

Low Voltage Fixed Switch

Defective Analysis

		PROPRIETARY MUTILATE BEFORE DISCARDING				
				SPEC. NO. 796-00001		
				Date 1/18/08	Supr. Date 4/6/90	Rev 6
Dist.	SUBJECT: Field Service of Low Voltage Switches				Drawn JN	Checked DKN

1. RECOGNITION OF A DEFECTIVE SWITCH

1.1 A defective switch may be identified by a higher than expected millivolt (mV) drop across the extremes of the switch as shown in Figure 1.

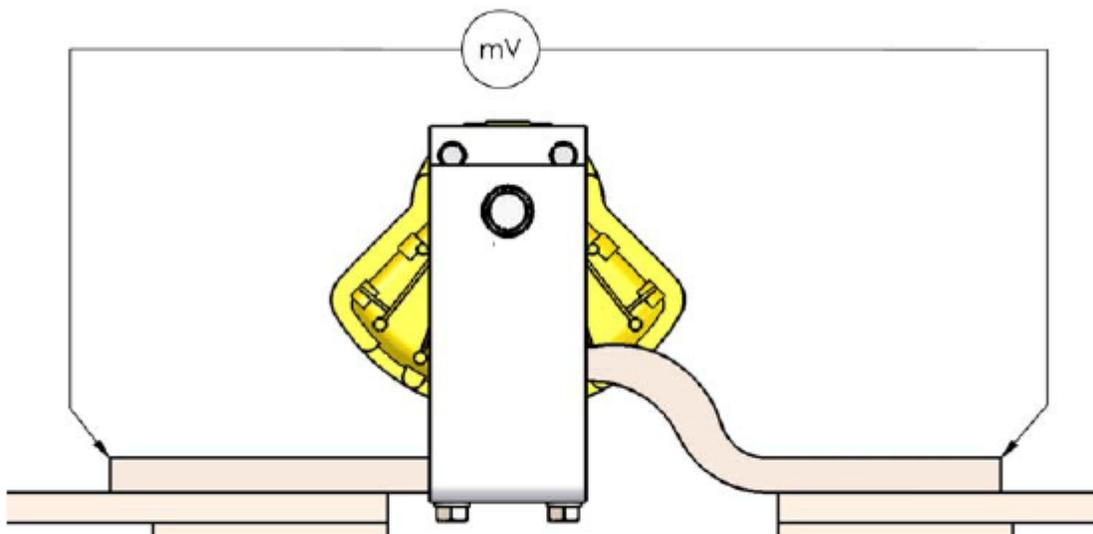


Figure 1.

Maximum mV drops across the extremes of the switch at rated load are shown in Table 1. Vacuum module type numbers may be found on the switch parts list Spec. 148-.

TABLE 1.	
Vacuum Module Type Number	Max. mV Drop @ Load Across Switch Extremes
148-32823	75
148-33252	75
148-33253	80
148-33300	75
148-34777	80
148-34778	80



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1.2 The defective switch will run significantly hotter. At rated current, the hottest point on the switch will run approximately at the temperatures shown, dependant on the vacuum module type, in Table 2. These temperatures are the rise above the temperature of the buswork to which the switch is attached. Vacuum module type numbers may be found on the switch parts list Spec. 148-

TABLE 2.	
Vacuum Module Type Number	Defective Switch Temp °C Above Buswork
148-32823	25
148-33252	25
148-33253	40
148-33300	25
148-34777	40
148-34778	40

1.3 Before demounting a switch for repair, check the tightness of the eight (8) bolts into each vacuum module. The torque should be 42 Ft-Lbs. If bolts are loose, tighten and repeat millivolt drop measurement.

2.0 LOCATION OF DEFECTIVE POLE WITHIN A MULTI-POLE SWITCH

2.1 If one of several poles (vacuum modules) in a switch has lost vacuum, it will usually operate cooler than the remaining poles. The millivolt drop across the pole faces (see Figure 2) of the bad pole will be higher than the max. mV drops as shown in Table 3.

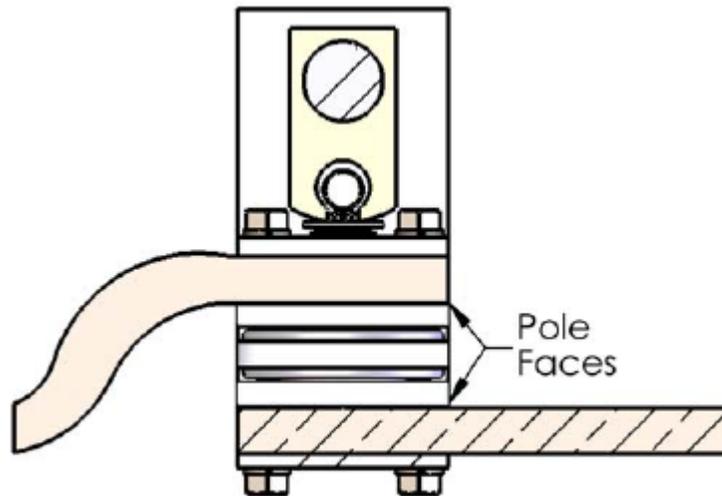


Figure 2.



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TABLE 3.	
Vacuum Module Type Number	Defective Switch Temp °C Above Buswork
148-32823	31.25
148-33252	31.25
148-33253	62.5
148-33300	31.25
148-34777	62.5
148-34778	62.5

2.2 Oxidation and discoloration of switch parts is not necessarily an indication of module failure, merely that the switch has been overloaded. If there is a marked difference in degree of oxidation among several units within a single switch, the least oxidized unit is suspect.

3.0 REMOVING THE VACUUM MODULE



Do not change more than one module at a time on a multi-pole switch.

3.1 Remove the suspected switch from service.

3.2 Mark the position of the drive plate relative to the flexible lead. See Figure 3 and Figure 4.



Do not rotate the drive plate from this position at any time or realignment will be required. See 7.0.

3.3 Close the switch and remove the four silicon bronze bolts from the drive plate. Refer to Figure 3.

3.4 Open the switch and slide the flex out.

3.5 Remove the remaining four bolts (below) holding the vacuum module and remove the module

4.0 INSPECTION OF VACUUM MODULES

4.1 The failure mode of the vacuum module is either by wear or loss of vacuum.

4.2 With vacuum intact the contacts are closed. Loss of vacuum will cause the contacts to separate. Separation can be detected by the ability to move the contacts together by hand compression.



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4.3 Wear allows the contacts to rock even though held tightly together by vacuum. This can be detected by applying finger closing pressure at each corner in turn.

4.4 Oxidation or evidence of overheating alone is not evidence of failure. Unless accompanied by other symptoms, the module may be cleaned, repainted and returned to service.

4.5 During operation, material is removed from the contact faces and deposited elsewhere within the module. It is normal to measure degree of continuity across an open module and to hear some rattle inside when shaken.

5.0 INSTALLATION OF VACUUM MODULE

5.1 Clean pole faces of new module and mating surfaces of bus and flex with light sandpaper (220) or 'Scotch Brite'.

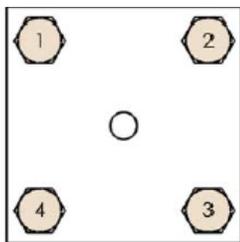
5.2 Coat surfaces with T&B "KOPR-SHIELD". NOTE: For single module switch units rated at 8kA, use LR-1 joint compound.

5.3 Mount vacuum module on bus bar orienting module serial number per 148- drawing. Insert four silicon bronze bolts and lock washers. Tighten bolts finger tight.

5.4 Slide flex between module and drive plate. Insert the four silicon bronze bolts with lock washers and tighten finger tight.

5.5 Close switch completely.

5.6 Using 3/4" socket on a torque wrench, gradually tighten bolts using the following sequence:



Bolt Number
1,3,2,4
1,3,2,4
1,3,2,4

Torque Value
15 Ft-lbs
30 Ft-lbs
42 Ft-lbs



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6.0 REPLACEMENT OF MECHANISM PARTS

6.1 Refer to Figure 3 and Figure 4 to determine which drive mechanism components are used on the switch being repaired. If the switch drive components look like those in Figure 3, continue with 6.2 through 6.7. If the components look like those in Figure 4, skip to 6.8 through 6.13.

6.2 Remove spring pins from both ends of the eccentric drive shaft.

6.3 Remove cotter pins from clevis pins.

6.4 Rotate shaft until clevis pins are free and remove them.

6.5 Remove the shaft extensions from both ends of the shaft.

6.6 Lift out eccentric shaft with connecting rods.

6.7 Replace defective part and reassemble. If it has been necessary to replace eye bolt, drive plate, spring washers (Belleville washers), realignment of the switch will be required. (See 7.0).

6.8 Remove spring pins from both ends of the eccentric drive shaft.

6.9 Remove retaining rings from both ends of barrel pin.

6.10 Rotate shaft to relieve force on connecting rods. Disengage them by sliding sideways off the pin.

6.11 Remove the shaft extensions from both ends of the shaft.

6.12 Lift out eccentric shaft with connecting rods.

6.13 Replace the defective part and reassemble. If it has been necessary to replace the adjustment bolt, spring washers (Belleville washers), drive plate, pin or flex, realignment of the mechanism will be required. (See 7.0).



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7.0 REALIGNMENT

Realignment is required only if mechanism parts or flex has been replaced.

7.1 Refer to Figure 3 and Figure 4 to determine which drive mechanism components are used on the switch being repaired. If the components look like those in Figure 3, continue with 7.2 through 7.3; if the components look like those in Figure 4, skip to 7.4 through 7.7.

7.2 For Figure 3, adjustment of the alignment consists of rotating the eye bolt, ½ turn at a time until the pick up angle range specified on the 148- level drawing is obtained.

It will be necessary to remove and reassemble the clevis pin for each alignment trial. It is not necessary to install the cotter pin until alignment is completed.

7.3 Pick up is defined as the shaft angle when opening tension is first applied to the vacuum module via the clevis pin. It is located by rotating the shaft from closed toward open until the clevis pin just becomes tightly trapped between the eye bolt and the connecting rods.

7.4 For Figure 4, begin with adjustment bolt engaged only 3 turns into the drive plate. Slide connecting rods onto pins and rotate shaft to fully close switch. Refer to the 150 level data sheet, Pg.2 for fully closed position for the switch in question.

7.5 Refer to 148- level drawing for the switch in question.

Check the spring washer (Belleville washer) stack height – add or subtract shim washers as required to give the specified compression height as shown on the 148- level drawing.

7.6 Check the pick up angle as specified on the 148- level and/or 150- level drawings. Adjust the bolt 1/6 turn at a time as needed to obtain the required pick up angle range.

Pick up is defined as the shaft angle when the opening tension is first applied to the vacuum module via the connecting rods. It is detected by rotating the switch shaft from fully closed toward open and noting when tension is applied to the adjustment bolt.

7.7 Replace the retaining rings.



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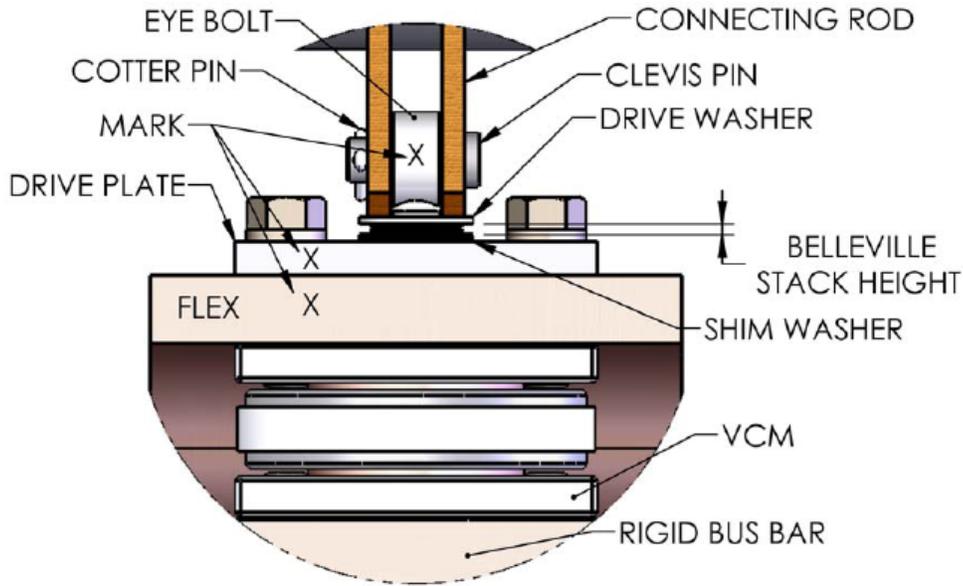


Figure 3.

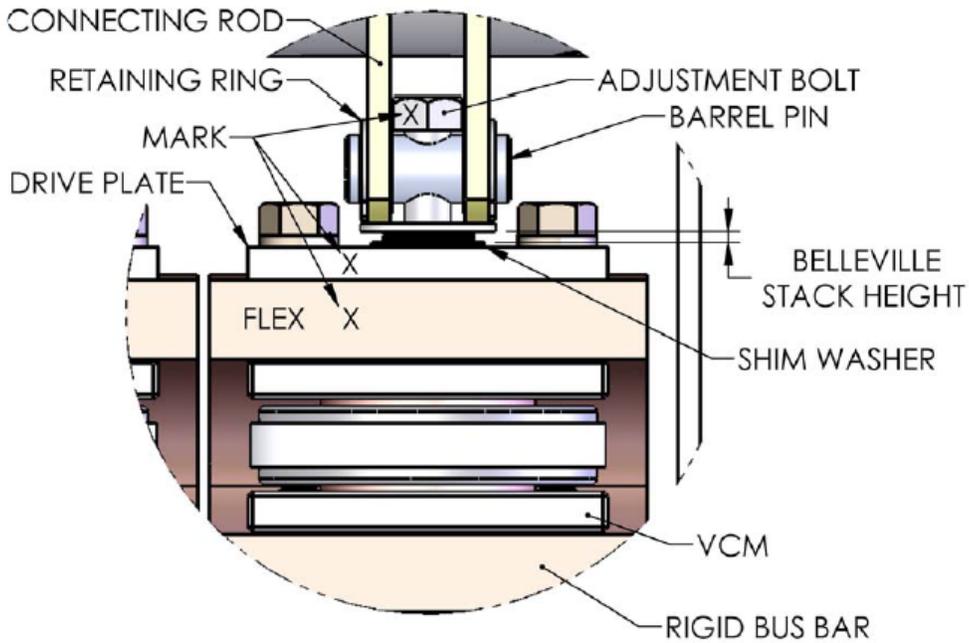


Figure 4.

