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Selector Switch Selection

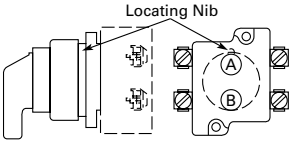
Cam and Contact Block Selection

Selector switches in their varied forms (two-position, three-position and four-position) are a big factor contributing to the great flexibility of control that a well rounded line of "pushbuttons" can achieve. Because of their flexibility, they tend to cause difficulty with product selection and application. The following systematic approach should simplify that task.

Cam and contact block selection is better understood if you:

- Work with each incoming and outgoing wire/circuit separately.
- Recognize the terms NO and NC only identify the type of contact by its mode before mounting to the operator. The "X-O" table (**Page V7-T1-210**) shows how that contact will act after assembly to the operator with the selected cam shape. X = closed circuit, O = open circuit.
- Up to six NO or NC contacts may be mounted behind each plunger location for a total of twelve contacts. Single circuit contact blocks have only one plunger with the other side of the block "open." Therefore, single circuit contact blocks transmit motion to blocks behind them only for the position containing the circuit.
- Each cam has two separate lobes, each of which operates one of the two contact block plungers independently of each other. Those are identified as position A (locating nib side) and position B (opposite of locating nib). The position designations give direction in selecting and mounting of the contact blocks.

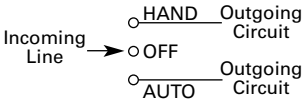
Contact Circuit Locations



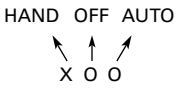
Systematic Approach

Application: **HAND-OFF-AUTO** selector switch. In this circuit, one incoming line is distributed to two other outgoing circuits by the switch. The two circuits can be looked at individually.

Step 1: Elementary Diagram.
Construct on paper, or in your mind, a simple elementary diagram of the switching scheme as follows:

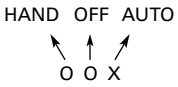


Step 2: "X-O" Pattern.
From the elementary diagram, you can construct an "X-O" diagram which describes when the contacts are to be closed (X) or open (O) in the various positions of the switch. The "X-O" for the **HAND** circuit looks like this:



In this circuit, you want a contact closed on the left (HAND) but open in the center and right.

For the **AUTO** circuit, the "X-O" diagram would look like this:



Putting them together, the complete "X-O" diagram is:

X O O
O O X

Once the "X-O" diagram has been generated the next step is to select the cam and contact block, or blocks, needed to perform the desired "X-O" functions. The selection tables on the following pages list the various types (shapes) of cams by number to choose from and the type of contact and position to achieve the function outlined in your "X-O" diagram.

Step 3: Cam Selection.
The cam you select determines the operation of all contact blocks mounted to the operator. It is selected on the basis that it provides the simplest circuitry for the desired "X-O" diagram. The selection tables show all the "X-O" combinations. For the purpose of this example, the applicable portion of those tables is shown on this page.

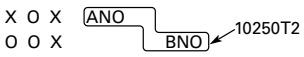
Now to make the cam selection, make a simple worksheet such as:

	Cam 2	Cam 3
X O O	(A)NO-(B)NC	**(A)NO**
O O X	(B)NO	**(B)NO**

It becomes immediately obvious that cam 3 is the better choice for two reasons, (1) the series combination can be avoided making it simpler to wire, (2) only two contacts are required, which is less expensive than the three contacts required by cam 2.

Step 4: Contact Block Selection.
Having selected the cam, contact block selection is simply a matter of gathering the A position and B position circuits into pairs which make up the most convenient contact block arrangement. If there is an imbalance in the number of circuits under A or B, then single circuit blocks must be selected for these leftover circuits.

Back to the worksheet, having selected cam 3 do this:



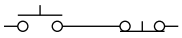
Step 5: Selector Switch Operator.
Lastly, you have to choose from the many types of operators—knob and lever in various colors or keyed. Also what combinations of maintained and spring return functions are required. Selection of these operators can be found on **Page V7-T1-212**. For the example in step 4 you may want a three-position maintained black knob, cam 3—Catalog Number 10250T1323.

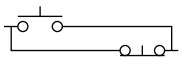
The Complete Switch:
10250T1323 with one 10250T2 or, for one composite catalog number, 10250T21KB found on **Page V7-T1-207.**

Diagrams
Circuits shown illustrate connections to obtain a selector switch circuit combination and are shown with their appropriate line diagrams. Field wiring of jumper connections required as shown.

X = Closed circuit
O = Open circuit

Wiring of Jumper Connections


Series Connection


Parallel Connection

Four-position selector switches are limited to four contact blocks.

Contact Blocks
For selection and number of available contact blocks per operator, see **Pages V7-T1-235** to **V7-T1-238**.

Example Selection Table

No.	"X-O" Pattern			Cam Code #2 Top A	Cam Code #2 Bottom B	Cam Code #3 Top A	Cam Code #3 Bottom B
1	X	O	O	① NO	NC	NO	—
4	O	O	X	—	NO	—	NO

Two-Position Selector Switch Contact Block Selection

No.	Desired Circuit and Operator Position		Contact Blocks Required to Accomplish Circuit Function: Top Plunger A		Bottom Plunger B
1	X	O	NC	or	NC
2	O	X	NO	or	NO

Note
① Wired in series.

Three-Position Switch—Cam and Contact Block Selection

No.	Desired Circuit and Operator Position			Contact Blocks Required to Accomplish Circuit Function (Jumpers must be installed where indicated) Operator with Cam Code #2 Mounting Location Top Plunger A	Operator with Cam Code #2 Mounting Location Bottom Plunger B	Operator with Cam Code #3 Mounting Location Top Plunger A	Operator with Cam Code #3 Mounting Location Bottom Plunger B
1	X	0	0	NO	NC	NO	
2	X	X	0		NC		NC
3	X	0	X	NO		NO	NO
4	0	0	X		NO		NO
5	0	X	X	NC	NO	NC	
6	0	X	0	NC		NC	NC

Four-Position Switch—Contact Block Selection

No.	Desired Circuit and Operator Position				Contact Blocks Required to Accomplish Circuit Function Mounting Location Top Plunger A	Bottom Plunger B
1	X	0	0	0	NC	
2	0	X	0	0		NO
3	0	0	X	0	NO	
4	0	0	0	X		NC
5	X	0	0	X	NC	NC
6	0	X	X	0	NO	NO
7	0	0	X	X	NO	NC
8	X	X	0	0	NC	NO
9	0	X	0	X		NO NC
10	X	0	X	0		NC NO
11	X	X	X	0		NC NO NO
12	0	X	X	X		NO NC NO
13	X	0	X	X		NO NC NC
14	X	X	0	X		NC NO NC

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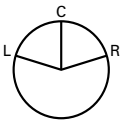
Key Removal Positions



Code Suffix	Key Removal Position
1	Right only
2	Left only
3	Right and left
4	Center only
5	Right and center
6	Left and center
7	All positions

Note: Key removal in "spring return from" positions not recommended.

Replacement Keys or Dissimilar Locks for Key Operators

Operators listed on **Page V7-T1-212** have identical locks and keys (Key Code H661) Catalog Number 10250ED824. For dissimilar lock and key combinations, see listing on this page.

Replacement Key

Description	Catalog Number
Replacement keys (code H661)	**10250ED824**

Selector Switch Operators with Dissimilar Locks and Keys (UL [NEMA] 4, 4X and 13)

The locks in all key operators listed on **Pages V7-T1-191, V7-T1-212** and **V7-T1-349** are identical and use key code number H661. Two keys are supplied with every lock. For additional code number H661 keys, order **Catalog Number 10250ED824**. For others, order 10250ED1130 and designate lock number. When dissimilar locks for each operator or each group of operators are required, select from the lock and key combination listed below. **When Ordering Operator Only** or a complete control unit with a substitute lock, order from table below and add "except Lock and Key Code No. …"

"H" Series Locks without Master Key—with Key Slot Cover

Lock and Key Code Numbers

H501	**H635**	**H663**
H620	**H639**	**H675**
H621	**H643**	**H683**
H634	**H654**	**H688**

"M" Series Locks with Master Key—with Key Slot Cover

Lock and Key Code Numbers

MD1	**MD14**	**ME8**	**MJ6**
MD2	**MD15**	**ME11**	**MJ10**
MD3	**MD16**	**ME16**	**MJ11**
MD4	**MD19**	**ME17**	**MJ13**
MD5	**MD20**	**ME18**	**MJ15**
MD7	**ME2**	**ME19**	**MJ16**
MD9	**ME3**	**MJ1**	**MD17**
MD10	**ME5**	**MJ3**	
MD11	**ME6**	**MJ4**	
MD13	**ME7**	**MJ5**	

Master Keys for Above Locks

Application	Catalog Number
For code:	
MD1–MD20	**10250ED825-3**
ME2–ME18	**10250ED825-4**
MJ1–MJ16	**10250ED825-5**

Selector Switch Operators with Caps

UL (NEMA) Type 3, 3R, 4, 4X, 12, 13

Selector Switch Operators with Caps

Positions	Operator Action ②	Black Knob Selector Switch—Vertical Mounting ③ Cam Code ④	Black Knob Selector Switch—Vertical Mounting ③ Catalog Number	Black Lever Selector Switch—Vertical Mounting ③ Cam Code ④	Black Lever Selector Switch—Vertical Mounting ③ Catalog Number
Two-Position Maintained ① 	Two-position—60° throw	1	**10250T1311**	1	**10250T3011**
	M S	1	**10250T1371**	1	**10250T3071**
Three-Position Maintained ⑤ 	Three-position—60° throw	2	**10250T1322**	2	**10250T3022**
	M M	3	**10250T1323**	3	**10250T3023**
	S M	2	**10250T1332**	2	**10250T3032**
	S M	3	**10250T1333**	3	**10250T3033**
	S S	2	**10250T1342**	2	**10250T3042**
	S S	3	**10250T1343**	3	**10250T3043**
	M S	2	**10250T1352**	2	**10250T3052**
	M S	3	**10250T1353**	3	**10250T3053**
	Four-position—40° throw	7	**10250T1367**	7	**10250T3067**

Notes

① Black knob selector switch, cam 1 shown.
② M = Maintained. S = Spring return in direction of arrow (R).
③ Field convertible to horizontal mounting or order operator only and separate operator cap.
④ For selection of the proper cam and contact block to obtain the proper circuit sequence, see selection instructions and tables on **Pages V7-T1-208**, **V7-T1-209** and **V7-T1-210**.
⑤ Black lever selector switch, cam 3 shown.