


control

INSTRUCTIONS

CAUTION: Before installing in a nuclear application, determine that the product is intended for such use.

limit switches CR9440-J1, -J2, -J3, -J4, and -J5

GENERAL

Limit switches are intended to relate electric control or signal circuits to the motions and positions of the mechanism being governed by the control system of which the limit switch is a part. In this manner, switches of this type may be employed to automatically initiate a slowdown by arranging the circuit so that operation will break the coil circuit of the proper contactor or contactors when the driven mechanism has reached that point in its travel at which such action should occur.

From the standpoint of the contacts and their operation, the CR9440-J1, -J2, -J3, -J4 and -J5 are identical. The load and fire mechanism incorporated in each switch imparts a vigorous snap-action to the movable contact so that, regardless of the speed at which the operating lever is moved, the contact make-and-break speed remains constant. In a similar manner the point in travel of the operating lever, at which the movable contact snaps to open the closed circuit and closes the open circuit, is unaffected by the speed of the tripping element of the mechanism.

The operating levers on the standard forms of this line of switches, with the exception of the yoke on the CR9440-J3 limit switch, are all readily adjustable in three-degree increments through an angle of 360 degrees. In the case of the standard CR9440-J1 form, the lever may be inverted permitting adjustment through only 180 degrees before interference with the cover results. For the angle through which the lever on the switch may be adjusted, the increment degrees per step of adjustment, and the mounting dimensions, refer to the nearest GE office.

In the majority of cases, these switches are set up for spring-return operation. In any of the forms, except the CR9440-J3, the direction of the spring-return operation may easily be reversed, using only a screwdriver.

Sturdy die castings house the CR9440-J1, -J2 and -J3 switches, while iron castings are employed to enclose the CR9440-J4 and -J5 forms. The precision-made moving elements are all of hardened steel to insure accuracy of operation throughout the life of the switch. This is of special interest where consistent repetitive operations, closely held, are to be performed.

These switches may be operated by tripping dogs or levers of the controlled mechanism traveling at speeds as high as 100 ft per min. At this velocity, the switches may be tripped at a frequency of up to 100 operations per minute.

While the CR9440-J4 watertight and -J5 (hazardous location) limit switches are made up for somewhat special applications, the CR9440-J1, -J2 and -J3 forms (oilproof) are made up for general-purpose applications. The CR9440-J1 and -J2 switches lend themselves readily to various mountings—base or side, by means of the base plate and the tapped holes in the sides of their enclosures. To facilitate a concealed wiring job, the base plate for the CR9440-J1 is provided with a knockout so that leads may be brought in from the rear.

DESCRIPTION

Electrically, these CR9440-J snap-action limit switches have single pole, double throw contacts. The symbol for these switches is shown below. In this symbol the four circles represent the stationary contacts, while the bar across the two right hand circles represents the movable, bridging contact. The latter element is impelled from one set of stationary contacts to the other by the load and fire mechanism as the operating lever of the switch reaches the "firing" point. Referring to the symbol, the right-hand contacts are referred to as closed or normally closed if the return spring is so oriented as to locate the movable contact in that position. The spring-return feature of these switches serves to maintain the operating lever in its established setting until such time as an external force is applied to displace it. Likewise, the contacts on the left are called open or normally open as the case may be.

RATING

The switches all have the same rating—a continuous capacity of 10 amperes, the ability to make 30 amp, ac or dc, and break ratings as shown in Table I.

TABLE I

DC Inductive Circuits				AC Circuits			
Volts	115	230	575	115	230	460	575
Amp	2.0	0.5	0.2	3.0	1.5	0.75	0.6

Loads in excess of those shown in Table I should not be imposed on these switches since the contact life would be greatly reduced by such a practice.

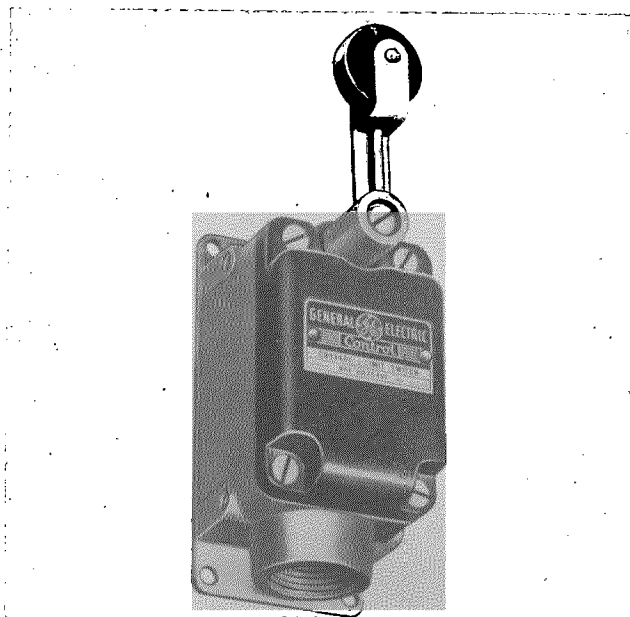


Fig. 1. CR9440-J1 limit switch

OVERTRAVEL

Into each of these switches is incorporated provision for forward overtravel—travel in the direction of operation beyond that point at which contact operation takes place. (In addition, all but the CR9440-J3 switch incorporate reverse overtravel, which in many applications, greatly simplifies locating the device, since no external mechanism is required to permit its operation.) Best results will be obtained by planning the installation so as to use the minimum amount of overtravel necessary to secure positive operation of the switch and in no case should the stipulated maximum overtravel be exceeded, as this will result in damage to the switch or to the tripping member on the machine. Outline drawings of the various switches will be supplied upon request.

REVERSING PROCEDURE—CR9440-J1

Before considering the reversal of the direction of operation of the CR9440-J1 forms of this line of limit switches, remove the rear cover or base plate from the switch. This will reveal the interior, as shown in Fig. 5.

Referring to Fig. 5, (A) is the overtravel spring, (B) the overtravel rack which engages with a pinion secured to the shaft, (C) is the return spring, (D) the swing bar, (E) the catches, and (F) is the latch. Note that the switch pictured in Fig. 5 is set up for counter-clockwise operation, viewed from the front. To reverse its direction of operation, insert the blade of a small screwdriver into the convolutions of spring (C) near the housing and lift up so that this end will clear the enclosure.

CAUTION: Since spring (C) Fig. 5, is under compression, care must be exercised in its removal to prevent its loss.

After this spring has been removed, push the swing bar (D) over to the side from which the spring was removed, introduce the small end of the spring (C) into the seat provided for it in the swing bar (D), and compress until the large end may be slid down the channel to its seat. Man-

ually trip the switch a few times, to check its operation, then replace the cover.

REVERSING PROCEDURE—CR9440-J2, -J4, -J5

The CR9440-J3 forms of this limit switch line may not be reversed. The reversal of the CR9440-J2, -J4 and -J5 forms is accomplished in the same manner in all three cases. Fig. 6 is a view of the CR9440-J2 switch with the front cover removed to show the contacts and their mounting as well as the switch-action reversing adjustment (A), which in the case of the CR9440-J4 and -J5 forms is located on the opposite side of the shaft center line toward the contacts. Assume, for example, that the switch pictured in Fig. 6 is set up for clockwise operation and it is desired to change to a counterclockwise operation.

The first step in the procedure is to loosen the switch-action-reversing adjustment screw (B) Fig. 6. Rotate the operating roller lever in the clockwise direction into full overtravel, noting that the adjustment plate (A) Fig. 6, shifts. Retighten the loosened screw securely to be sure that no slippage will occur between the adjustment plate and the section of the box on which it mounts. Operate the switch several times to be sure that the snap-action is present and that the return spring (C) Fig. 6, will reset the switch to its normal position, in preparation for succeeding operations. This latter check is accomplished by manually restraining the lever against the return spring and permitting it to return to its normal position very slowly. Should the spring return fail to function properly after the above procedure is completed, it would indicate that the adjustment plate did not shift sufficiently, and the operations described above should be repeated, making certain that the adjusting plate shifts its full travel.

ELIMINATION OF SPRING RETURN CR9440-J2, -J4, AND -J5

If, in the CR9440-J2, -J4, and -J5 switches, it is desired to eliminate the spring return feature to provide a maintaining contact switch, this may be accomplished by removing the screw and the adjusting plate (A) and (B) in Fig. 6.

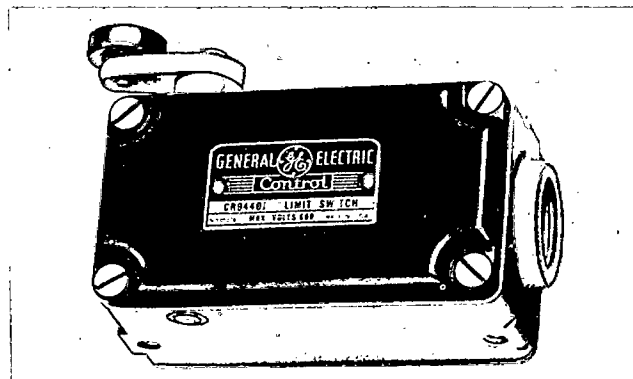


Fig. 2. CR9440-J2 limit switch

TRANSFER OPERATING LEVER

The operating lever on the CR9440-J2 and -J5 limit switches may easily be changed from one side of the switch to the opposite side. This transfer is most read-

accomplished if, in addition to a screwdriver, a $2\frac{1}{2}$ in. piece of $\frac{1}{4}$ in. diameter stock is on hand and the following steps are performed in the sequence shown.

1. Remove power from the involved switch.
2. Remove the switch cover.
3. Referring to Fig. 6, completely remove the screw (D).
4. Using the $\frac{1}{4}$ -in. rod, push the shaft out of the switch. (The $\frac{1}{4}$ -in. rod serves to maintain the alignment of the mechanism while the shaft is being shifted.)
5. With the lever on the desired side of the switch, push the $\frac{1}{4}$ -in. rod out with the shaft.
6. Align the tapped hole in the shaft with the clearance hole in the drum.
7. Replace screw (D), and the operation is complete.

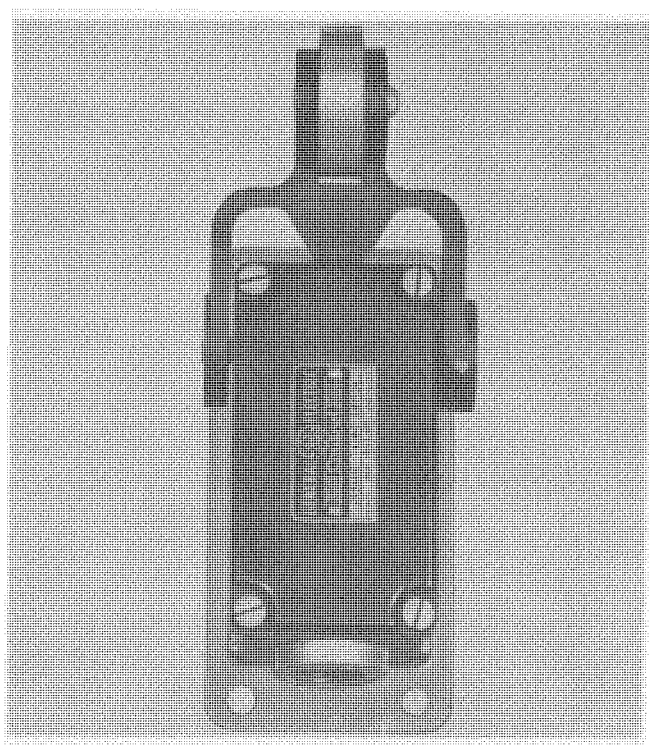


Fig. 3. CR9440-J3 limit switch

INSTALLATION AND ADJUSTMENT

INSPECTION AFTER SHIPMENT

After unpacking, and just prior to installation, the switch interior should be inspected for foreign material that may have entered the enclosure during shipment. To do this, take off both the front and rear covers and remove all visible foreign material. If an air hose is handy, blow out the interior with it, unless its use is likely to result in introducing water into the switch mechanism.

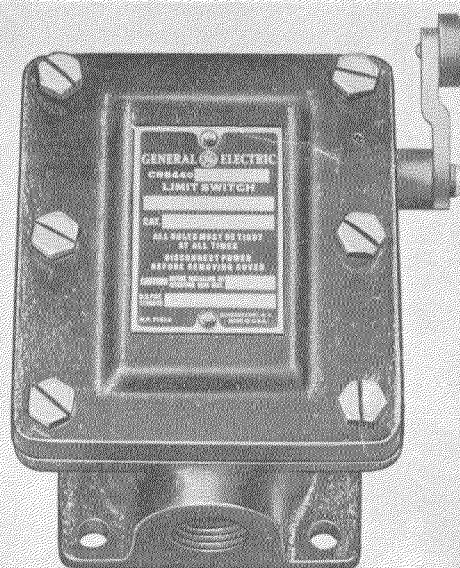


Fig. 4. CR9440-J5 limit switch

NOTE: Except for the nameplate and gasket between cover and box, the -J4 form is identical to the -J5 which is shown in Fig. 4.

If a CR9440-J1 is to be back wired, the knockout will be most easily removed at this time when the plate may be secured in a vice.

MOUNTING

Replace the rear cover and mount the switch securely, using mounting screws as specified on the switch outline, make conduit connections, wire up the device, and operate the switch a few times before replacing the front cover. The above mentioned operational check may be performed with the control energized as an additional check on the entire wiring scheme.

LOCATION OF OPERATING LEVER

With the switch properly located, the next step to consider is the location of the operating lever. Adjustment of the levers on many of these switches is accomplished by loosening the holding screws, shifting them to the desired points and retightening the screws. If the switch has a somewhat special lever, it will be necessary to remove completely the lever and its mounting screw in order to make the adjustment. With either type of lever, be sure to tighten the holding screw fully before operation is attempted.

MAINTENANCE AND LUBRICATION

Each switch is thoroughly lubricated before it is shipped from the factory, and oil-impregnated bearings are employed throughout, where possible, to reduce to a minimum the necessary on-the-job maintenance. After every 75,000 operations, or each six months' service, remove the cover of the switch and operate it a few times manually to be

sure that the snap-action is positive. One drop of light machine oil should be applied to the contact guide bar at this time, as well as to the pins on which the catches (E), Fig. 5, pivot. The composition rollers on the operating levers require no lubrication, since they are molded of a compound containing graphite. In the case of the metal roller on the CR9440-J3 switch, an oil-impregnated bearing has been incorporated.

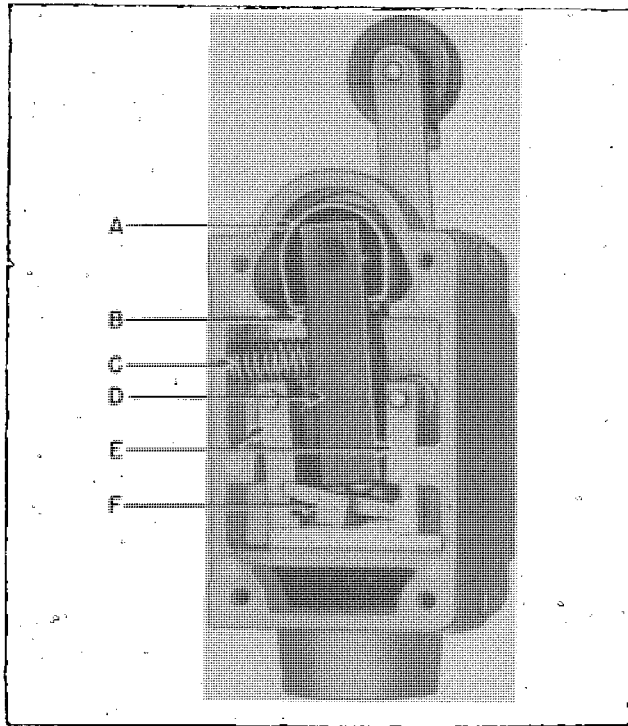


Fig. 5. Interior of CR9440-J1 limit switch

REPLACEMENT OF CONTACTS

Each time the switch is opened for lubrication, the contacts should be inspected for pitting or burning, and any that are not in good condition should be replaced. To remove any of the contact members, remove the screws holding the stationary contact blocks and lift out the entire contact assembly consisting of both stationary members, and the movable contact with its guide bar, carrier and springs. Then replace the parts which are worn or pitted.

RENEWAL PARTS

For renewal parts, refer to the nearest General Electric Sales Office, giving the complete nameplate rating of the switch and a description of the part desired.

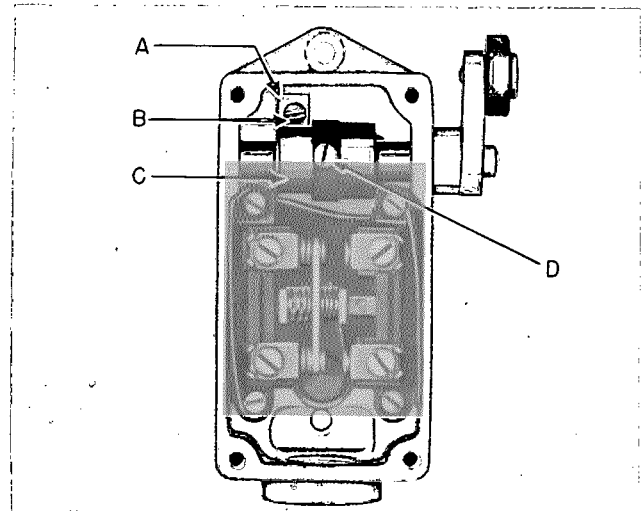


Fig. 6. Interior view of CR9440-J2 limit switch



Rotary Limit Switches

CR9441 Series A

Caution: Before installing in a nuclear application, determine that the product is intended for such use.

Warning: Disconnect power before installing or servicing.

Contact Rating

AC Pilot Duty			DC Pilot Duty*	
Volts	Amperes		Volts	Amperes
	Break	Make		
115	15	40	120	0.50
230	10	20	240	0.20
460	6	10	600	0.02
600	5	8		

* Use of slow make and break switches with dc is not recommended.

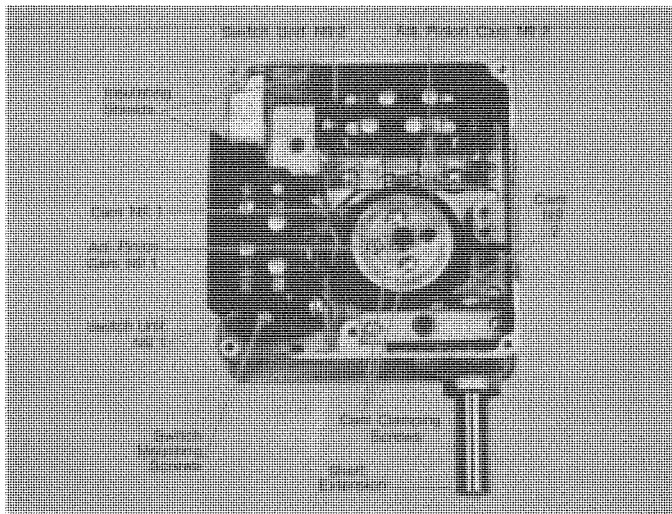


Figure 1. Rotary limit switch

Description

The CR9441E rotary limit switch is designed to coordinate reversing operations with the number of revolutions of a motor shaft or the rotation of driven equipment. Typical applications include control of limits of travel of machinery, opening and closing of doors and windows, operation of valves and various sequencing operations. The internal components of the device are shown in Figure 1 and are the same for all forms.

The operating mechanism consists of adjustable cams driven by a shaft through a gear reduction. Each cam operates the contacts of one switch unit.

Installation

Remove all source of power.

Mount the limit switch in any desired position using the mounting holes provided in the enclosure. If the input shaft is to be used in conjunction with another shaft, a flexible coupling is recommended for elimination of stress on the input shaft. Both plain shafts and woodruff key shafts are available for ease in mounting any type of coupling or gear drive. The maximum permissible speed of the input shaft is 600 rpm.

After the switch has been wired in accordance with the contact arrangement in the cover of the switch, adjust switch properly, fold down the insulating shield and replace the limit switch cover.

Adjustment

The operating mechanism of the limit switch should be adjusted to correlate the motion of the equipment that it is controlling. For limitations of the switch, see Table 1.

The adjustment of the trip point of each of the switch units is a simple operation.

1. Remove all power from device.
2. Remove the enclosure cover.
3. Loosen the two cam clamping screws on top of the cam assembly one quarter turn each (See Figure 1).
4. Locate the adjusting pinion for each cam. Light color pinion adjusts cam for switch #1. Dark color pinion adjusts cam for switch #2.
5. With a screwdriver, rotate cam in direction to operate switch.
6. When the operating cam has been adjusted so the roller has tripped the switch, the adjustment is complete.
7. Retighten clamping screws and replace the cover of the switch.

Maintenance

The device has been permanently lubricated at the factory. An increase in life may be obtained by occasionally placing a small quantity of gear grease on the worm and worm gear.

If a precision snap-acting switch should be in need of replacement, remove the two mounting screws and replace the switch.

Table 1

Switch Unit*	Gear Ratio	Turns of Driving Shaft			
		To Trip		To Reset	Over-travel
		Maximum	Minimum		
Snap Acting	128:1	120	4	2 1/2	5
	32:1	30	1	5/8	1
Slow Make and Break	128:1	120	4	1/4	5
	32:1	30	1	1/8	1

* Use of slow make and break switches with dc is not recommended.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the Purchaser's purposes, the matter should be referred to the nearest GE Sales Office.

For further information
call or write your local
General Electric
sales office or distributor,
or write ...

General Electric Company
General Purpose
Control Department
P. O. Box 2913
Bloomington, IL 61701

GENERAL  **ELECTRIC**