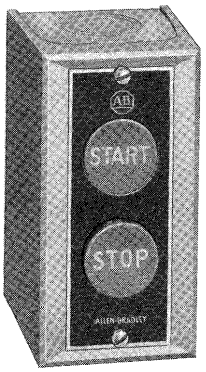
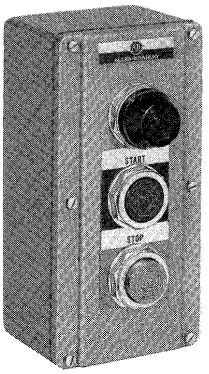
Product Data

TYPICAL WIRING DIAGRAMS For Push Button Control Stations



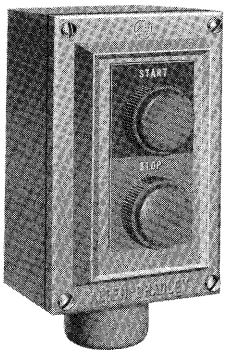
BULLETIN 800S
STANDARD DUTY

A-2750



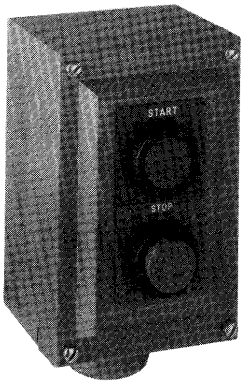
BULLETIN 800T
OIL TIGHT

B-1302



BULLETIN 800H
HEAVY DUTY
CORROSION-RESISTANT
BOOTED

A-6178



BULLETIN 800H
HEAVY DUTY
CORROSION-RESISTANT
BOOTLESS

89-068-g

Bulletin 800 Control Stations are a rugged line of devices designed for use in control circuits These control stations offer compact size and dependable operation to meet most application requirements. Assembled control stations are available in a variety of combinations that can include push buttons, selector switches, pilot lights, and special purpose devices.

Publication 800-2.0 -June, 1989
Supersedes Publication 800-2.0 Dated November, 1977

Table of Contents

General Information

This publication is designed to serve as:

1. A guide in understanding control circuits.
2. A handy reference pointing out the features of the more common circuits.
3. A guide in the selection and installation of push button control stations.

Genera/ Information (continued)

- Each circuit is illustrated with a control circuit schematic or line diagram and a control station wiring diagram.
- The schematic or line diagram includes all the components of the control circuit and indicates their function.
- The control station wiring diagram is a representation of the physical station, showing the relative positions of units, the suggested internal wiring, and connections with the starter.

Symbols common to most circuits are explained on Page 5. Less common symbols are explained where they occur.

NOTE - The symbols used in this publication were adapted by Allen-Bradley for use in accordance with NEMA standards. A particular application must satisfy the needs of the user and comply with applicable codes and laws before using any of the typical circuits shown in this publication.

Push Button Contact Selection

In the United States, contacts are normally rated by NEMA (National Electrical Manufacturers Association) standards. Internationally, contacts are rated by IEC (International Electrotechnical Commission) standards. By matching the contact rating to the load requirements, a proper contact block can be selected. Typically, Push Button contact selection includes the following factors; Voltage/Amperage Requirements, Type of Load and Environment.

The contacts selected must be capable of handling the voltage and current to be switched. Control circuit loads are typically called “pilot duty” loads. The load being switched can be a relay, contactor, or similar device that activates a "power circuit". Pilot Duty devices should not be used to switch horsepower or lighting loads unless they are specifically rated to do so.

Solid state applications such as those with programmable controllers may require contacts that are able to switch low current and low voltage resistive loads. Logic reed type contacts provide reliable switching of solid state loads with minimum contact bounce.

Contaminated or hazardous location environments may require the use of “sealed switch” type contacts. Applicable codes should always be checked.

Pilot Light Selection

Pilot Light selection is based on the following factors; Voltage, Lamp Requirements, Environment, and Cost.

The voltage of a pilot light must match the voltage supply. If both AC and DC voltage sources are available, AC voltage is recommended because it typically extends lamp life on incandescent units. When using an AC source of 120 Volts or higher, a transformer type pilot light can also increase lamp life.

Selection of the type of lamp can also affect lamp life. There are three types of lamps commonly used in pilot lights; incandescent, neon, and LED (Light Emitting Diode).

Incandescent lamps have the shortest lamp life and are susceptible to damage from shock and vibration. Incandescent lamps with lower voltages have thicker filaments and burn cooler, plus are more durable. Neon lamps provide longer lamp life, but have slightly reduced illumination. LED lamps provide the longest lamp life and are the least susceptible to damage from shock and vibration.

Illumination requirements are also important when selecting a lamp. Depending on the color, an incandescent lamp can provide brighter illumination when compared with a neon or LED lamn.

Cost of the unit in terms of initial expense should also be addressed. Although it may be cost effective to initially install a device with a full voltage incandescent lamp, a transformer type, LED or neon unit can reduce downtime costs through increased lamp life.

For more information on Pilot Light selection, refer to Allen-Bradley, Milwaukee, WI.

Undervoltage Protection

Unless otherwise specified, the circuits provide undervoltage protection or "three wire" control. In the event of power failure, these circuits are designed to protect against automatic restarting when the power returns. This type of protection should be used where accidents or damage might result from unexpected starts.

Undervoltage Release

The circuits using undervoltage release or "two wire" control are noted in the Table of Contents. With any type of control, the motor starts automatically after a power failure. Typically, these circuits involve automatic pilot devices such as thermostats, float switches, etc.

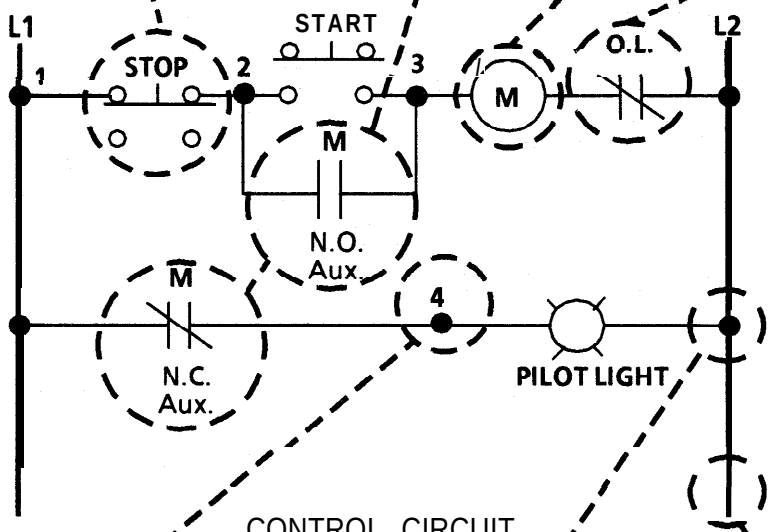
Explanation of Symbols

Momentary Contact Push Button - Depressing button opens and closes lower contacts. Releasing button returns contacts to the normal condition shown.

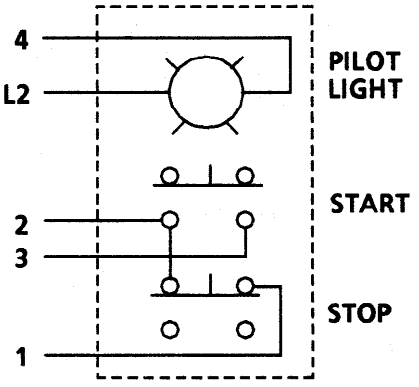
Auxiliary Contacts-Operate when parent switch does. In this case, normally open (N.O.) contacts close and normally closed (NC.) contacts open when coil (M) is energized.

Operating Coil of Contactor:
M - Main Line
F - Forward
R - Reverse
S - Slow
F - Fast
CR-Control Relay

Overload Relay Contacts - (One or more depending on starter construction).



CONTROL CIRCUIT



PUSH BUTTON CIRCUIT
WIRING DIAGRAM

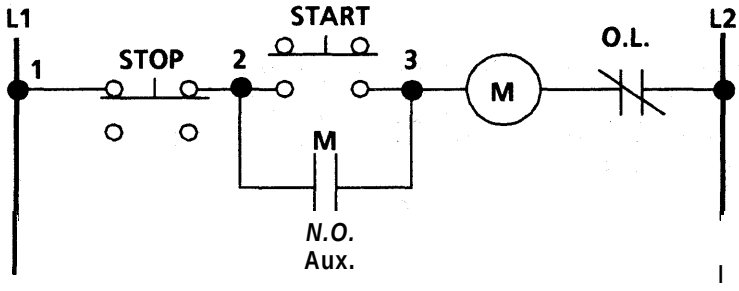
Reference Point-Identified on starter, corresponds with number shown in push button station wiring diagram.

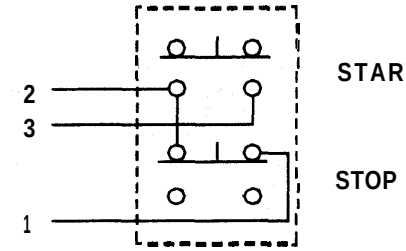
Junction of Conductors - Absence of node indicates wires cross with no connection.

Power Line - Symbolized by weighted lines.

Start-Stop Control Wiring Diagrams

SINGLE STATION-BASIC CIRCUIT





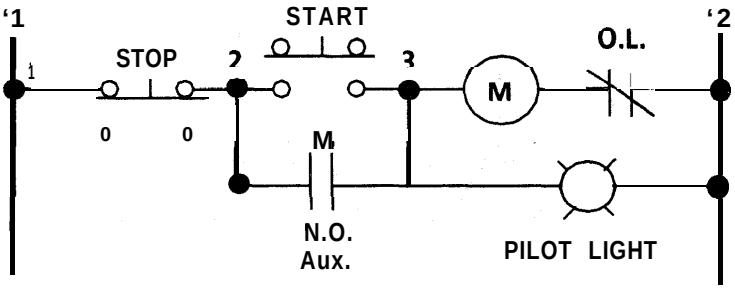
OPERATION-Depressing the START button energizes coil M, hold-in contacts M and maintains the circuit after the START button is released. Depressing the STOP button breaks the circuit, de-energizing coil M, contacts M return to their normally open position.

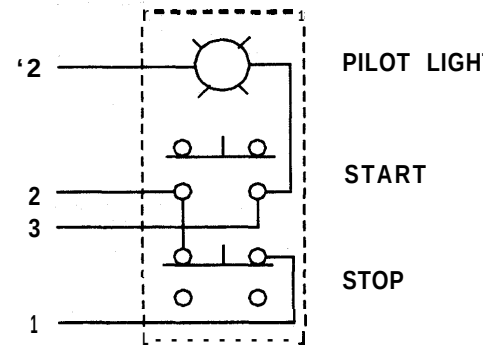
OVERLOAD PROTECTION -Operation of the overload relay contacts breaks the circuit, thus opens M. To restart the motor, the overloads must be reset and the START button must again be depressed.

UNDERVOLTACE PROTECTION - If a power failure de-energizes the circuit, hold-in contacts open. This protects against the motor starting automatically after the power returns. Unless otherwise stated, circuits to follow incorporate Undervoltage Protection.

PUSH BUTTON STATIONS	
Type of Station	**Catalog Number**
Standard Duty	800S-2SA
Heavy Duty General Purpose	800H-2HA
Heavy Duty- Booted Corrosion-Resistant	800H-2HA4R
Heavy Duty- Bootless Corrosion-Resistant	800H2HA4RL
Oiltight/Watertight	800T-2TA

SINGLE STATION -WITH MOTOR RUNNING PILOT LIGHT



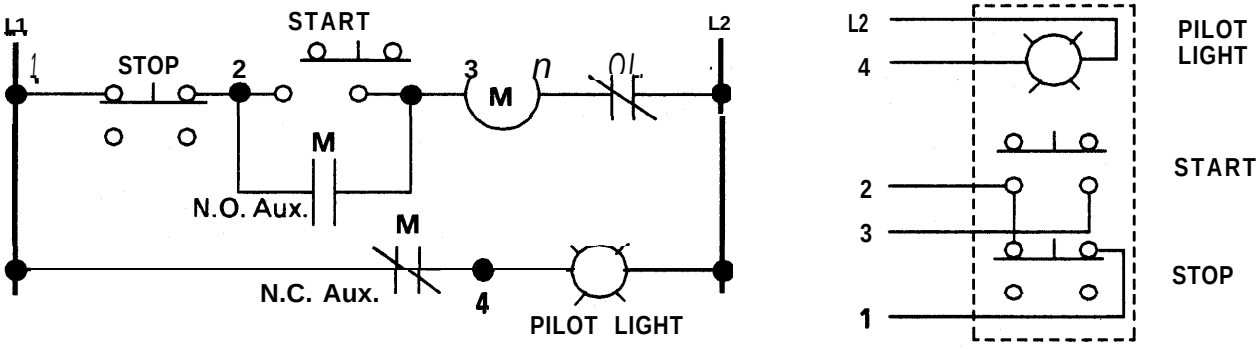


Whenever the motor is running, the pilot light is illuminated. Except for this modification, the circuit and its operation is the same as the basic single station.

PUSH BUTTON STATIONS					
Voltage	**Type of Station**				
	Standard Duty	Heavy Duty General Purpose	Heavy Duty - Booted Corrosion-Resistant	Heavy Duty - Bootless Corrosion-Resistant	Oiltight/ Watertight
	Catalog Number	**Catalog Number**	**Catalog Number**	**Catalog Number**	**Catalog Number**
120V 240V 480V, 60Hz 600V, 60Hz	800S=2SAP 800S-2SAP	800H-2HAR 800H-2HAP 800H-2HAY 800H-2HAV	800H-2HAR4R 800H-2HAP2R 800H-2HAY4R 800H-2HAV4R	800H-2HAR4RL 800H-2HAP4RL 800H-2HAY4RL 800H-2HAV4RL	800T-2TAR 800T-2TAP 800T-2TAY

Start-Stop Control Wiring Diagrams

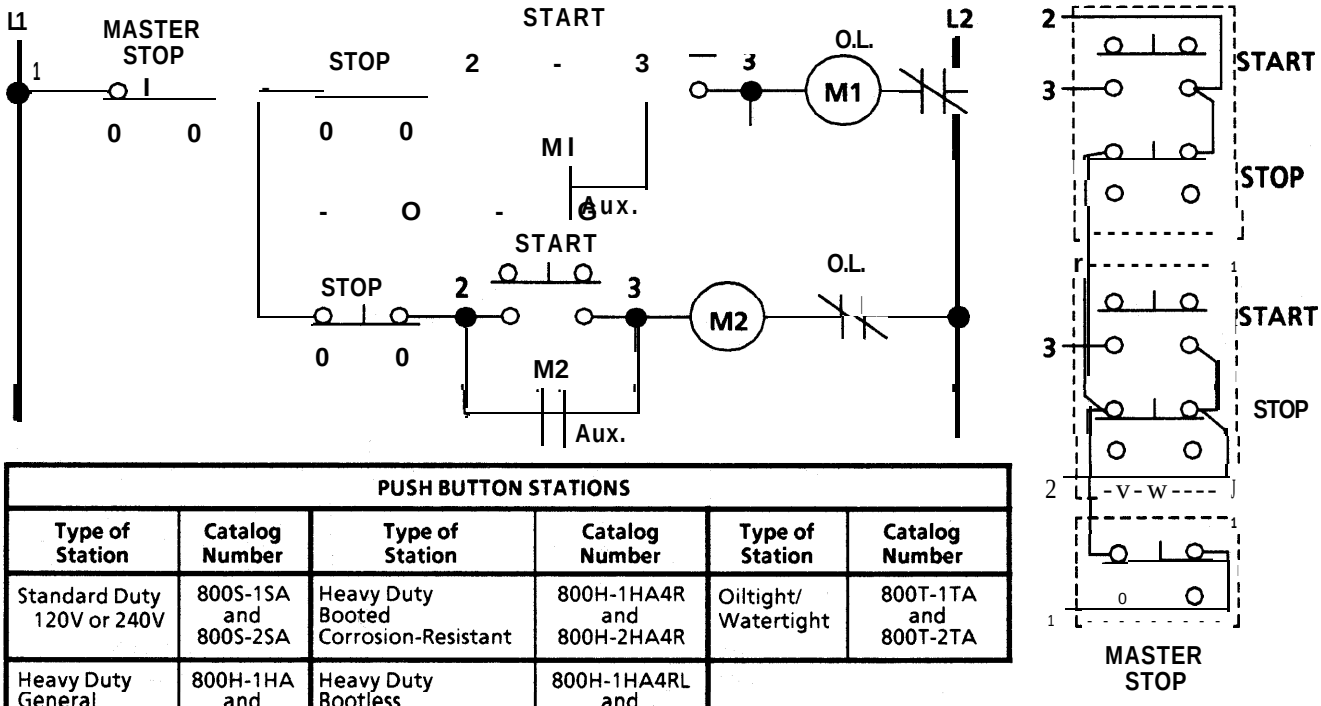
SINGLE STATION-WITH MOTOR STOPPED PILOT LIGHT



Bulletin 1495 normally closed auxiliary contacts are required. With the motor running contacts are open; with the motor stopped contacts are closed and the pilot light is illuminated. The basic circuit and its operation is the same as the diagram on Page 6.

PUSH BUTTON STATIONS					
Voltage		Type of Station			
	Standard Duty	Heavy Duty General Purpose	Heavy Duty • Booted Corrosion-Resistant	Heavy Duty • Bootless Corrosion-Resistant	Oiltight/ Watertight
	Catalog Number	Catalog Number	Catalog Number	Catalog Number	Catalog Number
120V	800S-2SAP	800H-2HAR	800H-2HAR4R	800H-2HAR4RL	800T-2TAR
240v	800S-2SAP	800H-2HAP	800H-2HAP4R	800H-2HAP4RL	800T-2TAP
480V 60Hz		800H-2HAY	800H-2HAY4R	800H-2HAY4RL	800T-2TAY
600V 60Hz		800H-2HAV	800H-2HAV4R	800H-2HAV4RL	800T-2TAV

GROUP OF SINGLE STATIONS-WITH MASTER STOP BUTTON



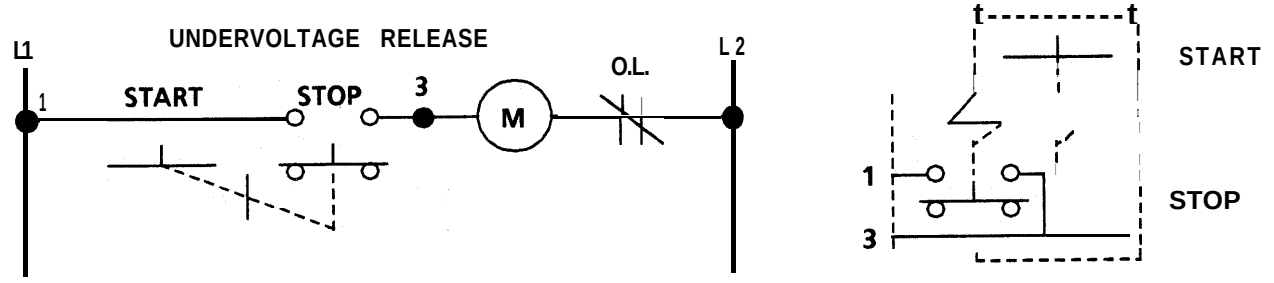
PUSH BUTTON STATIONS					
Type of Station	Catalog Number	Type of Station	Catalog Number	Type of Station	Catalog Number
Standard Duty 120V or 240V	800S-1SA and 800S-2SA	Heavy Duty Booted Corrosion-Resistant	800H-1HA4R and 800H-2HA4R	Oiltight/ Watertight	800T-1TA and 800T-2TA
Heavy Duty General Purpose	800H-1HA and 800H-2HA	Heavy Duty Bootless Corrosion-Resistant	800H-1HA4RL and 800H-2HA4RL		

A momentary contact MASTER STOP button is connected in series with a group of parallel connected circuits. Depressing the button de-energizes all of the circuits.

The circuits above are the basic START-STOP circuit shown on Page 6. They could be any of the preceding or following circuits that provide undervoltage protection. Two wire control or undervoltage release circuits are not applicable because they would be energized as the master stop button IS released.

Start-Stop Control Wiring Diagrams

SINGLE STATION - MAINTAINED CONTACT PUSH BUTTONS

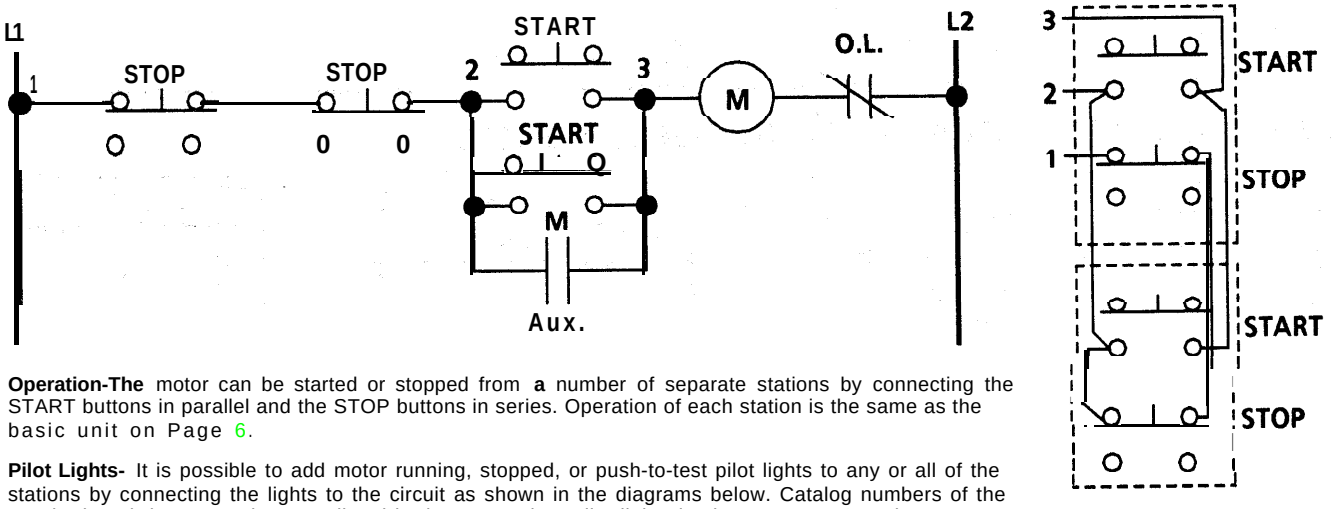


The START button mechanically maintains the contacts that take the place of hold-in contacts. Depressing the START button maintains the circuit; depressing the STOP button breaks the circuit by opening the start contacts.

If the contactor is de-energized by a power failure or overload operation, the start contacts are unaffected. The motor starts automatically.

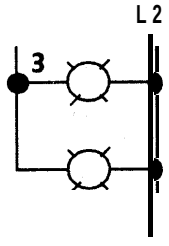
PUSH BUTTON STATIONS					
Type of Station	Standard Duty	**Heavy** Duty General Purpose	Heavy Duty-Booted Corrosion-Resistant	Heavy Duty-Bootless Corrosion-Resistant	Oiltight/Watertight
Catalog Number	800S-2SBM	800H-2HAM	800H-2HAM4R	800H-2HAM4RL	800T-2TAM

MULTI-STATION-WITH MOMENTARY CONTACT PUSH BUTTONS

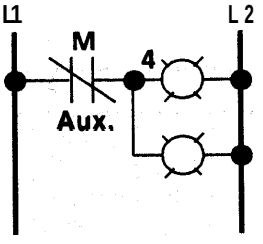


Operation-The motor can be started or stopped from **a** number of separate stations by connecting the START buttons in parallel and the STOP buttons in series. Operation of each station is the same as the basic unit on Page 6.

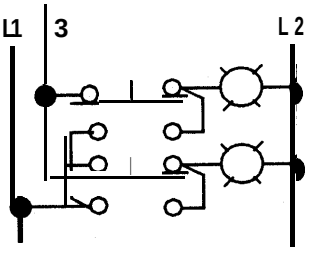
Pilot Lights- It is possible to add motor running, stopped, or push-to-test pilot lights to any or all of the stations by connecting the lights to the circuit as shown in the diagrams below. Catalog numbers of the required push button stations are listed in the appropriate pilot light circuits on Pages 6 and 7.



MOTOR RUNNING



MOTOR STOPPED

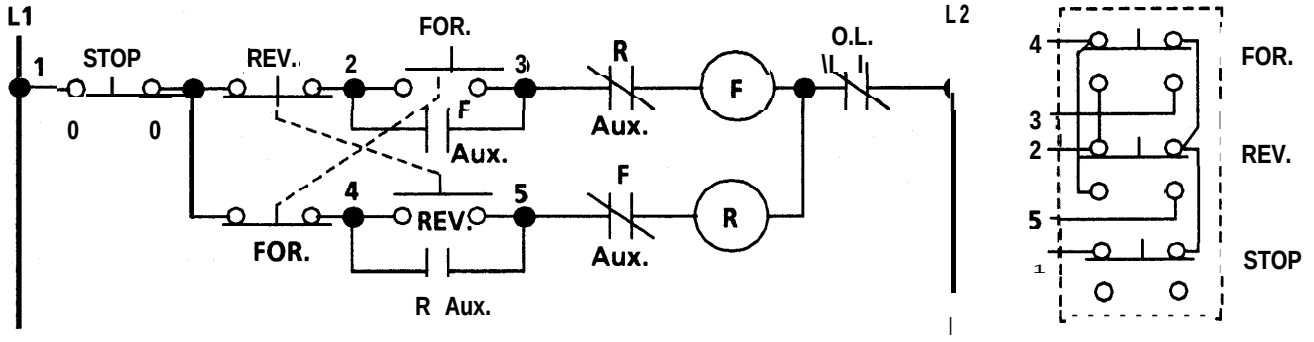


PUSH-TO-TEST RUNNING

PUSH BUTTON STATIONS					
Type of Station	Standard Duty	Heavy Duty General Purpose	Heavy Duty-Booted Corrosion-Resistant	**Heavy** Duty-Bootless Corrosion-Resistant	Oiltight/Watertight
Catalog Number	800S-2SA	800H-2HA	800H-2HA4R	800H-2HA4RL	

Reversing Control Wiring Diagrams

REVERSING STATION -BASIC CIRCUIT

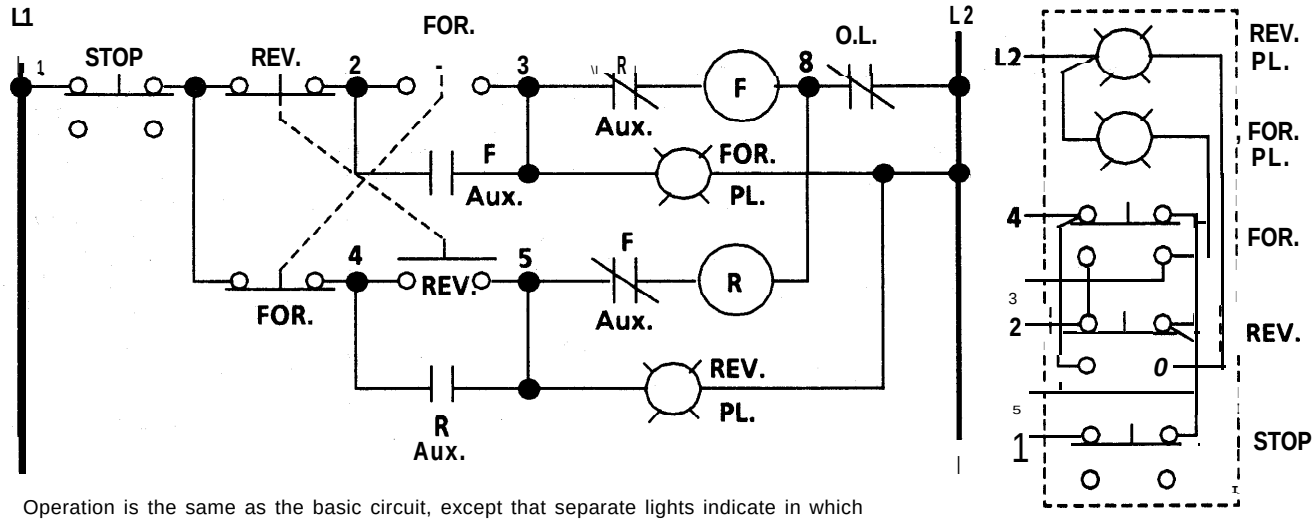


Operation - Depressing the FORWARD button begins the following sequence:
1. Coil F is energized. 2. Normally open contacts F close to hold in the FORWARD contactor; Normally closed interlock contacts F open to prevent the REVERSE contactor from being energized.

Changing the Direction of Rotation -Through the use of normally open contacts in the FORWARD and REVERSE push button units, it is unnecessary to depress the STOP button before changing the direction of rotation. Depressing the REVERSE button while running forward: 1. De-energizes the FORWARD control circuit, and 2. Energizes and holds in the REVERSE contactor in a manner similar to the forward operation outlined above. This results in "plug-reversing", that is, the motor acts as a brake until rotation stops, then the motor immediately starts turning in the opposite direction.

PUSH BUTTON STATIONS					
Type of Station	Standard Duty	Heavy Duty General Purpose	Heavy Duty-Booted Corrosion-Resistant	Heavy Duty-Bootless Corrosion-Resistant	Oiltight/Watertight
Cataloa Number	800S-3SA	800H-3HA	800H-3HA4R	800H-3HA4RL	800T-3TA

REVERSING STATION -WITH DIRECTION INDICATING PILOT LIGHTS

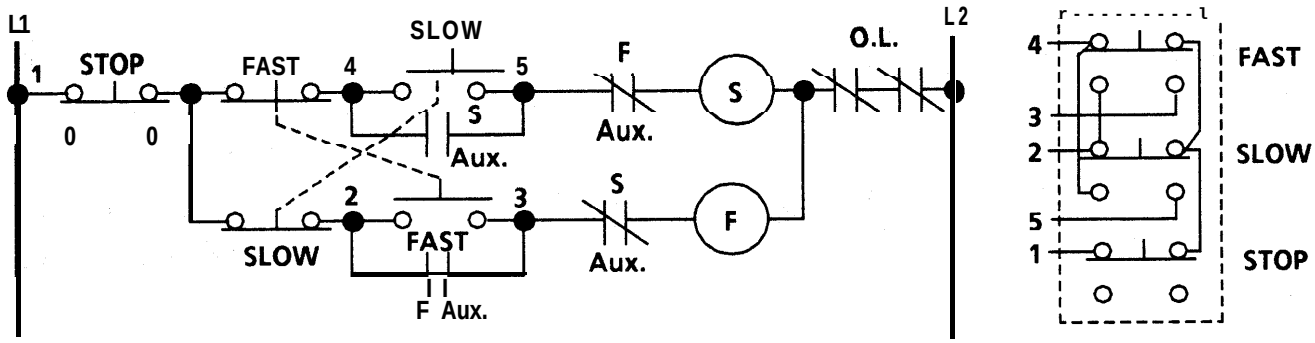


Operation is the same as the basic circuit, except that separate lights indicate in which direction the motor is running.

PUSH BUTTON STATIONS				
Voltage	**Type of Station &Catalog Number**			
	Heavy Duty General Purpose	Heavy Duty-Booted Corrosion-Resistant	Heavy Duty-Bootless Corrosion-Resistant	Oiltight/Watertight
120V	800H-3HA2R	800H-3HA2R4R	800H-3HA2R4RL	800T-3TA2R
240V	800H-3HA2P	800H-3HA2P4R	800H-3HA2P4RL	800T-3TA2P
480V, 60Hz	800H-3HA2Y	800H-3HA2Y4R	800H-3HA2Y4RL	800T-3TA2Y
600V, 60HZ	800H-3HA2V	800H-3HA2V4R	800H-3HA2V4RL	800T-3TA2V

Two-Speed Control Wiring Diagrams

TWO-SPEED STATION - BASIC CIRCUIT

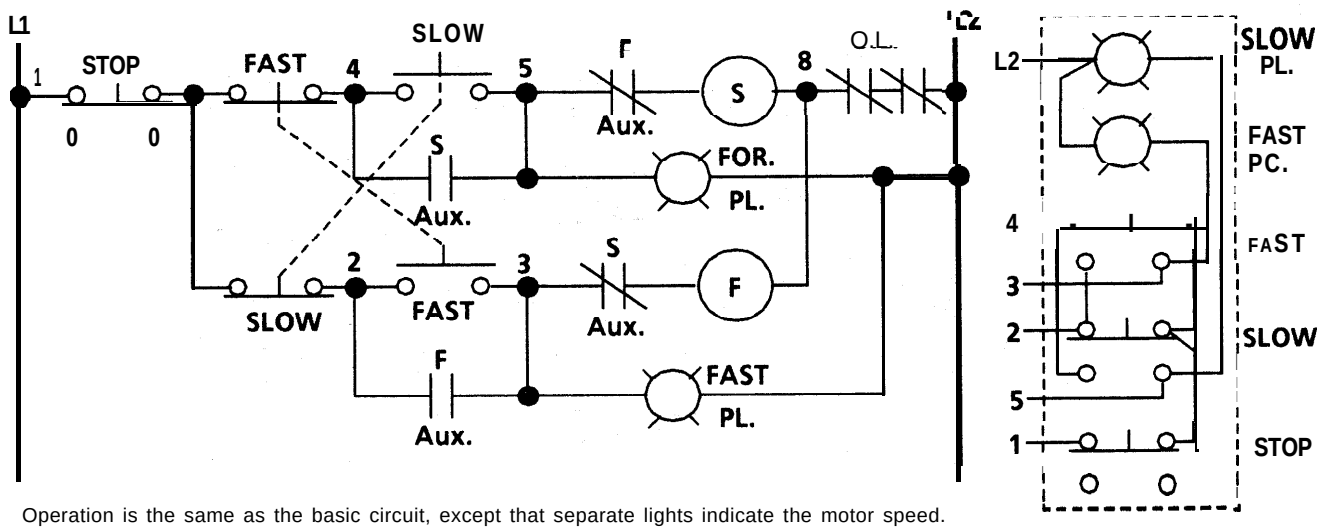


Operation - Depressing the SLOW button begins the following sequence: 1. Coil S is energized. 2. Normally open contacts S close to hold in the SLOW contactor; Normally closed interlock contacts S open to prevent the FAST contactor from being energized.

Changing Speeds- Through the use of the normally closed contacts in the SLOW and FAST push button units, it is unnecessary to depress the STOP button before changing speeds. Depressing the SLOW button while running fast: 1. De-energizes the fast control circuit. 2. Energizes and holds in the SLOW contactor as outlined above.

PUSH BUTTON STATIONS					
Type of Station	Standard Duty	Heavy Duty General Purpose	Heavy Duty-Booted Corrosion-Resistant	Heavy Duty-Bootless Corrosion-Resistant	Oiltight/Watertight
Catalog Number	800S-3SF	800H-3HF	800H-3HF4R	800H-3HF4RL	800T-3TF

TWO-SPEED STATION -WITH SPEED INDICATING PILOT LIGHTS

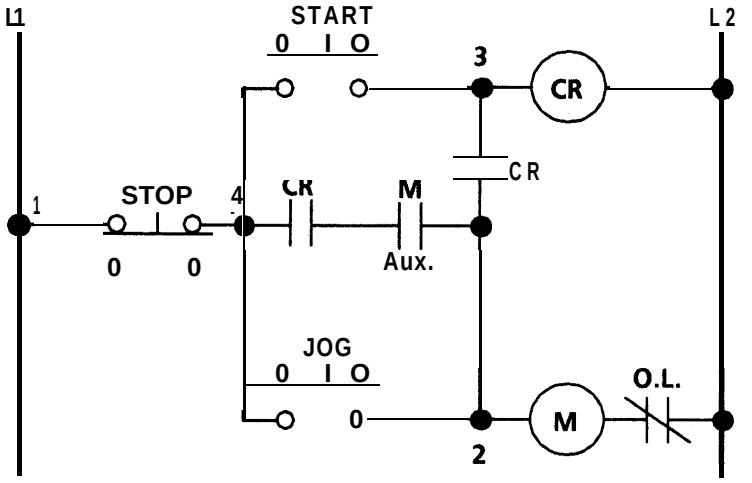


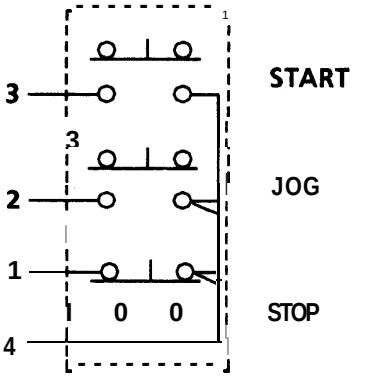
Operation is the same as the basic circuit, except that separate lights indicate the motor speed.

PUSH BUTTON STATIONS				
Voltage	**Type of Station &Catalog Number**			
	Heavy Duty General Purpose	Heavy Duty-Booted Corrosion-Resistant	Heavy Duty-Bootless Corrosion-Resistant	Oiltight/Watertight
120V	800H-3HF2R	800H-3HF2R4R	800H-3HF2R4RL	800T-3TF2R
240V	800H-3HF2P	800H-3HF2P4R	800H-3HF2P4RL	800T-3TF2P
480V 60HZ	800H-3HF2Y	800H-3HF2Y4R	800H-3HF2Y4RL	800T-3TF2Y
600V 60HZ	800H-3HF2V	800H-3HF2V4R	800H-3HF2V4RL	800T-TF2V

Miscellaneous Wiring Diagrams

SEPARATE START, STOP, & JOG -WITH STANDARD PUSH BUTTONS AND JOG RELAY



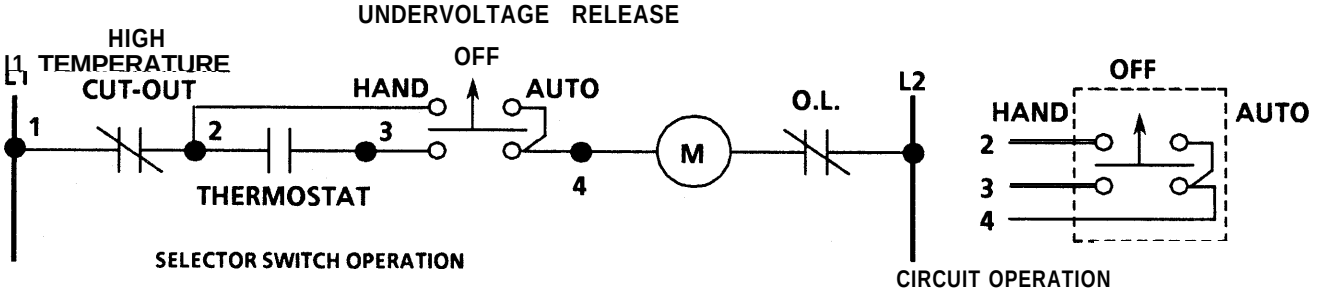


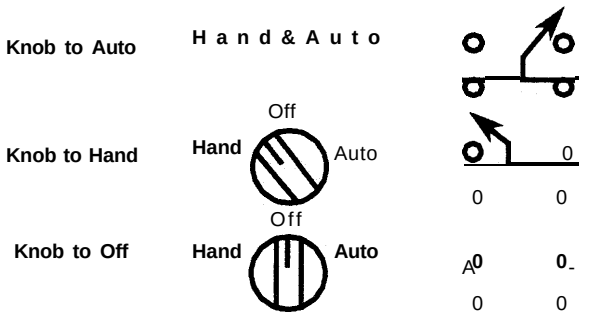
OPERATION - Depressing the START Button begins the following sequence: 1. Coil CR is energized; 2. Contacts CR close; 3. Coil M is energized; 4. Contacts M close to hold in the contactor.

Depressing the JOG button energizes Coil M, but normally open contacts CR prevent against the contactor holding in; the motor will run only as long as the operator holds in the JOG button.

PUSH BUTTON STATIONS				
Type of Station	Heavy Duty General Purpose	Heavy Duty-Booted Corrosion-Resistant	Heavy Duty-Bootless Corrosion-Resistant	Oiltight/Watertight
Catalog Number	800H-3HG	800H-3HG4R	800H-3HG4RL	800T-3TG

THERMOSTAT CONTROLLED MOTOR -WITH SELECTOR SWITCH





Selector Switch to Auto-When the temperature is below the preset value, the thermostat contacts are closed and contactor M is held in. Above this temperature, the contacts automatically open the circuit. A high temperature cut-out is included to open the circuit if the thermostat contacts should fail open.

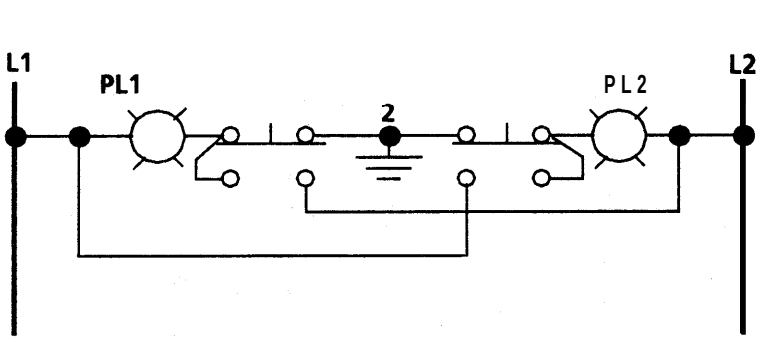
Selector Switch to Hand-The thermostat is by-passed to permit testing of the circuit or emergency operation of the motor. The high temperature cut-out should be set to operate in the event of dangerous temperatures.

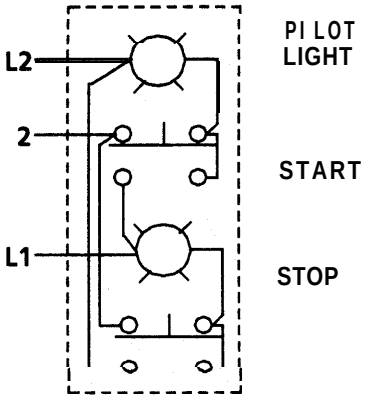
Selector Switch to Off -The circuit is open.

PUSH BUTTON STATIONS					
Type of Station	Standard Duty	Heavy Duty General Purpose	Heavy Duty-Booted Corrosion-Resistant	Heavy Duty-Bootless Corrosion-Resistant	Oiltight/Watertight
Catalog Number	800S-R3SX	800H-R3HA	800H-R3HA4R	800H-R3HA4RL	800T-RT3A

Miscellaneous Wiring Diagrams

GROUND DETECTION-WITH PUSH-TO-TEST PILOT LIGHTS





Operation -This circuit is used to detect **a** ground fault in ungrounded control circuits. Under normal conditions, the lights are series connected and will burn dim. When a ground fault on L1 occurs, PL1 is short circuited and PL2 is directly across the line; PL1 is out and PL2 burns brightly. Similarly, when a ground fault on L2 occurs, PL2 is out and PL1 burns brightly.

Push-to-Test Pilot Lights- Because the lights are series connected, neither will light if one of them is burned out. The Push-To-Test feature makes it possible to quickly identify the defective bulb by simply depressing the lens, connecting the bulb directly across L1 and L2.

PUSH BUTTON STATIONS	
Type of Station	**Catalog Number**
Oiltight	
120V, 60Hz	800T-2TW18
240V, 60Hz	800T-2TW19
480V, 60Hz	800T-2TW20
600V, 60Hz	800T-2TW21