should never be changed unless absolutely necessary and then only with a test certificate (allows you to estimate what load you are applying to the valve) and with the valve manufacturer's knowledge. The minimum torque setting that will ensure the proper function of the valve should be used.

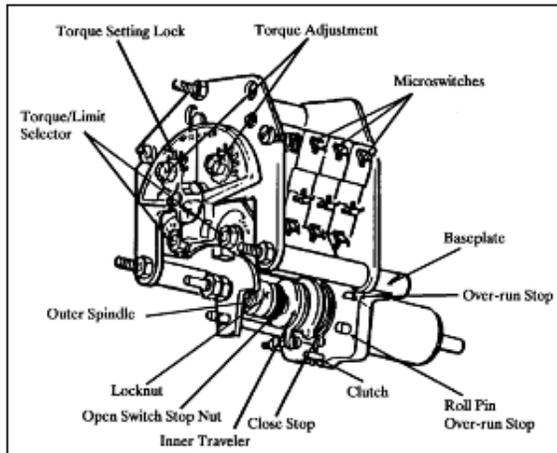
### Setting Limit Switches – Nuclear

Refer to Figures 5-15, 5-16, 5-17 and 5-18.

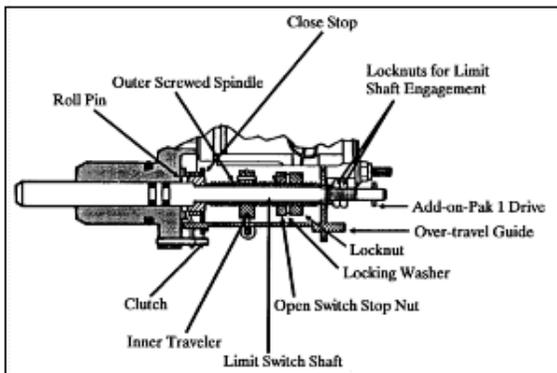
1. Remove the switch mechanism cover.

**NOTE:** This procedure is based on clockwise center column rotation for valve closing.

2. Loosen the locknut and the open switch stop nut. Unscrew both the locknut and open switch stop nut away from the inner traveler. (Note that the locking washer must also be moved away.)

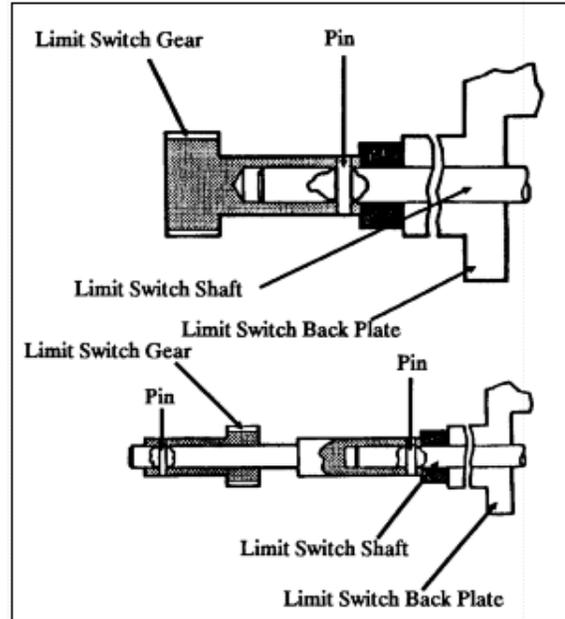


**Figure 5-15 Switch Mechanism (Nuclear)**

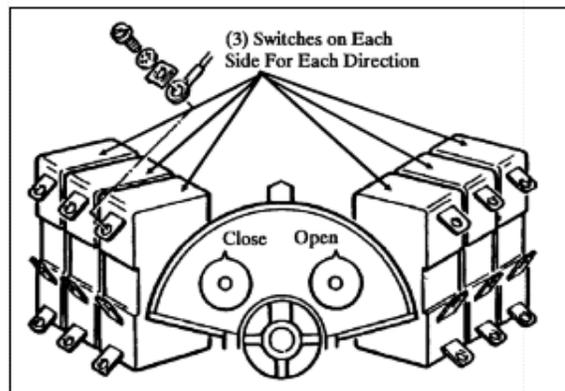


**Figure 5-16 Cross Section of Limit Switch**

3. Place the actuator in the "hand" position and manually close the valve.
4. Loosen the two limit switch shaft engagement locknuts.
5. Pull the outer screwed spindle assembly forward until the roll pin on the limit switch shaft disengages from the end of the outer screwed spindle.
6. While holding the overtravel guide tightly against the roll pin over-run stop (counterclockwise), turn the outer screwed spindle until the inner traveler contacts the close stop.



**Figure 5-17 Typical Limit Switch Drive Arrangements**



**Figure 5-18 Switch Terminal Connections (Nuclear)**

7. Slip the outer screwed spindle assembly back into position on the limit switch shaft. Align the roll pin on the limit switch shaft with the closest slot on the outer screwed spindle assembly.
8. Retighten the limit switch shaft engagement locknuts. Open the valve approximately 1 inch. Close the valve and check to be sure the

- overtravel guide is hard against the roll pin over-run stop.
9. If it is not, perform steps the following steps:
    - a. Open the valve approximately 1 inch or until the limit switch has made approximately one turn.
    - b. Loosen the two limit switch shaft engagement locknuts.
    - c. Pull the outer screwed spindle assembly forward and rotate it counterclockwise 90 degrees until the roll pin is aligned with the next slot in the outer screwed spindle assembly.
    - d. Slip the outer screwed spindle assembly back into position on the limit switch shaft.
    - e. Retighten the limit switch shaft engagement locknuts.
    - f. Close the valve and verify that the overtravel guide is hard against the roll pin over-run stop.
    - g. Verify that all the close limit switches are tripping.
  10. Open the valve to the desired open limit switch trip point.
  11. Turn the open switch stop nut until it contacts the inner traveler.
  12. Hold the overtravel guide in the clockwise position hard against the roll pin over-run stop.
  13. After ensuring that the open switch stop nut is against the inner traveler, move the locking washer against the stop nut and tighten the locknut against both of them.
  14. After closing the valve approximately 1 inch, open it and verify the open limit switch setpoint.
  15. The limit switches are now set. For all actuators with speeds of at least 86 rpm, the amount of limit switch overtravel must be verified on the valve assembly; i.e., after the overtravel guide reaches the over-run stop, the clutch slips and the limit switch shaft continues to turn. If overtravel exists, simply tap the roll pin over-run stop toward the gearcase until it is flush with the baseplate. Reverify proper operation of the limit switches.

### Operational Testing

This procedure provides instructions for operational testing of Rotork valve actuators. Operational testing is required after maintenance has been performed on either the valve or the actuator. It is also an essential part of a periodic maintenance program and troubleshooting.

Follow these procedures step by step. To avoid losing your place or performing a step out of sequence, it is suggested that each step be checked off as it is completed. If you have any questions or are unsure of what is to be done, ask your instructor for assistance.

1. Place the actuator in the manual mode by pressing the hand/auto lever in the "manual" direction and rotating the handwheel.
2. Cycle the valve completely (from full-open to full-closed) with the handwheel. Leave the valve in the "closed" position.

NOTE: The valve should operate smoothly. If binding is detected, advise your instructor.

3. Open the valve electrically using the control switch. Verify that the position indicator shows "open".
4. Close the valve electrically using the control switch. Verify that the position indicator shows "closed".
5. Place the actuator in the manual mode by pressing the hand/auto lever in the "manual" direction and rotating the handwheel.
6. Rotate the handwheel in the "close" direction to verify that the valve has seated. The handwheel should move very slightly or not at all.

The operational test is now complete. Place all equipment in its proper place and notify your instructor.

