



ECET 4530

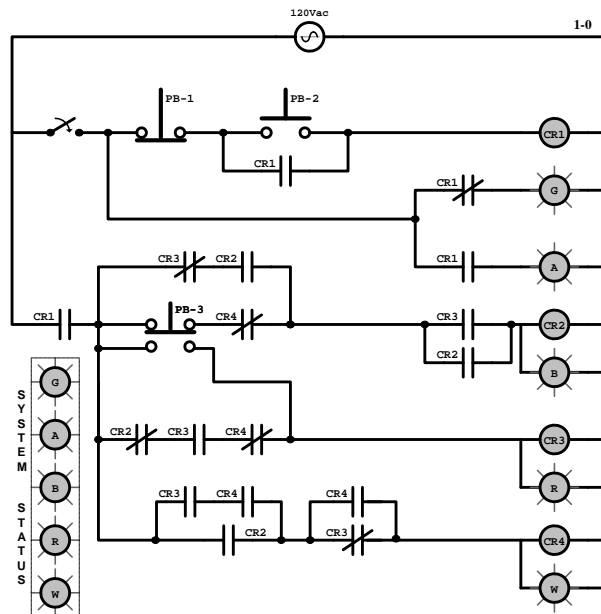
Industrial Motor Control

Relay Logic Example Problem



Determine the system status after:

- Step 1:** Flip Power Switch ON
- Step 2:** Press PB-2
- Step 3:** Release PB-2
- Step 4:** Press PB-3
- Step 5:** Release PB-3
- Step 6:** Press PB-3 (2nd Time)
- Step 7:** Release PB-3 (2nd Time)
- Step 8:** Press PB-1
- Step 9:** Release PB-1
- Step 10:** Flip Power Switch OFF





System status with the Power Switch in the OFF position.

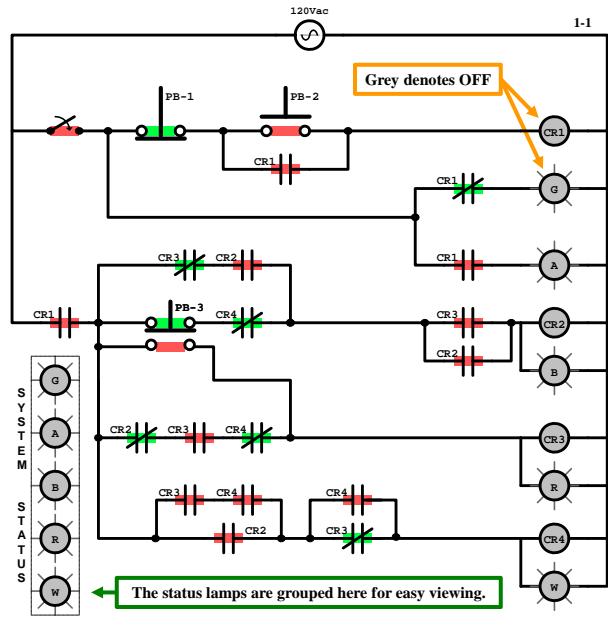
On: None

All logic devices are shown in their normal positions.

Off: Green
Amber
Blue
Red
White

The colored bars shown behind the logic devices denote the current state of the devices:
█ - open
█ - closed

Since there is a delay between the time that a field coil is (de)energized and the time that its associated contacts actuate (drop-out), a change in the state of a field coil will be shown as an independent event compared to a change in the state of its contacts.

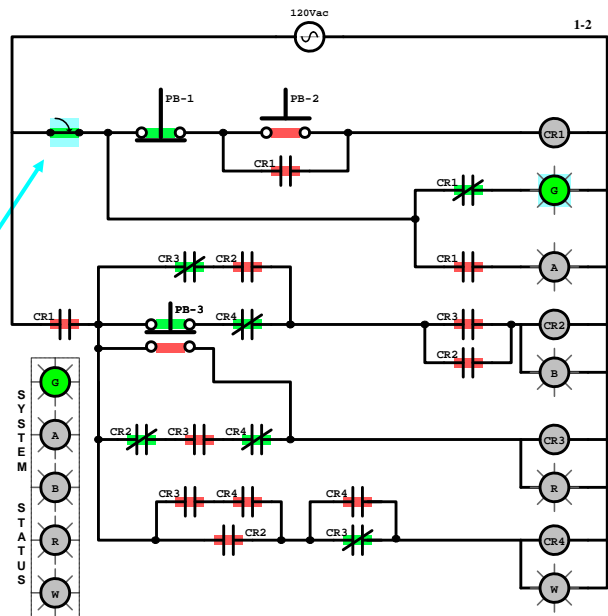


Step 1: Power Switch flipped ON

Result: Green Light ON

No additional changes in the system

A solid, light-blue background denotes that the state of that device changed from the previous slide to the current slide.
 I.e. - The "Power Switch" was in the OFF position and the Green Light was OFF in the previous slide.

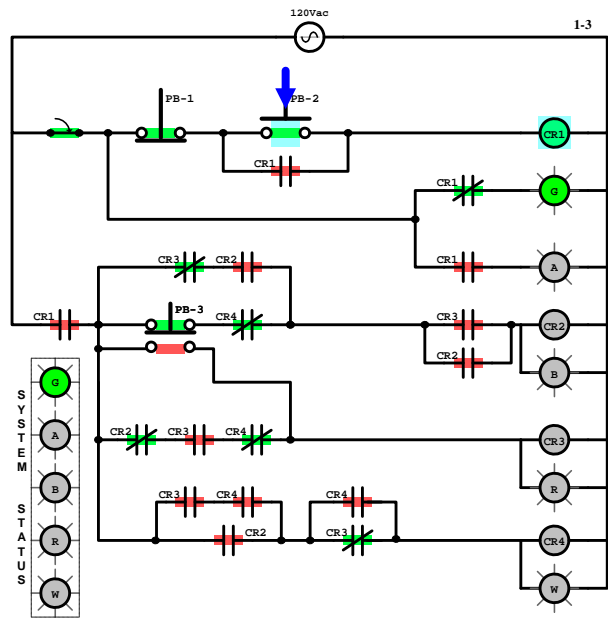




Step 2: PB-2 Pressed
(and held in)

Result: CR1 field coil is energized...

The "...” denotes that there is a delay between the time when a field coil is (de)energized and the time that any additional events occur when its associated contacts actuate (drop-out).
I.e. – The CR1 field coil has been energized, but the CR1 contacts haven't actuated; their actuation will be addressed in the next slide.



Step 2: PB-2 Pressed
(continued) (and held in)

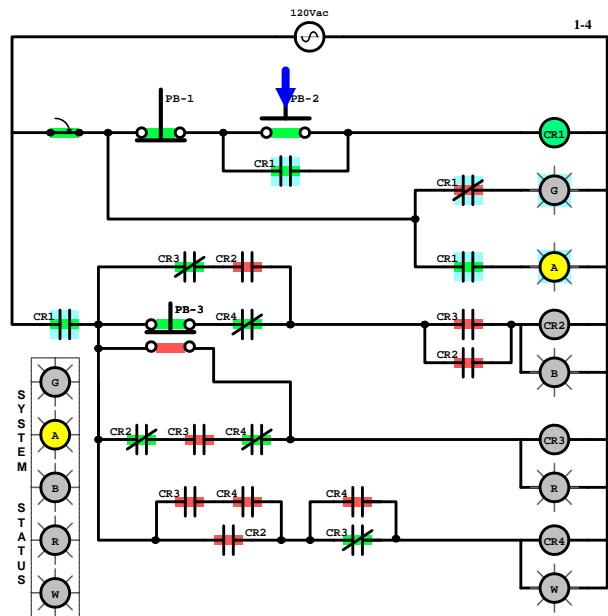
Delay: After CR1 field coil is energized:

CR1 contacts change position

"which instantaneously causes"

**Green Light OFF
Amber Light ON**

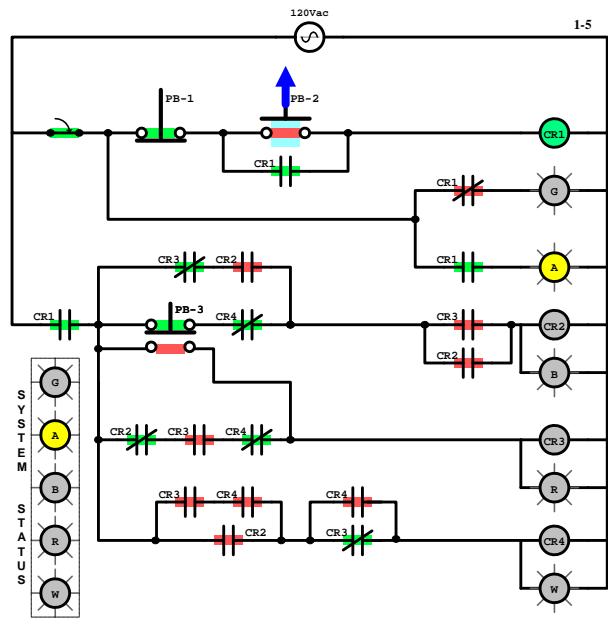
No additional changes in the system





Step 3: PB-2 Released

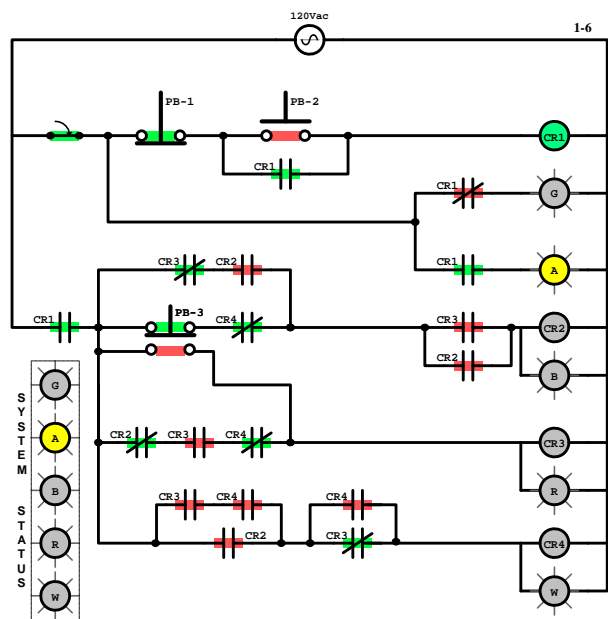
Result: No additional changes in the system



System status after PB-2 is Pressed and Released:

On: Amber

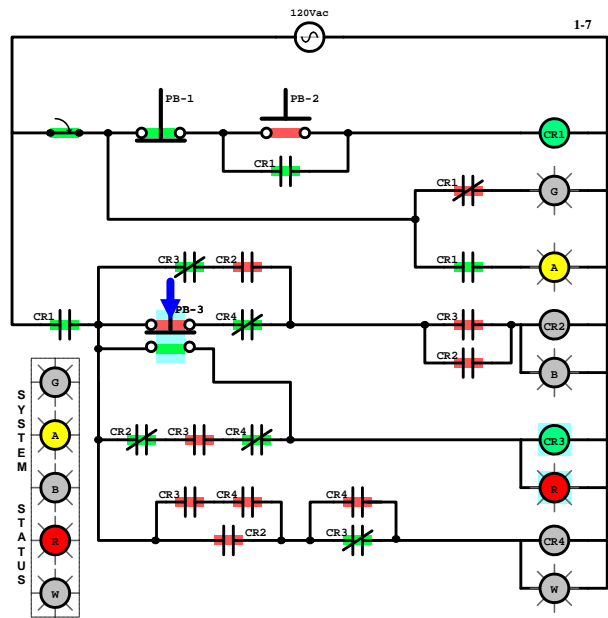
Off: Green
Blue
Red
White





Step 4: PB-3 Pressed
(and held in)

Result: Red Light ON
"and simultaneously" → +
CR3 field coil is energized...

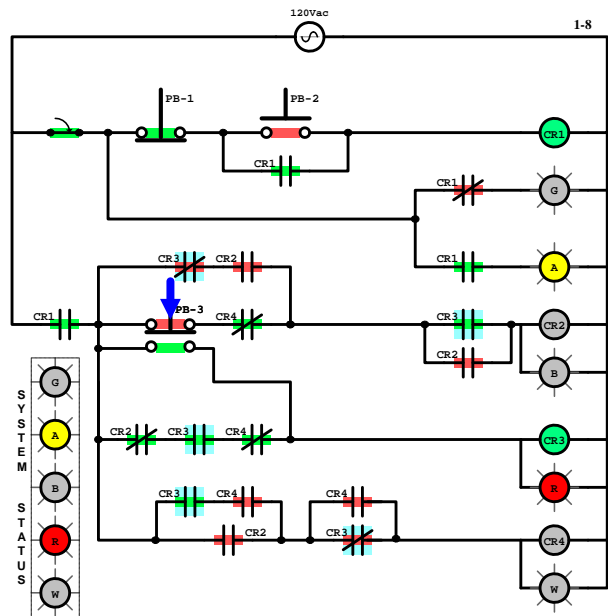


Step 4: PB-3 Pressed
(continued) (and held in)

Result: After CR3 field coil is energized:

CR3 contacts change position

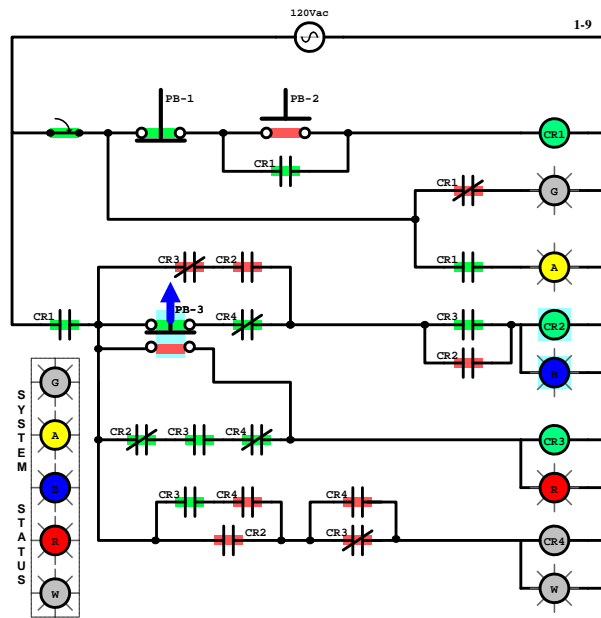
No additional changes in the system





Step 5: PB-3 Released

Result: Blue Light ON
+
CR2 field coil is energized...

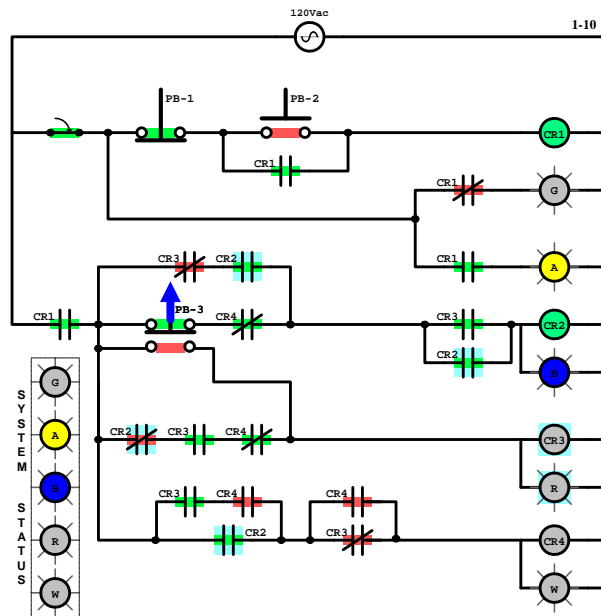


Step 5: PB-3 Released

(continued)

Result: After CR2 field coil is energized:

CR2 contacts change position
↓
Red Light OFF
+
CR3 field coil is de-energized...





Step 5: PB-3 Released

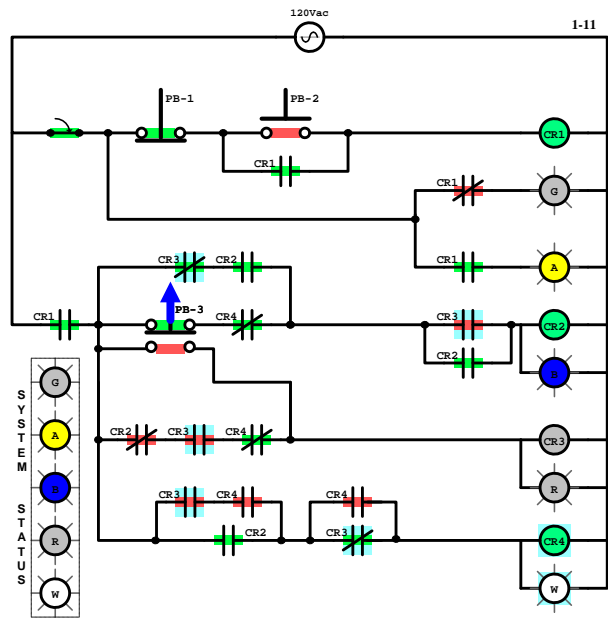
(continued)

Result: After CR3 field coil is de-energized:

CR3 contacts
change position

↓
White Light ON

+
CR4 field coil is energized...



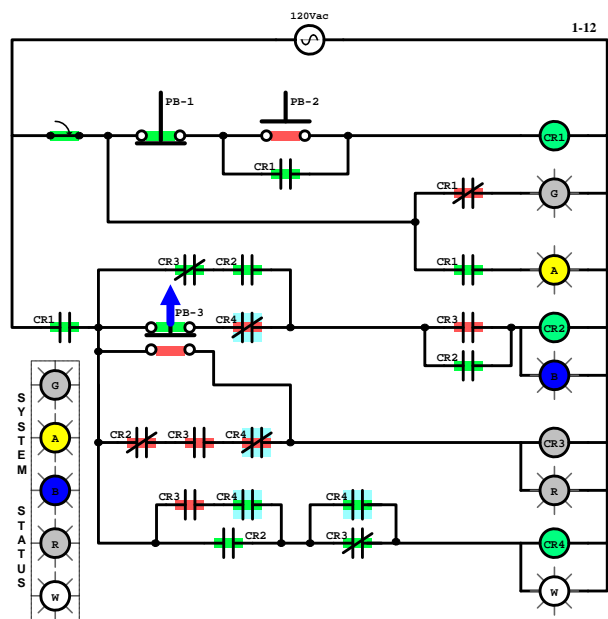
Step 5: PB-3 Released

(continued)

Result: After CR4 field coil is energized:

CR4 contacts
change position

No additional
changes in
the system

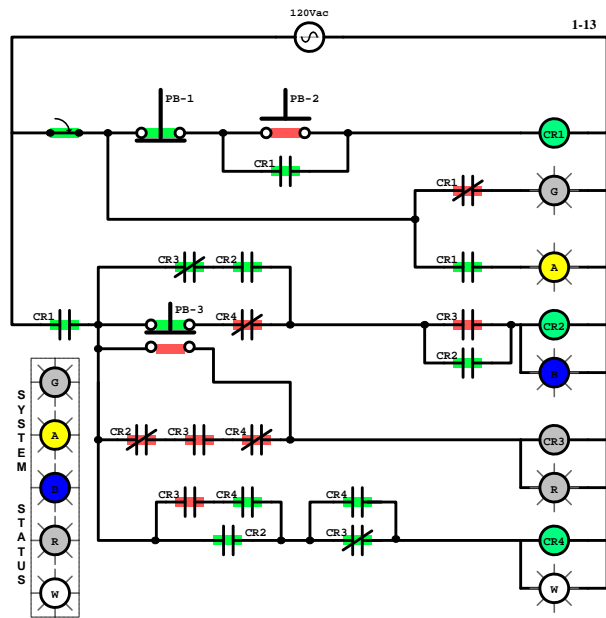




**System status after
PB-3 is Pressed
and Released:**

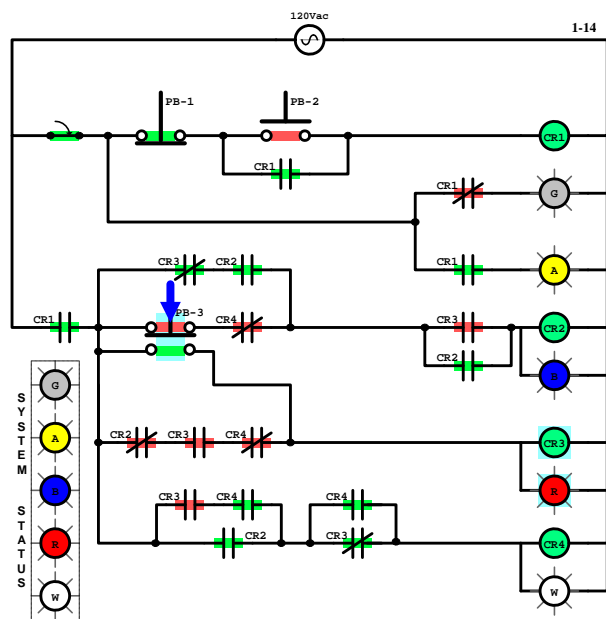
On: Amber
Blue
White

Off: Green
Red



**Step 6: PB-3 Pressed
(and held in 2nd time)**

**Result: Red Light ON
+
CR3 field coil
is energized...**

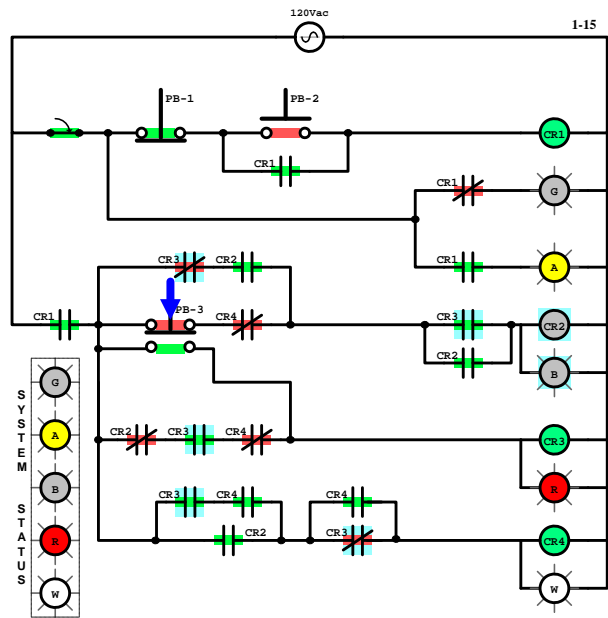




Step 6: PB-3 Pressed
 (continued) (and held in 2nd time)

Result: After CR3 field coil is energized:

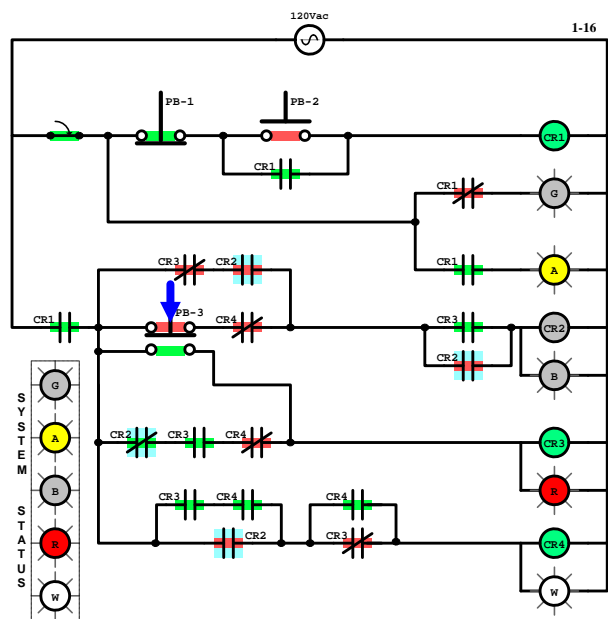
CR3 contacts
 change position
 ↓
 Blue Light OFF
 +
 CR2 field coil is de-energized...



Step 6: PB-3 Pressed
 (continued) (and held in 2nd time)

Result: After CR2 field coil is de-energized:

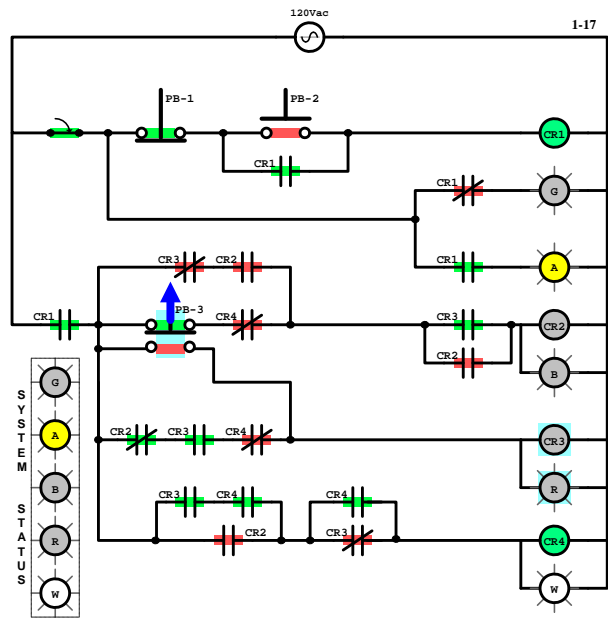
CR2 contacts
 change position
 No additional
 changes in
 the system





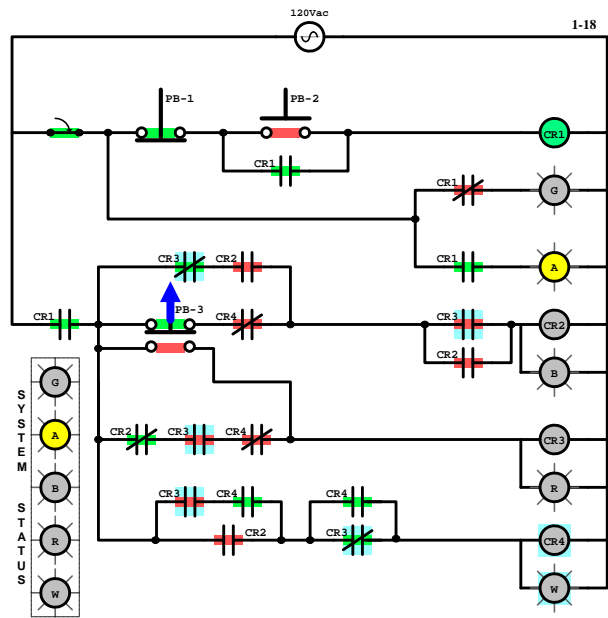
Step 7: PB-3 Released
(2nd time)

Result: Red Light OFF
+
CR3 field coil is de-energized...



Step 7: PB-3 Released
(2nd time)

Result: After CR3 field coil is de-energized:
CR3 contacts change position
↓
White Light OFF
+
CR4 field coil is de-energized...





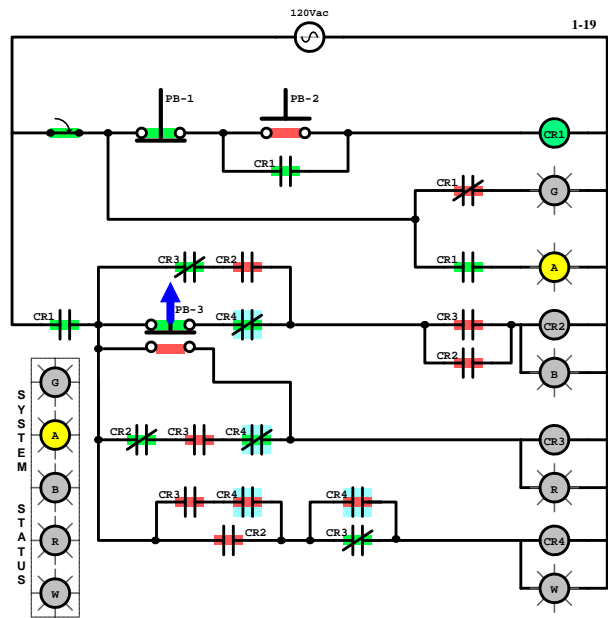
Step 7: PB-3 Released

(continued) (2nd time)

Result: After CR4 field coil is de-energized:

CR4 contacts
change position

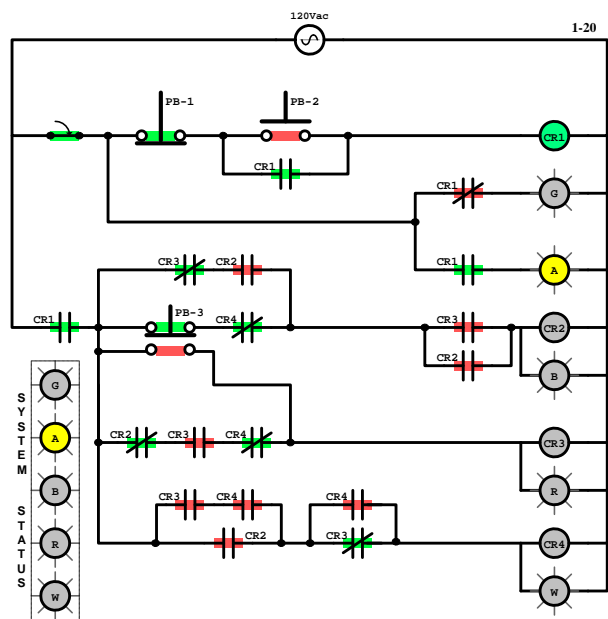
No additional
changes in
the system



**System status after
PB-3 is Pressed
and Released (2nd time)**

On: Amber

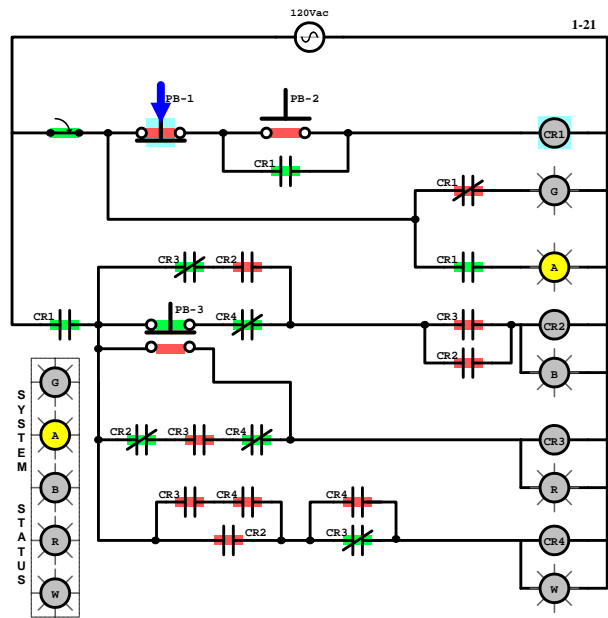
Off: Green
Blue
Red
White





Step 8: PB-1 Pressed
(and held in)

Result: CR1 field coil is de-energized...



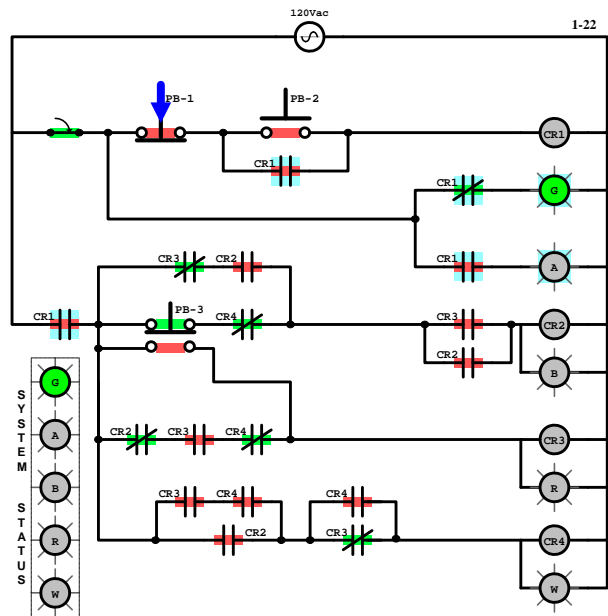
Step 8: PB-1 Pressed
(continued) (and held in)

Result: After CR1 field coil is de-energized:

CR1 contacts change position

Green Light ON
Amber Light OFF

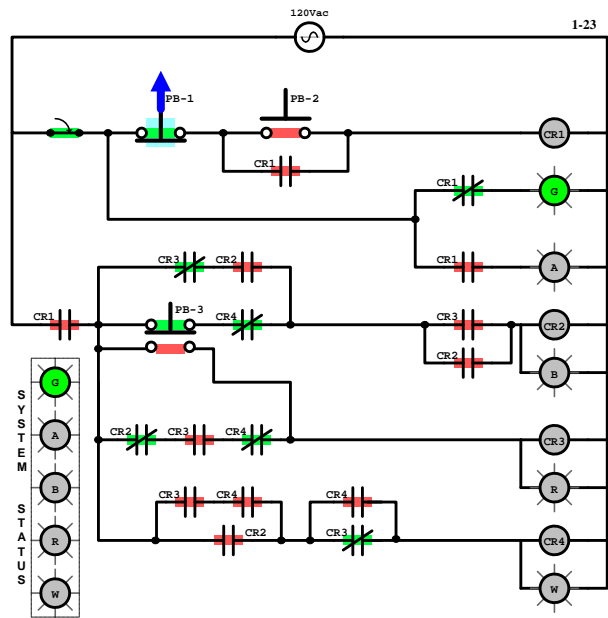
No additional changes in the system





Step 9: PB-1 Released

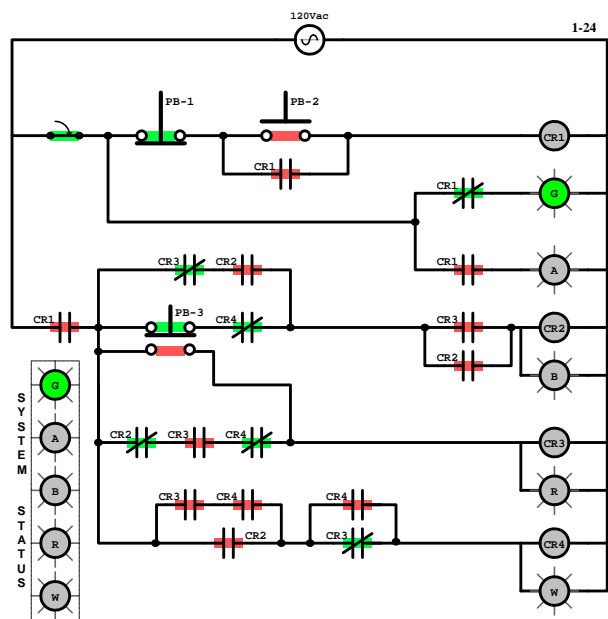
Result: No additional changes in the system



System status after PB-1 is Pressed and Released:

On: Green

Off: Amber
Blue
Red
White

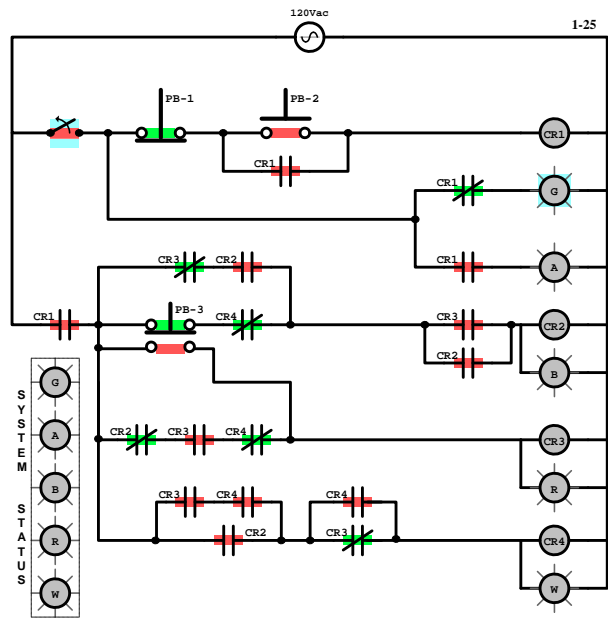




Step 10: Power Switch
flipped OFF

Result: Green Light OFF

No additional
changes in
the system



System status with the
power switch in the
OFF position.

On: None

Off: Green
Amber
Blue
Red
White

